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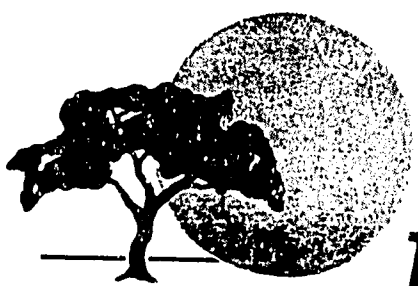
Jubba Environmental and Socioeconomic Studies

VOLUME III: SOCIOECONOMIC STUDIES



JESS *Jubba Environmental and Socioeconomic Studies*

Daraasaadka Dooxada Jubba

A project of • Ministry of National Planning and Jubba Valley Development • United States Agency for International Development • Associates in Rural Development, Inc.

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Pastoral Economy and Seasonal Livestock Movements in the Jubba Valley
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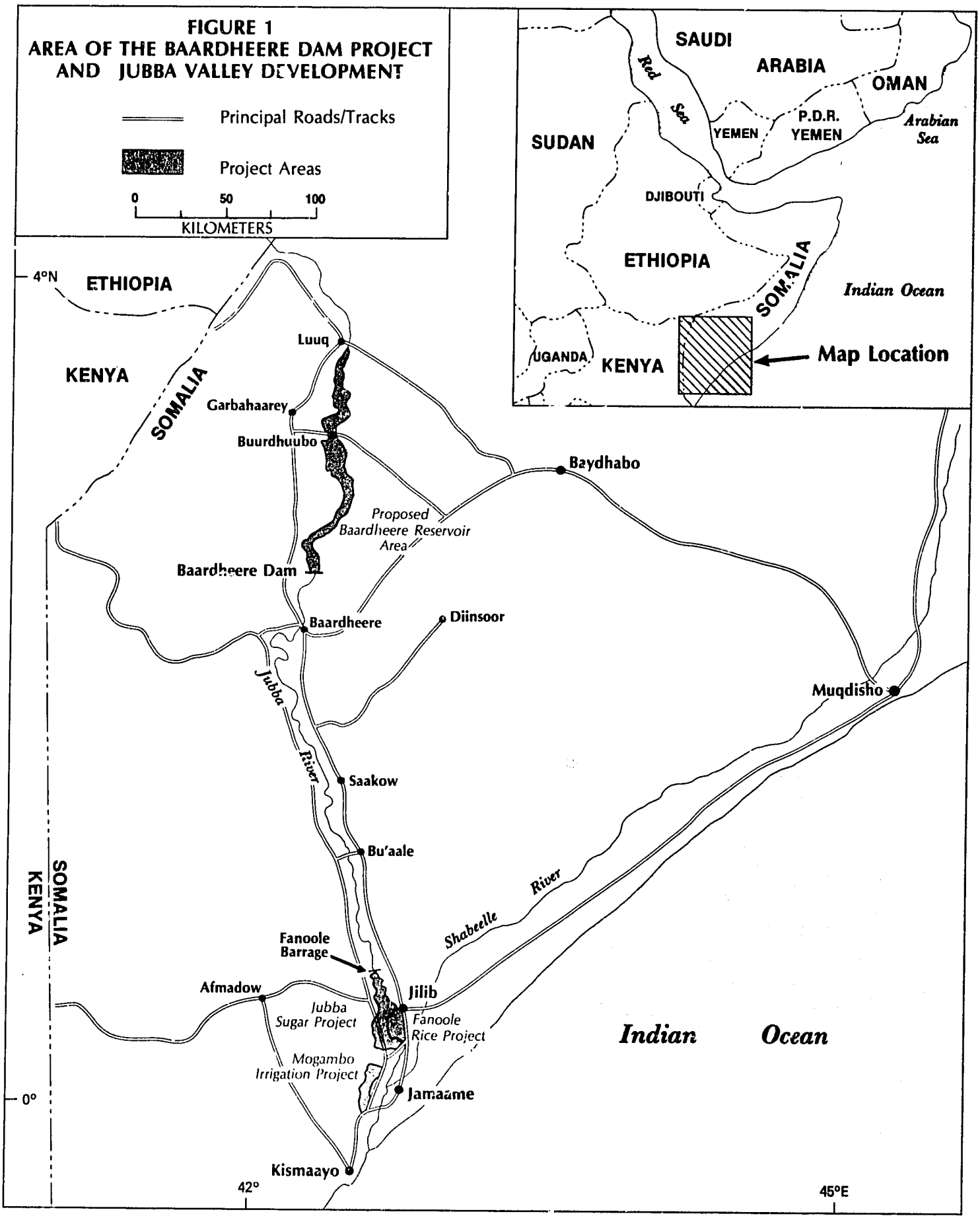
FIGURE 1
AREA OF THE BAARDHEERE DAM PROJECT
AND JUBBA VALLEY DEVELOPMENT
Principal Roads/Tracks
Project Areas
0
50
100
KILOMETERS
SAUDI
ARABIA
OMAN
Red Sea
SUDAN
YEMEN
P.D.R. YEMEN
Arabian Sea
DJIBOUTI
ETHIOPIA
SOMALIA
Indian Ocean
UGANDA
KENYA
Map Location
4°N
ETHIOPIA
KENYA
SOMALIA
Luuq
Garbahaarey
Buurdhuubo
Baydhabo
Proposed Baardheere Reservoir Area
Baardheere Dam
Baardheere
Diinsoor
Jubba River
Muqdisho
Saakow
Bu'aale
Shabeelle River
Fanoole Barrage
Afmadow
Jilib
Jubba Sugar Project
Fanoole Rice Project
Mogambo Irrigation Project
Jamaame
Indian Ocean
0°
Kismaayo
42°
45°E

Jubba Environmental and Socioeconomic Studies (JESS) were part of the Jubba Development Analytical Studies Project (JuDAS), implemented in southern Somalia by the U.S. Agency for International Development (USAID) and Ministry of National Planning and Jubba Valley Development (MNPJVD) of the Government of the Somali Democratic Republic (GSDR). Associates in Rural Development, Inc. (ARD), of Burlington, Vermont, provided technical assistance and project management for JESS under USAID contract number AFR-0134-C-00-5047-00. The JuDAS Project also included a soils and land-use classification project, completed in 1987 by the U.S. Bureau of Reclamation (USBR), and a long-term training component administered by USAID. In addition, the Board on Science and Technology for International Development (BOSTID) of the National Academy of Sciences (NAS) provided advisory services to USAID and MNPJVD under JuDAS.

JESS began in September 1985 and ended in March 1989 with publication of this final report. It was carried out as a three-phase project to collect environmental and socioeconomic data in Somalia's Jubba Valley—the site of proposed development of a large hydroelectric dam with the following characteristics:

Specifications of Proposed Baardheere Dam and Reservoir[1]

Installed generating capacity	105 mw
Dam height	75 m
Dam length	609 m
Elevation at dam crest	144 masl
Reservoir water level	
min. normal operation (at penstocks)	128 masl
max. normal operation	142 masl
max. exceptional (flood)	148 masl
max. normal fluctuation[2]	14 m
Reservoir characteristics[3]	
length	160 km
surface area	310 km^2
volume	3,400 million m^3
Discharge[4]	
annual monthly mean	152 cumecs
max. operation	203 cumecs
design flood	750 cumecs
Average residence time for inflows during max. normal operation	191 days

1. Values are approximate, based on preliminary design (ELC 1985).
2. Drawdown in typical year is 7 m. 3. Approximated for 142 masl.
4. Information updated by AHT (personal communications, 1988).

Complementary to construction of the dam, various plans are being prepared for subsequent development of irrigated agriculture in the middle and lower Jubba Valley. Numerous environmental and socioeconomic changes will occur with dam construction, filling of the reservoir, infrastructural enhancement, and intensification of agriculture.

The JuDAS Project had two major purposes:

- **to gather necessary information on soils/land use and socioeconomic and environmental factors to be incorporated into a master planning process for Jubba Valley development; and**
- **to provide MNPJVD with technical support and training.**

As one of its objectives was to assist Jubba Valley development, JESS continuously supplied results from its socioeconomic and environmental studies to a master planning team assigned to MNPJVD. The team was financed by the German Agency for Technical Cooperation (GTZ) and staffed through Agrar- und HydroTechnik, GMbH (AHT). JESS also provided practical, informal training for its Somali counterparts and served in an advisory capacity to USAID and MNPJVD on long-term training. The three phases of JESS are described below.

Phase I was a six-month period from September 1985 to March 1986 that was used to review and assemble data from existing literature, studies, and ongoing programs in the project area. Based on information gaps and an overview of the area, JESS prepared a work plan to conduct appropriate baseline and problem-specific studies concerning environmental and socioeconomic conditions in the Valley.

Phase II lasted for 24 months, from April 1986 to March 1988, and focused on intensive field data collection, including two longer-term baseline studies (on socioeconomics and terrestrial ecology) and various separate short-term investigations on a variety of environmental and socioeconomic factors relevant to Jubba Valley development.

Phase III, from April 1988 to March 1989, consisted of data analysis, synthesis, interpretation of research results and report writing. This phase culminated in the present comprehensive final report

which presents pertinent research findings, and recommendations for enhancing the positive effects and avoiding or mitigating negative impacts of dam construction and operation, as well as development of the Jubba Valley.

The main vehicle for NAS/BOSTID's interaction with the JESS team, USAID and MNPJVD, was a series of workshops/technical advisory meetings. The first workshop, which was held in Somalia at the end of January 1986 and included a field trip to the Jubba Valley, was organized to give direct input to the design of JESS Phase II studies. This workshop was followed up with a two-day meeting in April at ARD's offices in Burlington, Vermont with the panel reviewing the JESS draft Phase II work plan. Beginning in late September 1986, a one-week workshop was held in Kenya to visit water development projects in the Athi and Tana River basins, to review and discuss lessons learned and avoid problems which could occur in similar developments in the Jubba Valley. A final workshop was held in Coolfont, West Virginia in May 1987, and was used to review progress of JESS research, after more than a year of field activities. In late 1988 and early 1989, panel members also reviewed earlier drafts of final reports on longer-term research included in these volumes. During implementation of JESS, the following scientists participated on NAS's Jubba Valley Advisory Panel:

Thayer Scudder, Ph.D. (Chairman), Director, Institute for Development and Anthropology, California Institute of Technology

Claudia Carr, Ph.D., Professor, Department of Conservation and Resource Studies, University of California

Lee Cassanelli, Ph.D., Associate Professor of History, University of Pennsylvania

Charles W. Howe, Ph.D., Professor of Economics, University of Colorado

John M. Hunter, Ph.D., Professor of Community Health Sciences & Professor of Geography, Michigan State University

Walter J. Lusigi, Ph.D., United Nations Educational, Scientific and Cultural Organization, Nairobi

Peter Rogers, Ph.D., Professor, Division of Applied Sciences, Harvard University

Berekat H. Selassi, Ph.D., Professor, Howard University & Georgetown University

Michael Dow, Ph.D., Associate Director, BOSTID

Jeffrey A. Gritzner, Ph.D., Senior Program Officer, BOSTID

Susan M. Piarulli, Program Assistant, BOSTID

The environmental studies proposed in the Phase II work plan were oriented around a longer-term effort, *Terrestrial Ecology Baseline Studies* (TEBS), due to a shift in focus to the study of vegetation and land-use changes in riverine and floodplain areas associated with the Jubba River. JESS' tropical ecologist led the TEBS effort with support from various consultants in forestry, botany, wildlife management, and remote sensing.

The longer-term *Socioeconomic Baseline Studies* (SEBS) were planned around a comprehensive household/family survey of randomly selected villages and towns in the Jubba Valley. The survey covered many aspects, such as a demographic profile, family resources management and allocation, health and nutrition, social services, land tenure, and resources-use rights. SEBS later had an additional special emphasis through a *Women's Baseline Study* (WBS), used to assess issues related to the role of women in development. A separate initiative was also undertaken for a brief survey to assess marketing and price structures for agricultural commodities. These studies were directed by JESS anthropologists and the JESS socioeconomist.

Thirty short-term environmental and socioeconomic investigations were also carried out during Phase II to fill gaps in the technical information for scientifically narrow areas. Reports emanating from these studies and project-management reporting are listed on the following page. It should be understood that JESS short-term consultants worked, in most cases, in isolation from each other and produced certain findings and recommendations that were not comparable. While JESS has reproduced the findings and recommendations of each of these scientists as reported, Volume I (*Executive Report*) and reports based on JESS longer-term studies (TEBS and SEBS) represent the most comprehensive assessment of the overall JESS effort: these reports consider and, in most cases, summarize the findings of other investigations.

With the final design and specifications of the proposed Baardheere Dam and development projects for the Jubba Valley still undergoing study and revision, the need for JESS environmental and socioeconomic assessments was more generic. The flexibility and responsiveness of USAID project management and ARD's field team permitted various studies to be revised or rescheduled based on the realities of an evolving development project.

Complete List of JESS Reports.

Phase I Review and Phase II Work Plan for the JESS Project; July 1986. Report No. 1.

Bibliography for the JESS Project; July 1986. Report No. 2.

JESS Manpower and Training Assessment; Richard Z. Donovan; July 1986. Report No. 3.

Jubba Environmental and Socioeconomic Studies First Annual Report; November 1986. Report No. 4.

JESS Interim Report on Health Impacts of Design Alternatives for Proposed Baardheere Dam; William R. Jobin; November 1986. Report No. 5.

JESS Interim Report on Health Consequences of Design Criteria for Water Supply and Sanitation in New and Resettled Communities; William R. Jobin; November 1986. Report No. 6.

JESS Consultancy Report on Water Quality and Public Health Engineering; William R. Jobin; November 1986. Report No. 7.

JESS Interim Report on Cultural Heritage Sites in Proposed Baardheere Reservoir Area; Steven A. Brandt; November 1986. Report No. 8.

Interim Report on Vegetation Survey of the Jubba Valley; Christopher F. Hemming; October 1986 Report No. 9.

JESS Phase I Design Studies; William R. Jobin, Peter A. Bloch, James C. Riddell, Curt R. Schneider and James F. Ruff; July 1986 Report No. 10.

JESS Second Consultancy Report on Water Quality and Public Health Engineering; William R. Jobin; January 1987. Report No. 11.

JESS Fisheries Consultancy I Report; Earl K. Meredith; June 1987. Report No. 12.

JESS Interim Report on Aerial Photography Interpretation; Eric Trump; June 1987. Report No. 13.

JESS Preliminary Report on Aerial Survey of the Jubba River; R. Murray Watson; June 1987 Report No. 14.

JESS Third Consultancy Report on Water Quality and Public Health Engineering; William R. Jobin; July 1987. Report No. 15.

JESS Working Paper: Pre-construction Concerns with the Baardheere Dam; R. E. Tillman; November 1987. Report No. 16.

JESS Interim Report: Riverine Forests of the Jubba Valley, Issues and Recommendations for Conservation; Ian Deshmukh; November 1987. Report No. 17.

JESS Interim Report: Mapping Jess Research Results; Paul Dulin; October 1987. Report No. 18.

JESS Interim Report: Survey of Palearctic Migrant Birds in Somalia's Middle and Lower Jubba Valley; David Pearson; October 1987. Report No.19.

JESS Interim Report: Long-term Environmental and Socioeconomic Monitoring; Paul Dulin; October 1987. Report No. 20.

JESS Report on Water Balance and Sediment Transport in the Jubba River Watershed; Donald Alford; August 1987. Report No. 21.

JESS Interim Report: Data Management and Analysis; Leonard A. Malczynski; November 1987. Report No. 22.

JESS Interim Report: Vegetation Survey of Baardheere Reservoir Zone; Christopher F. Hemming; August 1987. Report No. 23.

Jubba *Environmental and Socioeconomic Studies: Second Annual Report;* December 1987. Report No. 24.

JESS Interim Report: Second Survey of Palearctic Migrant Birds in Somalia's Middle and Lower Jubba Valley; David Pearson; December 1987. Report No. 25.

JESS Report on Cultural Heritage Survey of the Proposed Baardheere Reservoir; Steven A. Brandt and Thomas H. Gresham, with contributions from Robert Benson, Nanny Carder, and James Ellison; June 1988. Report No. 26.

JESS Report on Forestry in the Jubba Valley; T. J. Synnott; March 1988. Report No. 27.

JESS Report on Biological Limnology of the Jubba River; Steven G. Njuguna and Francis M. Muthuri; March 1988. Report No. 28.

JESS Report on Malaria Endemicity in the Lower Jubba Region; Marian Warsame Yusuf; April 1988. Report No. 29.

Phase II Report and Phase III Work Plan; March 1988. Report No. 30.

JESS Report on Land Tenure Dynamics in the Jubba Valley; James C. Riddell; May 1988. Report No. 31.

JESS Report on Fisheries; Earl K. Meredith; June 1988. Report No. 32.

JESS Report on Pastoral Economy and Seasonal Livestock Movements in the Jubba Valley; Jorg Janzen; August 1988 Report No. 33..

JESS Report on Land Tenure in the Middle Jubba Valley: Issues and Policy Recommendations; Catherine Besteman and Michael Roth; August 1988. Report No. 34.

JESS Report on Economic History of the Lower Jubba: Implications for Development Planning; Ken Menkhaus; August 1988. Report No. 35.

JESS Summary Report on Bilharzia and Distribution of Bulinus Abyssinicus *in the Jubba Valley;* Ralph Klumpp; August 1988. Report No. 36. (Included in *JESS Report No. 39.*)

JESS Report On Aerial Resource and Land-use Surveys in the Jubba Valley; Murray Watson and Jennifer Nimmo; May 1988. Report No. 37.

JESS Report on Upper Jubba Watershed Performance; Tom Hart; August 1988. Report No.38.

JESS Report on Water Quality and Public Health Aspects; William Jobin; August 1988. Report No. 39.

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Throughout the life of the project, JESS cooperated with other projects and ministries, often exchanging data at informal and formal levels. Such exchanges always took place with full knowledge of MPNJVD and USAID. The following descriptions illustrate the wide range of contacts established during the project.

Land Tenure Center (LTC) of the University of Wisconsin — From the outset, JESS encouraged a close working relationship with two LTC researchers engaged in land tenure assessments in middle Jubba Valley. JESS assisted with logistics, personnel, and advice, and received considerable support in terms of data collection. LTC researchers routinely visited JESS team members and participated in some team meetings to exchange information whenever they returned to Muqdisho from their fieldwork. The JESS team made attempts to visit LTC field sites in the Jubba Valley whenever their activities were in proximity to those sites. As a result of this close liaison, LTC produced a report on land-tenure issues in the Jubba Valley for JESS.

Settlement and Resource Systems Analysis (SARSA) — JESS established close working relationships with the SARSA team. This one-year project studied rural-urban linkages within an approximate 100 km around Kismaayo. Several joint team meetings were held, data were freely exchanged, and both teams made an effort to coordinate their work and standardize data collection to avoid overlapping efforts.

Livestock Marketing and Health (LMH) Project — While it was not necessary to hold joint team meetings, JESS and LMH freely exchanged data on livestock practices in the Jubba Valley. Members of both teams routinely attended consultant debriefings of common interest.

Central Rangelands Development Project (CRDP) — While JESS and CRDP had different geographic venues of interest, information on numerous shared sectoral and technical activities was commonly exchanged between them. Terrestrial ecologists from both teams pooled their resources at times for taxonomic assistance, and the social scientists compared survey techniques. To a limited degree, the projects provided each other with assistance in logistics.

British Forestry Project — The JESS ecologist had numerous meetings with members of the British Forestry Project concerning vegetation and land-use mapping.

World Concern — JESS had two unique experiences with World Concern. During the floods in May 1987, World Concern asked JESS to assist with rescue operations near Luuq. Refugee fields had been severely flooded, and many irrigation pumps were underwater. JESS responded with a loan of a boat and two boat pilots, which enabled World Concern to rescue a majority of refugee irrigation pumps before they rusted beyond repair. In a second instance, World Concern volunteered to perform an anemia survey in Jilib after JESS was forced to cancel a similar study with the Refugee Health Unit (RHU) of the National Refugee Commission. Under this agreement, JESS loaned World Concern hemoglobin spectrophotometers that had been purchased for the RHU study in exchange for the data collected between March and September 1988.

Halcrow-Fox Associates (HFA) — HFA conducted a study for MNPJVD concerning resettlement of the population currently situated in the area of the proposed reservoir. JESS was HFA's first contact in Somalia concerning information and logistic support. During 1987 and early 1988, a very close working relationship developed between the two groups. Incoming HFA consultants were routinely briefed by the team before the onset of their fieldwork. With the permission of MPNJVD, HFA relied heavily on JESS equipment for its fieldwork.

World Bank — One of the principal objectives of JESS is to make its research results available to potential donors in order to meet requirements for financial and development plans. JESS provided considerable assistance to a World Bank preappraisal mission for the Baardheere Dam regarding environmental and resettlement issues, organized and implemented a field trip to the reservoir area for the World Bank team and provided liaison between MNPJVD and the bank in terms of archaeology studies. Copies of all JESS reports have been continuously supplied to the Bank during all phases of the project.

United Nations High Commissioner for Refugees (UNHCR) — JESS held several meetings with resettlement teams from UNHCR. Reports and field notes were made available to these teams as well as remote sensing products developed during JESS.

Somali Academy of Science (SOMAC) — In its studies on archaeology and land tenure, JESS worked with counterparts in an attempt to encourage wider participation of Somali scientists.

National University of Somalia (NUS) — JESS utilized expertise from the faculties of medicine and chemistry to conduct studies in epidemiology, water quality, limnology, and land tenure. JESS was instrumental in arranging the turnover of a USBR atomic-absorption spectrophotometer and other laboratory equipment to NUS before the end of the JuDAS project.

Ministry of Health (MOH) — JESS worked closely with MOH in planning and implementing epidemiology surveys in the lower Jubba Valley. MOH supervisors and technicians conducted this study with JESS financing, logistics, and technical assistance.

World Health Organization (WHO) — JESS also worked closely with WHO officials in planning and implementing the epidemiology surveys. Based on this liaison, surveys were conducted under standards endorsed by WHO. Reports on study results were presented to WHO at an individual debriefing.

Ministry of Fish and Marine Resources (MFMR) — JESS maintained a close relationship with MFMR throughout its studies in Phase II. Personnel from this ministry used JESS boats and equipment to conduct freshwater fisheries research in two Somali rivers and assist fishery cooperatives, one on each river.

Baardheere Dam Technical Committee — The JESS team leader was a member of this committee at the invitation of the Baardheere Dam Project.

Agrar- und HydroTechnik — According to USAID's JuDAS project paper and the scope of work in ARD's technical assistance contract, the purpose of JESS was to generate environmental and socioeconomic information necessary for the creation of a master plan for Jubba Valley development. MNPJVD has overall authority for coordination of the master plan, while GTZ is financing technical assistance through the AHT master planning team. JESS and master planning efforts were to be coordinated in a timely manner by MNPJVD. However, JESS and master plan schedules were *not* in synchronization. Because these projects were funded, negotiated, designed, and planned by different donors, their schedules were not coordinated.

JESS' Phase II began in April 1986 and ended in March 1988. Outputs of that phase were to be used by master planners for preparation of *Master Plan Volume 1: Present Stage of Development*, but this volume was released in December 1987.

AHT's *Master Plan Volume 2: Regional Development Strategy* was released in July 1988. It briefly defines a series of alternative development projects for the Jubba Valley. While AHT took advantage of JESS' Phase II baseline information, analyses of baseline studies data were not completed until the end of Phase III, with the release of the preliminary drafts of the JESS final report in August 1988. AHT's *Master Plan Volume 3: Jubba Valley Development Investment Program* was originally scheduled for release in December 1988, before the planned presentation of the JESS final report.

With these timing and scheduling constraints, JESS staff had to open informal channels of information exchange with the AHT master planning team. Throughout Phase II, USAID, MNPJVD, AHT, and a wide audience of reviewers were kept informed of JESS activities and research results through the release of timely interim reports prepared by consultants and long-term JESS staff. In addition, 28 monthly reports, prepared during the implementation of Phases I and II, were widely distributed in Somalia and elsewhere. SEBS data bases and other research materials, including aerial photographs, water-quality sampling data, field-trip notes, vegetation maps and the results of aerial censuses, were turned over to the master planning team as a matter of course. Various debriefings were presented by JESS consultants after completing their short-term investigations. JESS/AHT interteam meetings, and informal one-on-one collaboration between JESS staff and AHT consultants were mutually beneficial to both teams' efforts in data collection.

As intended in the design of JESS, information collected during Phase II was processed and analyzed during Phase III. Full reports were prepared for both of the longer-term baseline studies (SEBS and TEBS). These, in combination with the group of short-term, intermittent investigation reports, complete JESS' contribution of environmental and socioeconomic studies relative to proposed development in Jubba Valley development. Recommendations are included for enhancement of the beneficial aspects and mitigation and/or avoidance of negative impacts associated with

proposed developments, while guidelines for environmental and socioeconomic monitoring take into account the inherent limitations of Somalia's sociopolitical and economic constraints.

This final report was prepared from direct analyses of JESS research and reviews of other data and literature relevant to Jubba Valley development. The ***Executive Report (Volume I)*** synthesizes available information concerning the environmental and socioeconomic implications of construction of the Baardheere Dam and subsequent development of the Jubba Valley. All other JESS reports on long-term baseline studies and short-term investigations are annexed to the *Executive Report:* **Volume II (Environmental Studies), Volume III (Socioeconomic Studies),** and **Volume IV (Bibliography).**

Copies of research materials, including principal data bases and code books, tabular data, field maps, site descriptions, photographic slides, and aerial photographs, were prepared and transferred to the five *JESS Data Repositories*—MNPJVD, USAID/Somalia, USAID/REDSO/ESA, USAID/Washington, and ARD/Burlington. A list of repository materials is included in Volume IV.

As of 31 March 1989, the JESS technical assistance team included:

Robert "Gus" Tillman, Ph.D.—team leader, environmental assessment;
Kathryn Craven, Ph.D.—socioeconomics;
Ian Deshmukh, Ph.D.—ecology, vegetation, and wildlife;
James Merryman, Ph.D.—anthropology;
Nancy Merryman, Ph.D.—women's issues, administrative coordination;
Marie Tillman—data center coordination, bibliographer; and
Robert Ondrusek—information management.

Two personnel changes occurred during the three and one-half years of the project. Dr. E. Drannon Buskirk served as team leader from November 1985 until February 1987, when Dr. Tillman assumed this role. Mr. Richard Donovan was ARD's home-office project manager from the inception of the project until May 1987. Mr. Paul Dulin then managed JESS until completion of the contract and coordinated the preparation of the final report.

Throughout the life of the project, ARD home-office staff participated in various aspects of project management, administration, technical assistance and logistics. Dr. George Burrill, ARD's president, maintained overall management responsibility for the contract. Mr. Richard Hart, the firm's business manager, provided administrative coordination. Mr. Kevin Fitzcharles assisted with project management, hiring consultants, and handling logistics. Mr. Ross Bryant and Mr. Ted O'Shaughnessy supervised procurement. Dr. Alfred Waldstein provided intermittent technical assistance in the preparation of the SEBS final report. Star Albright and Clair Dunn were responsible for editorial production of the final report.

For USAID/Somalia, Sally Patton was project manager from the inception of JuDAS until July 1987. Weston Fisher then managed the project until its completion. Both gave generously of their time and were instrumental in the implementation of this complex project.

A	A.A.P.G.	American Association of Petroleum Geologists
	ACMRR	Advisory Committee of Experts on Marine Resources Research
	ADC	Agricultural Development Corporation
	AETFAT	Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale
	AFIS	Administrazione Fiduciaria Italiana della Somalia
	AHT	Agrar-und HydroTechnik, GMbH
	AID	U.S. Agency for International Development
	AIDS	acquired immune deficiency syndrome
	AIRD	Associates for International Resources and Development
	ARD	Associates in Rural Development, Inc.
	ARIS	Aerial Resource Inventory System
	ARTEMIS	African Real-Time Environmental Monitoring using Imaging Satellites
	ASCE	American Society of Civil Engineers
	ASD	Air Survey and Development, Inc.
	ASEAN	Association of Southeast Asian Nations
	ASGA	Association des Services Geologiques Africains
	AVHRR	Advanced Very High Resolution Radiometer
B	B.P.	before present (present being 1952, when radiocarbon dating became commercially available)
	BDP	Baardheere Dam Project
	BFPS	British Forestry Project, Somalia
	BMZ	Bundesministerium fuer Wirtschaftliche Zusammenarbeit
	BNA	Blue Nile Associates
	BOSTID	Board on Science and Technology for International Development
C	ca.	*circa* (approximately)
	CAS	catch assessment survey
	CDA	Cooperation for Development in Africa
	CEC	Commission of the European Communities
	CIFA	Committee for Inland Fisheries of Africa
	CILSS	Comite Permanent Interetats de Lutte contre la Secheresse dans le Sahel
	CISP	Comitato Internazionale per lo Sviluppo dei Popolo
	CITES	Convention on International Trade in Endangered Species
	CPCA	Comite des Peches Continentales pour l'Afrique (FAO)
	CPUE	catch per unit of (fishing) effort
	CRDP	Central Rangelands Development Project
	cumecs	cubic meters per second
	CV	coefficient of variation
	CWS	Church World Services

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D	D.V.W.K.	German Association for Water Resources and Land Improvement
	DAP	disodium ammonium phosphate
	DC	district commissioner
	DLWR	Department of Land and Water Resources
E	EC	electrical conductivity
	EC25	electrical conductivity at 25°C.
	EEC	European Economic Community
	EIFAC	European Inland Fisheries Advisory Commission
	ELC	Electroconsult
	EMRO	Eastern Mediterranean Regional Office (WHO)
	ENC	Ente Nazionale Commercio
	ERDAS	Earth Resources Data Analysis Systems, Inc.
	ERP	European Recovery Programme
	ERS	Economic Research Service
F	FAO	Food and Agriculture Organization of the United Nations
	FBS	fish biology sampling
	FEWSD	Food Early Warning System Department
	FR	Forest Reserve
	FSP	fish sampling program
G	GDP	Gross Domestic Product
	GJV	Greater Jubba Valley
	gm	gram
	gn	gill net
	GNP	gross national product
	GOE	Government of Ethiopia
	GSDR	Government of the Somali Democratic Republic
	GTZ	German Agency for Technical Cooperation
H	ha	hectare
	hl	hook line
	HMSO	Her Majesty's Stationery Office
	hn	hoop net
I	IBRD	International Bank for Reconstruction and Development (World Bank)
	ICA	International Center for Aquaculture
	ICE	Instituto Nazionale per Il Commercio Estero
	ICOLD	International Commission on Large Dams
	ICRAF	International Council for Research in Agroforestry
	ICTA	Instituto Ciencia y Tecnología Agrícolas (Guatemala) (Institute of Agricultural Science and Technology)
	IDC	International Development Corporation
	IFAD	International Fund for Agricultural Development

	IFO	Institut fuer Wirtschaftforschung
	IIASA	International Institute for Applied Systems Analysis
	IIED	International Institute for Environment and Development
	IIIC	International Irrigation Information Centre
	ILCA	International Livestock Center for Africa
	ILO	International Labour Office
	IMF	International Monetary Fund
	IPAL	Integrated Project on Arid Lands
	IPM	Integrated Pest Management
	ISNAR	International Service for National Agricultural Research
	ITC	International Institute for Aerial Survey and Earth Sciences
	ITE	Institute of Terrestrial Ecology
	IUCN	International Union for Conservation of Nature and Natural Resources
	IWR	Institute for Water Resources
J	JASPA	Jobs and Skills Programme for Africa
	JESS	Jubba Environmental and Socioeconomic Studies
	JSP	Juba Sugar Project
	JuDAS	Jubba Development Analytical Studies
K	KFW	Kreditanstalt fur Wiederaufbau, German Aid Funding Organization
	kph	knots per hour
	KREMU	Kenya Rangeland Ecological Monitoring Unit
L	LDC	less developed countries
	ln	natural logarithm
	LRDC	Land Resources Development Centre (now part of TDRI, Tropical Resources Development Institute)
	LSA	Later Stone Age
	LSU	Land System Units
	LWR	Department of Land and Water Resources, Ministry of Agriculture
M	MAB	Man and the Biosphere Programme
	MARC	Monitoring and Assessment Research Centre
	MARS	Market Study
	masl	meters above sea level
	maxcpue	maximum catch per unit of effort
	MCC	Mennonite Central Committee
	mcm	million cubic meters
	mcpue	mean catch per unit of effort
	MEI	morphoredaphic index
	MFMR	Ministry of Fisheries and Marine Resources
	mincpue	minimum catch per unit of effort
	MIP	Mogambo Irrigation Project

MJVD	Ministry of Jubba Valley Development
MMP	Sir Malcolm MacDonald and Partners, Ltd.
MNPJVD	Ministry of National Planning and Jubba Valley Development (formerly MJVD)
MOA	Minister of Agriculture
MOH	Ministry of Health
MSA	Middle Stone Age
MSY	maximum sustainable yield
N	
n.d.	no date
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NERC	Natural Environment Research Council
NES	National Environment Secretariat
NESDIS	National Environmental, Satellite, Data and Information Service
NHWL	Normal High Water Level in Reservoir
NLITH	number of lithics found in a density sample
NOAA AVHRR	National Oceanic and Atmospheric Administration, Advanced Very High Resolution Radiometry
NRA	National Range Agency
NTTCP	National Tsetse and *Trypanosomiasis* Control Project
NUS	National University of Somalia
O	
OAS	Organization of American States
ODA	Overseas Development Administration
ODI	Overseas Development Institute
ODU	Overseas Development Unit
OECD	Organization for Economic Cooperation
OEF	Overseas Education Fund
OMVG	Organization pour la Mise en Valeur du Fleuve Gambie
ORS	oral rehydration salts
ORT	oral rehydration therapy
P	
PA18	Piper 18 (Super Cub) airplane
pET	potential evapotranspiration
PHC	Primary Health Care
PPC	Bureau for Program and Policy Coordination
ppm	parts per million
PVO	Private and Voluntary Organizations
R	
r^2	coefficient of determination in regression analysis
RAO	Regional Agricultural Officer
REDSO	Regional Economic Development Services Offices
RGS	river gauging stations
RMR	Resource Management and Research, Ltd.

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S	SAIS	Studio Architetti Ingegneri Specializzati
	SAREC	Swedish Agency for Research Cooperation with Developing Countries
	SCOPE	Scientific Committee on Problems of the Environment
	SDR	Somali Democratic Republic
	SEBS	Socioeconomic Baseline Studies (of JESS)
	SES	Somali Ecological Society
	SG	specific gravity
	SIATSA	Tropical Agricultural Research Services
	SIDA	Swedish International Development Agency
	SLR	single lens reflex camera
	SMP	Somali Marine Projects
	SOGREAH	Societe Grenobloise d'Etudes et d'Applications Hydroliques
	SOMAC	Somalia Academy of Arts and Sciences
	SRC	Synergic Resources Corporation
	SRCS	Somali Red Crescent Society
	SRP	Somalia Research Project (University College of London)
	SRS	Southern Rangelands Survey
	SSh	Somali shillings
	SWDO	Somali Women's Democratic Organization
T	t	metric ton, metric tonne
	TAMS	Tippetts-Abbett-McCarthy-Stratton
	TARDA	Tana and Athi River Development Authority
	TDS	total dissolved solids
	TEBS	Terrestrial Ecology Baseline Studies (of JESS)
	TLU	Tropical Livestock Unit
	TSS	total suspended sediment
	TVA	Tennessee Valley Authority
U	UN	United Nations
	UNCTAD	United Nations Conference on Trade and Development
	UNDP	United Nations Development Programme
	UNEP	United Nations Environment Programme
	UNESCO	United Nations Educational, Scientific, and Cultural Organization
	UNHCR	United Nations High Commission for Refugees
	UNICEF	United Nations Children's Fund
	UNIDO	United Nations Industrial Development Organization
	USAID	U.S. Agency for International Development
	USBR	U.S. Bureau of Reclamation
	USDA	U.S. Department of Agriculture
	USEPA	U.S. Environmental Protection Agency
	USGPO	U.S. Government Printing Office

V	VITA	Volunteers for International Technical Assistance, Inc.
W	WASH	Water and Sanitation for Health Project
	WBS	Women's Baseline Study
	WDA	Water Development Agency
	WHO	World Health Organization
	WWF	World Wide Fund for Nature (formerly World Wildlife Fund)
Y	YMCA	Young Men's Christian Association

Throughout this report scientific units follow standard international practice. For example, kg km^{-2} $year^{-1}$ means kilograms per square kilometer per year.

The International Monetary Fund calculated the average official exchange rate for 1987 at 105.6 SSh to the U.S. dollar. The purchasing power parity during the same period, however, was just over 166 SSh to the U.S. dollar.

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The following glossary of standard Somali place names and terms used in JESS reports represents a close approximation to Somali pronunciation and orthography. Words in *parentheses* are alternate spellings that are commonly seen, but which JESS feels are non-standard. The spelling of "Jubba" is an obvious example--by far, the most commonly encountered spelling of the river has only one "b," but based on the most common Somali pronunciation of this word, the double "b" spelling is considered standard. Words appearing in *square brackets* indicate another, different Somali or foreign name for the same place. For example, the most common Somali name for the capital is not Muqdisho, Mogadishu, or Mogadiscio, but Xamar (pronounced "hamar").

Place Names

Afgooye
Afmadow
Arbay Cabdi
Baardheere (Bardera, Bardere, Bardhere)
Badhaadhe
Banta
Baraawe (Brava, Barawe)
Baydhabo (Baidoa)
Beledul Kariim
Bidi
Birbiriso
Bu'aale [mistakenly identified on some maps as Dujuuma]
Buulo Maamow
Buur Fuule
Buurdhuubo (Burdubo)
Cabdulle Kakane
Canjeel
Cusbooley
Deex — grazing area between lower Jubba River and the coast
Demo
Dhacar — grazing area in lower Jubba, west of the river
Dhesheeg Radiile
Dhoobey — grazing area east of lower Middle Jubba
Dhesheeg Waamo (Deshek Uamo)
Dujuuma
Faafxadhuun
Fanoole
Fuuma
Gaduudey
Garbahaarey
Golweyn
Gomeeni Yare
Goob Weyn
Gurmeyso
Hakaka
Haraawe
Hiloshiid
Hombooy
Honqorre
Hurufle
Iskandariya [Alessandria]
Jabbi
Jamaame [Margherita]
Jilib (Gelib)
Jowarri — grazing area east of upper Middle Jubba and bay
Kalaanje
Kaytooy
Kismaayo (Kismayo, Chisimaio, Kismayu)
Kumbareera
Kumtiire
Kuudka
Libaanga
Libooye
Luuq (Luq, Luk, Lugh, Lugh Ferrandi, Lugh Ganane)
Madiina
Mana Moofa
Manaane
Mardha
Mareerey
Maykoreebe
Mogambo
Mokomane
Moofa
Muqdisho (Mogadishu, Mogadisho, Mogadiscio) [Xamar]
Nafta Quur

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Nasiib Buundo
Nyiirecy
Qalaaliyo
Qoraxey
Saakow (Saacow, Sakow)
Sarenley
Sarsaar
Shabeelle
Shangaani
Tansaaniya
Turdho
Wandiid — grazing area east of Saakow; east of Banaada
Webi Jubba (Uebi Juba) [Ganaane] — Jubba River
Xagar Buulo
Yontooy

Houses
aqal - portable nomad hut
baraako - rectangular with tin roof
cariish - rectangular wattle or mud and wattle
hoori - portable nomad hut
mundul - round wattle or mud and wattle
sar - cement or cement-brick house

Measures and Storage
boosto — about 1/24 of a hectare
darab — about 1/4 of a hectare
kintaal — quintal or about 100 kilograms
shood — 1/4 of a suus or .62 to .75 kilograms
suus — 2.5 to 3.0 kilograms
teneg — large ghee tin

Physical Features
bakool — white soils
ceel — well
degaan — "home areas" of pastoralists
dhesheeg (deshek, desheek, dhasheeg) — depression
dhoobey — dark/black clay soils
doonk — inland rainfed soil
dooy — red clay soil
gosha — of the forest
haro — lake
hilo — watering place
jiimo — riverbank
shiid — stone
tog, togga (tug, toog) — seasonal stream
war — manmade pond
webi — river

Politics
beel — subdistrict
guddi — committee
guddoomiye — chairman
madaxweyne — president
nabadoon — peacemaker
sheikh — Islamic religious leader
tuulo — village
xaafad — neighborhood

Seasons
gu' — big rains (April to June)
xagaa — dry season (June to September)
deyr — small rains (October to November)
jiilaal — very dry season (December to February)

Socioeconomic Baseline Studies

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This report includes information from *JESS Reports No. 31* – "JESS Report on Land Tenure Dynamics in the Jubba Valley," James C. Riddell, May 1988; *No. 34* – "JESS Report on Land Tenure in the Middle Jubba Valley: Issues and Policy Recommendations," Catherine Besteman and Michael Roth, August 1988; and *No. 35* – "JESS Report on Economic History of the Lower Jubba: Implications for Development Planning," Kenneth Menkhaus, August 1988. Associates in Rural Development, Burlington, Vermont. Photographs in this report are by James Merryman, unless otherwise noted.

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I. EXECUTIVE SUMMARY

The Government of the Somali Democratic Republic (GSDR), with the support of the international donor community, is prepared to launch a comprehensive program for the development of Jubba Valley. The keystone of this program is construction of a dam on the Jubba River near Baardheere. Planners have been looking toward construction of the dam, among other things, to increase agricultural output by fostering irrigation development.

Regardless of the resilience of Somali culture, Baardheere Dam will bring about change of a nature and magnitude that cannot be surmounted by traditional adaptive mechanisms alone.

The objectives of the Socioeconomic Baseline Study (SEBS) report are to:

- present a body of new information on socioeconomic life in Jubba Valley;
- assess the impact of development efforts on this socioeconomic life;
- recommend measures to enhance beneficial impacts and mitigate adverse ones; and
- propose a program to monitor the progress of those impacts and interventions.

Information has been collected for the purpose of developing data on which to base strategies and plans for Jubba Valley development as well as to serve as a benchmark against which to measure the impact of development. The study has focused particularly on new information from the valley in the areas of social institutions and patterns of agricultural production and resource management, such as existing water and land-use practices. The frame of reference for SEBS analysis and recommendations is clearly the local level.

The audience for the SEBS study is primarily development planners and project designers in the GSDR and in the international donor community.

The study area of the socioeconomic baseline study includes the 120,000 km^2 comprising the three administrative regions transected by the Jubba River. Most of the study area demonstrates the bimodal pattern of rainfall typical of equatorial East Africa. Between Dolow and Jilib, mean annual rainfall increases in a southerly direction from approximately 200 mm to more than 700 mm at Mareerey. South of Jilib, rainfall declines to 450 mm at Jamaame and 350 mm at Kismaayo.

The most important hydrological feature of the study area is the Jubba River. This river is the only perennially flowing water body in Somalia to reach the Indian Ocean.

JESS began its socioeconomic studies at the end of 1985 with a review of literature on the Jubba Valley. SEBS then proceeded to collect its field data through three separate field studies.

This report presents information on the Jubba Valley in the following areas:

- historical overview;
- demographic overview;
- economic overview;
- production systems;
- labor force;
- nutrition;
- health;
- impacts of the proposed developments and mitigating measures; and
- monitoring.

Historical Overview

The agricultural community of lower Jubba Valley—from Fanoole Barrage to Kismaayo—has undergone extensive changes in its political economy over the past 100 years. In comparison to the more isolated, undeveloped middle Jubba Valley, lower Jubba has been subject to higher levels of outside economic penetration and development. In many respects, the region's economy and society have been transformed by this penetration, especially in the past 20 years.

A hundred years ago, riverine farmers were able to produce ample surplus grain to sell to coastal Arab traders, despite rudimentary technology and disruptions of chronic warfare with surrounding herders. Today, the same population is largely unable to feed itself, despite the advanced technology present in the valley. Villagers must rely on cash wages to supplement declining agricultural production.

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A primary cause of the decline in smallholder production is the concomitant deterioration of a secure land-tenure system. Over the past 50 years, the best of smallholders' land has been subject to a series of expropriations by outside developers.

Early agricultural production in the Jubba Valley was undertaken exclusively by smallholder peasants, who concentrated on staple crops—sorghum, maize, and sesame. Since the arrival of Italian colonial plantations in the 1930s, the most fertile, irrigable land along the river has been increasingly devoted to cash crops. The arrival of cash crops in the valley has often been accompanied by land expropriation which has sometimes led to a decline in local income. This historical trend toward large-scale cash-crop production and the socioeconomic changes it has brought about pose important questions for current development planning.

First, it is clear that staple food security has been compromised by the displacement of maize and sesame production from irrigable riverbanks to rainfed land. Displacement of staple crops by cash crops along the river has therefore diminished food security at local and national levels.

Second, emphasis on large-scale production since the Italian colonial period has been based on a widespread assumption that smallholder production is exclusively subsistence-oriented and incapable of generating a surplus for wider markets. The historical record refutes this assumption.

Historically, communities in the Jubba Valley consisted of self-sufficient household economies that seldom engaged in wage labor. Today, increasing numbers of village households have become dependent on wage labor at plantations or state farms for much or all of their income.

In the 1950s and 1960s, residents of the lower Jubba Valley enjoyed a more developed health and educational system than currently exists.

However, the region's infrastructure has improved in the past 20 years, as asphalt roads and electricity now service some portions of the lower Jubba Valley. Project roads have increased villagers' access to markets which has improved their ability to produce for those markets and lessened their dependence on traveling traders.

Demographic Overview

The JESS team is using a figure of just over one million inhabitants as the best estimate of the population of the Jubba Valley in 1983 to 1984. Males make up 48.5 percent and females, 51.5 percent of the population.

Forty-six percent of the population is under age 15. This indicates a potential for rapid growth since such a large portion is just approaching reproductive age. Sixty-eight percent of the population is under age 25.

The mean number of live births per woman (for women 40 years and older) in the Women's Baseline Study (WBS) sample is 6.5. Approximately 25 percent of these offspring had died by the time of the WBS interview. The actual rate of population growth in the Jubba Valley is about three percent per year.

The vast majority of people in Jubba Valley live in simple, traditional-style dwellings fabricated from natural materials. With increasing population pressure and continued clearing of riverine forests and other vegetation for agriculture, it is probable that future housing standards will change as currently preferred natural building materials become more scarce.

Material possessions of most valley households are relatively sparse. Among permanently settled populations, material goods are few in number and limited to tools, cookware, and a modest number of garments per adult, reflecting the generally low income levels and subsistence-based economy of the valley.

Household size for the valley averages 6.2 people.

The average age of a woman at her first marriage is 18 while it is 26 for a man. The average number of cohabiting wives per valley household is 1.16. Nineteen percent of valley marriages have ended in divorce.

Of the Jubba Valley population age 15 and older, 36 percent of males and 15 percent of females reported ability to read and write Somali. Fifty-nine percent of school-age valley males and 81 percent of females have had no formal education. Low levels of literacy and formal education in the valley reflect a population with minimal skills—qualified to perform few tasks beyond cultivation, herding, and unskilled labor.

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Substantially more Jubba Valley males have religious than secular education, but there is little difference between the number of women who have received religious or secular training. Exposure to Koranic training, as with formal education, is highest in towns and lowest among pastoralists.

Intracommunity homogeneity contrasts with considerable diversity between communities and socio-ecological groups throughout the valley. The majority of valley communities are settled, relatively small, and have few kinship links or political ties to larger and more powerful social and political entities beyond the valley.

Economic Overview

With the Revolution of 1969, the Somali government embarked on a Socialist option to development. The government nationalized many private assets and greatly expanded the role of the public sector in the economy.

The succession of drought years in the early 1970s made the government aware of the importance of agriculture and livestock to the nation's health, which was reflected in the 1974 to 1978 development plan. However, the nation's economic situation worsened with the 1977 to 1978 Ogaden War with Ethiopia.

An increasing gap between revenues and expenditures which began in 1979 and has continued through the 1980s, has meant that Somalia has had to rely on grants and loans from outside lenders. Between 1980 and 1984, the agricultural sector, which contributed 54 percent to the Gross Domestic Product (GDP), grew by an estimated .4 percent per year, and livestock output by only slightly more. External debt rose to $1.5 billion—almost equal to the nation's GDP. The debt resulted in balance-of-payment problems and foreign exchange shortages that affected imports.

A liberalization of the economy began in 1982, but was curtailed in 1988. Policies and actual investments in recent years have emphasized livestock health and marketing, agriculture investments, banana production for export, and, to a lesser extent, food production. Development assistance has been maintained at high levels with many development projects and programs being undertaken.

Jubba Valley contains the highest concentration of cattle in Somalia, representing nearly one-third of the national herd, and over 10 percent of the national camel herd. Jubba Valley is home to an active small-farm sector. It also generates the bulk of national rice and sugar production and a significant share of national banana production. However, the secondary and tertiary sectors of the Jubba Valley economy are poorly developed.

There are few specialized or wholesale markets, or fixed places where bulking for wholesale takes place. Most transactions take place for cash. Few Jubba Valley villages have dedicated marketplaces. The majority of the marketplaces that do exist are used primarily for the sale of milk by pastoral women from nearby encampments.

Jubba Valley Institutions

The overall pattern of local institutions in the valley is one of democratic process, local autonomy, and relatively loose integration with national institutions.

Valley residents have adapted most effectively to changes in the administrative structure implemented in their communities because the new structure was built on traditional institutions. Therefore, adaptations developed in the evolution of traditional institutions were automatically factored into the new structure.

The local administrative structure is the most effective institution for contacting community members and mobilizing their support and participation. Going through the *guddoomiye* (chairman) maximizes the chances of a thorough public airing of issues concerning proposals of community interest and developing a local consensus on how to respond to such proposals.

Traditional tenure systems prevail, even though usufructuary rights were negated with the passage of the 1975 Agricultural Land Law. Multiple holdings are common under traditional tenure arrangements, yet formal law provides for only one leasehold acquisition. Tenure rights to bushland are recognized by residents, although the land law disclaims these rights. Land transactions are common practice (especially giving and borrowing of parcels), despite provisions in the formal statutes banning these transfers.

Land can be acquired under customary tenure arrangements in a number of ways–inheritance being foremost. Fifty-one percent of cultivated parcels in a recent sample were acquired through inheritance, 25 percent from the village council, 12 percent purchased, nine percent received as a gift or long-term loan, and three percent "just cleared" by the

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owner. Slightly less than half of the inherited parcels (44 percent) were subdivided at inheritance.

The 1975 Agricultural Land Law has begun to have an impact on landholding in the valley–especially the Lower Jubba Region. People are adapting less effectively to changes in rules for managing local land resources than to the new administrative structure because they are losing control of a portion of their resources.

Landholders in Middle Jubba Region are experiencing increasing tenure insecurity as a result of the threat of outsiders gaining title to their lands through the formal leasehold process. Smallholders would like to register their land, but lack the money, knowledge of registration procedures, and time needed to do so. Outsiders (generally government and ex-government officials) who register land have outside sources of income and are more familiar with and accustomed to working in government bureaucracies. Land registration has not resulted in capital development or higher productivity. While the incidence of registration is still fairly inconsequential, the increasing importance of registration by outsiders will continue to exacerbate conflicts between state-leasehold and customary tenure systems. The resulting tenure insecurity adversely affects investment, output, and the participation of smallholders in the valley's economic development.

National institutions generally penetrate the Jubba Valley only to the district level. Government services being provided to valley residents are sporadic. Communications are still rudimentary, as are roads. Few inhabitants receive much government aid in the education, health, agricultural, or livestock sectors.

Production Systems

Riverine agricultural systems rely on three types of land for production: *dhesheegs*, or natural depressions behind the levees that line the Jubba; *doonk*, or rainfed land away from the Jubba; and *jiimo*, or riverbank land that lines the Jubba River. This characterization is most accurate for Middle Jubba Region. In Lower Jubba, man-made alterations have eliminated the bulk of dhesheeg land from smallholder production systems. In Gedo, few dhesheegs exist. Dhesheeg land is the most important single resource of households practicing riverine agriculture. However, families try to control plots in each of the three categories.

Almost three-quarters of riverine households own some livestock.

The greatest degree of irrigation in Jubba Valley occurs among riverine agricultural households. Small-group irrigation is most common in Gedo Region. Since pumps are so expensive, farmers often participate in irrigation through sharecropping arrangements.

Riverine agriculture is focused on subsistence. The primary irrigated crop is onions, although farmers tend to grow maize in the gu' season and sesame in the deyr season. Sale of livestock and milk products play a role equal to agricultural sales in annual household incomes.

Multi-species livestock-keeping continues to be important among pastoralists. One-quarter of all pastoral families in the sample kept herds of cattle, camels, sheep, and goats. Average cattle holdings are 30 head, camels are 25, and goats are 39. In addition to livestock, 41 percent of all pastoral households have some agricultural holdings.

Herd management is organized on a household and extended kin basis with family members supplying the bulk of the labor—herding livestock in extensive area, open-range contexts. Among pastoral households, median livestock income is one and one-quarter times greater than median agricultural income.

Livestock production continues to be primarily for household consumption and not for market sale of live animals. Household production is geared toward milk and milk products, primarily *ghee*. Dairy orientation of Jubba Valley livestock producers is reflected in the low off-take for market sales and further illustrated by the low meat consumption of livestock producers. Most cash from livestock sales goes toward purchases of grain to substitute for diminishing pastoral milk supplies during dry seasons.

Over the past few decades, large-scale banana, rice, and sugar projects in lower Jubba have effectively eliminated riverine and floodplain areas from pastoral use, creating greater pressure on remaining pastoral resources of the valley.

Agro-pastoralism relies on a particular combination of soils and water. Agro-pastoralism in the Jubba Valley context is a subsistence mode combining fixed settlement and seasonal cultivation of rainfed crops—mainly drought-resistant varieties of sor-

ghum– with a degree of open-range livestock herding. For the most part, today's agro-pastoral settlers in the valley are former pastoralists who have settled in response to a range of ecological stresses, particularly drought.

Agricultural and pastoral production systems have contrasting labor demands. When the two systems are combined to form agro-pastoralism, high demands are placed on household labor units which require careful planning and flexibility.

State farms are located in the area between Fanoole Barrage and the southern border of Jamaame District. One of the most important effects has been a great loss of agricultural land. However, more than two-thirds of the total land leased to three state farms was unused in each season of 1987.

Of the three state farms in the Lower Jubba Region, Fanoole Rice Project has experienced the greatest difficulties in achieving projected levels of production and has been a serious financial liability for the Somali government. Juba Sugar Project has done the best job of meeting its targets of land under production but is still far behind in meeting its sugar production goals.

These state farm projects tend to be socially disruptive. Local people have become state workers on projects that produce less food than the small farms that were supplanted by the state farms. Some people have drifted into towns joining the urban unemployed, and others have left the country.

Few women in the valley control economic assets of their own. However, a small number own livestock and farms for both subsistence production and sale. Some women have inherited farms and livestock from parents or deceased husbands. An additional number have purchased livestock and farms or cleared the land themselves. Women frequently have smaller numbers of livestock than male household heads and farm the least productive, most rainfall-dependent dryland. Women usually manage their own farms, making the production and selling decisions. Some urban women make a significant income from business; a number of women also supplement family income by small-scale trading, crafts, and tea shop operation. Women are substantial producers—in terms of labor invested in the households' overall production system as well as the assets they control.

The Labor Force

Eighty-five percent of all primary occupations in Jubba Valley are in agriculture or herding. Nearly one-half of the men and about one-fifth of the women reported that agriculture was their main occupation.

Beyond farming and herding, the government is the valley's single largest employer for men. Civil service employment accounts for seven percent of adult male employment, but only about one percent of adult female employment.

The average number of these "manpower units" (household manpower available) in a Jubba Valley household is 3.78. Among the three regions, Middle Jubba has the lowest level with 3.42 units, while the average for Gedo is 4.21 units.

The commercial sector is an effective but small network which employs five percent of the men and 1.2 percent of the women in the JESS sample.

JESS estimates that, in 1987, 583,150 residents of Jubba Valley were adults (51.6 percent) of full-work capacity (age 15 to 64). The weighted number for children age eight to 14 and adults age 65 to 74 rendered an additional 106,968 manpower units. The total theoretical labor force of Jubba Valley was 690,118 production or manpower units.

In all, the sample revealed one percent of the estimated population absent from the homestead, looking for work in the valley. In the SEBS sample, 13 percent were absent due to work.

Nearly 19 percent of all valley respondents hired labor for pay at one time or another, primarily for agricultural tasks. Peak periods of labor demand are for soil preparation and weeding. The overwhelming demand for labor is in the gu' season.

At current prices, a per capita "living wage" is approximately 150 to 200 SSh/day. Public-sector wages are below living standards while private-sector rates are marginally above. A family cannot depend on wage labor as the sole source of income because earnings are usually not enough to sustain more than one person.

Working age adults in Lower Jubba Region clearly constitute a pool of potential labor for future development endeavors. Whether they take advantage of new opportunities depends on whether remuneration matches current living costs and keeps pace with inflation.

In general, residents of Jubba Valley do not manifest signs of severe malnutrition. There is still a good mix of livestock and agricultural products to balance nutritional intakes. However, there are some groups in the valley who appear to suffer from ailments that may be nutritionally based: anemia is widespread in women of reproductive age, and some children show evidence of severe anemia. In some areas, particularly the pastoral and agro-pastoral areas of Gedo Region, pregnant and lactating women suffer and some die from multiple nutritional deficiencies. In the same area, there is an indication that frequent miscarriages may be due to *brucellosis* which is transmitted through animal milk. Overt signs of malnutrition were not otherwise seen during the JESS surveys.

Adequate protein intake may have been less of a problem in the past than it is now. Many villages that used to have frequent contact with herders for the purchase of milk have been cut off from this source by bunds and irrigation canals of large projects. Milk availability for the herders depends on the size and state of health of their herds. The loss of herds in droughts has caused rapid sedentarization and created a new milkless group that must also depend on the passing herder for this food. Although there are few overt signs of protein malnutrition in the general population, rickets, marasmus, kwashiorkor, and sparse, discolored hair in children were noted in two villages.

Meat consumption is generally a function of availability and buying power. It is consumed far more by urban groups than any of the rural groups, including herders. Riverine villagers have told JESS that they eat meat only when herders in the area must slaughter a weak or dying animal. It is clear that if more people could afford it, meat in village butcheries would be slaughtered on a more regular basis. The pattern appears to be a central butchery serving a number of villages with meat made available once to several times a week, depending on the population density in the area and their income level.

Fish consumption is greater than anticipated from other reports on dietary habits. Nearly one-half of urban populations consumes fish frequently (most in Kismaayo), and one-third of riverine populations claims to consume fish regularly. Consumption appears to increase in times of agricultural crisis.

Vegetable and fruit consumption tends to rise with improving incomes. In all cases, except for wild plants and fruits, urban consumers ate fruits and vegetables almost twice as frequently as rural consumers. Approximately 70 percent of rural consumers frequently eat tomatoes and onions. Nearly one-half of the agricultural populations eats squash or pumpkin frequently. Papayas, mangos, and watermelons are consumed by a fairly high proportion of valley inhabitants with the exception of pastoral groups, who eat more wild fruits.

Health

Malaria is the most frequently reported disease in the SEBS sample. Malaria is most severe in Lower Jubba Region. Diarrhea and tetanus (generally neonatal tetanus), are the next most frequently reported diseases. The seasons when most people experience illness are first gu' and then jiilaal. Women also suffer from a high incidence of anemia and *lo'ow* (a multiple vitamin deficiency disease).

The number of miscarriages and stillbirths in Garbahaarey District is very high compared to other districts. Garbahaarey District has the lowest number and percentage of women who have used ORT and who have received vaccinations.

Female circumcision is discouraged by the government. The prohibition has taken hold in urban areas more than in rural areas. Some women claim to use the mild and nondisfiguring *sunna arab* form of female circumcision.

When people are ill, medical professionals and pharmacists are consulted the most, while traditional healers are consulted the least. However, in the vast majority of cases, no one is seen after the first treatment. Among people who get a second opinion, religious healers are the most popular choice.

The highest percentages of immunizable illnesses occurring, for all age groups, are measles, polio, and tetanus. Tetanus is the number one killer of children in all socio-ecological (SES) categories. Malaria/fever is the second biggest childhood killer in the valley. Diarrhea is the third most important cause of death among children in all areas except the riverine zone.

Most water sources used by valley inhabitants are unclean and often the source of health problems. Some sources of groundwater become increasingly salty (often to the point of impotability) as dry seasons progress.

Systematic and sanitary solid waste disposal systems are also almost entirely lacking in the Jubba Valley. Except in the larger towns, it is rare to find households that have or use toilets or pit-latrines. Most households simply use the bush for their needs.

Impacts of Proposed Developments

The SEBS study is analyzing the impacts of five major developments on the Jubba River:

- the construction of the Baardheere Dam and the creation of a reservoir stretching to the town of Luuq;
- the resettlement of 13,000 people from the impoundment area;
- the development of irrigation along the lines of the various types of irrigation currently practiced on the river;
- the growth of several urban areas due to their proximity to the dam, agricultural production centers, or major transportation axes; and
- the development of transportation, electrical transmission, and mechanized irrigation infrastructure.

The projected flood regime will continue to cause economic damage to those areas most severely affected by flooding, but will dramatically reduce floods where floodwater is currently most used for farming. The magnitude of the consequent reduction in crop production in current flood-recession-dependent areas is unknown. In principle, agricultural production on much of the floodplain will drop to the levels of rainfed fields.

Closing Baardheere Dam will cause loss of rangelands in the inundation area. Large numbers of livestock will undoubtedly leave the area since rangelands around the reservoir will be a poor source of forage (initially, at least) compared with the lost floodplain. Tsetse may become established around the reservoir even though it is thought to be absent now. Because of loss of forage from the floodplain and the inundation area, there will be increasing pressure on the remaining resources of graze and browse. Herders will have to change their household economic strategies, particularly in the dry season. Alternatives may include using the rangelands of the Shabeelle Valley rather than the Jubba Valley (if this area can support more livestock), increasing participation in agriculture (especially to use crop residues to feed livestock), or dropping out of livestock herding completely.

Another effect of impounding Jubba River waters will be changes in available farmland. The future reservoir area will no longer be suitable for farming. Currently, an estimated 12,000 ha in the reservoir area are under cultivation and will be lost when the reservoir is filled (Watson and Nimmo 1988). In addition, an indeterminate amount of riverine and dhesheeg farmland will be lost due to the lower constant river flow and lack of gentle overbank flooding. However, there may be a gain of 2,000 to 3,000 ha of seasonal farmland in the reservoir drawdown as impounded water is released through the dam (Deshmukh 1989).

The Baardheere Dam construction project will create a human influx in the Baardheere region that will substantially exceed the anticipated 2,000 laborers needed to work on the dam. The rapid influx of population could easily create slums and shanty towns on the periphery of Baardheere town which could pose serious social and health problems. Water and sanitation needs are particularly critical.

Potential dam-related health problems revolve around the two already prevalent diseases of schistosomiasis (bilharzia) and malaria, and on the possible increase of others, such as river blindness. Irrigation canals that are not kept clean of weeds and have slow water moving through them may also become loci of schistosomiasis as irrigation works spread. Damming the Jubba river and increasing irrigated agriculture could cause a rapid rise in the incidence of malaria.

Road transportation networks linking the east and west banks of the Jubba River will be substantially altered by the reservoir.

The reservoir will lead to a loss of cultural resources. Inundation of the valley above the dam site will also result in cultural loss of material objects of historic, scientific, and aesthetic value which are part of Somalia's cultural heritage, in particular, and are of interest to the world scientific community, in general.

A large new water body created by filling the reservoir behind Baardheere Dam will lead to increased crocodile and hippopotamus populations.

Impact of the Baardheere Dam on nutrition levels will probably be mixed. Expansion of irrigated agriculture accompanying a more constant river

flow will permit the production of greater quantities and varieties of food crops. Sorghum could replace maize as the staple crop in some unirrigated areas if the dam impoundment lowers the water table and narrows the floodplain. The dam is likely to have an important negative effect on nutrition among people who currently trade with pastoralists for milk but from whom herder transhumant routes may be diverted by the presence of the reservoir.

After filling the reservoir, inundated land vegetation will decompose and release nutrients, substantially increasing fish populations—until nutrients wane and fish predator populations increase. Within a decade, potential fish catches will decline and come into balance with a slower rate of nutrient inputs. Even after the reservoir attains maturity, fish populations will still remain a significant resource. In the interim, excellent yields can be expected.

The small possibilities of river navigation that may open with the dam could be reduced by the economic effects likely to occur with the completion of the paved road through Middle Jubba Region.

The change in floodplain hydrology can be most easily mitigated for many farmers through the use of small diesel-powered irrigation pumps. However, to prevent impoverishment of the majority of recession-dependent agriculturalists, flood-recession agriculture will have to continue via controlled flooding.

The main issues in the livestock sector will be mitigating loss of forage resources and access to watering holes either directly on the banks of the Jubba River or in dhesheegs fed by the river. A controlled flood, complemented by minimal infrastructure, will largely compensate herders for their losses of grazing and watering holes.

In order to minimize the loss of agricultural production by the Baardheere Dam reservoir, releases from the dam should be scheduled and last long enough to permit agriculture in the drawdown zone.

Growth of the construction camp for the dam will create a number of short-term health and sanitation problems which contractors will have to address as construction proceeds. Authorities will have to monitor the health and sanitation status of the site closely to avert problems that could have a negative impact on the general Somali population later on.

In the meantime, completion of the dam and the expansion of irrigated agriculture will have long-term impacts on the health and sanitation of Jubba Valley. To avert a general degradation of conditions, programs aimed at public education and prevention of the spread of bilharzia, malaria, and tsetse should begin. Providing valley residents with good quality drinking water in adequate quantities is also a priority.

Breaks in communications between the east and west banks of the new reservoir should be addressed by general development of the road transportation system in the region.

Overall demographic data reflect the following characteristics of the reservoir population that are pertinent to resettlement:

- it is very young and expanding rapidly;
- it is characterized by low levels of literacy and formal education; and
- it is overwhelmingly involved in basic production activities, with a nearly complete absence of additional skills or occupational training.

Based on these characteristics, when resettled, the reservoir population will be almost entirely dependent on the soil and water resources of the new location to continue their livelihood, which is almost totally oriented toward agriculture and livestock production. Their economic adjustment to a new environment will depend on finding an appropriate mix of ecological factors which will be compatible with previous modes of production. Of even greater importance is how much land will be allocated to each resettled household. If each is given two hectares or less and no additional arable land is available for clearing and cultivation, the settlement will fail because it will be unable to incorporate a second generation (Scudder 1987). Given a rapidly expanding population with few skills and little education, the next generation will inherit a marginal agricultural existence, or be forced to accept roles as low-wage laborers, or migrate from the area in search of employment that requires only minimal skills.

Planners of Jubba Valley resettlement should look to previous Somali resettlement experience for guidance in their efforts.

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It is desirable to relocate reservoir villages at sites as similar to their present ones as possible. Sites should have the characteristics, where possible, of continued low-population density, potential for riverine and dryland agriculture, and access to inland grazing.

The most successful resettlement program will preserve the social integrity of communities being relocated by maintaining their political structures.

With regard to the limited skills and education of the resettlement population, it is imperative that attempts be made to settle them in environments in which their present sets of economic skills centering on agriculture and livestock management will not place them at a disadvantage.

From the outset of relocation site selection, it is imperative that surrounding communities be consulted to ensure that they do not already have traditional claims to and/or economic dependence on the land designated for resettlement sites (Scudder 1985). Efforts should be made to ensure settler-host compatibility.

After relocation sites have been identified, representatives of communities to be resettled should be taken to visit the sites and then returned to their homes to inform their communities about the conditions and characteristics of the new environment. Settlers should participate in deciding the future composition of resettlement communities.

With careful planning, settlers can be transported by truck, accompanied by their houses and belongings, directly from the reservoir zone to their new relocation sites. The comfort and familiarity of their own homes can provide an immediate buffer against the adjustment to a new and unfamiliar environment.

There are currently three types of irrigation systems operating in Jubba Valley:

- state farms;
- private, commercial farms; and
- small-group farms.

Each irrigation type has its distinctive technical, managerial, and socioeconomic profile.

State farms are large operations which are centrally managed by professional, often expatriate, staff. They take advantage of economies of scale to produce on a large scale for consumption outside Jubba Valley. Lands enclosed in their perimeters have been sequestered from the productive resources of neighboring villages and pastoral groups. Local farmers are employed on the state farms as agricultural laborers. State farms require heavy capital investment and access to considerable foreign exchange to operate. They may generate foreign exchange by exporting a share of their production. Incidence of waterborne diseases often rises in the vicinity of state farms.

Private, commercial farms are generally much smaller than state farms. They produce food crops (mainly bananas), for market either in Somalia or overseas. They are organized as a private enterprise with the owner as manager. They also enclose lands that have been sequestered from village resources, thereby reducing local production of food staples. In practice, members of local farm families provide agricultural labor for the operations of these farms. Investment for development of a private, commercial farm is less per hectare than for a state farm. Private, commercial farms generate considerable foreign exchange receipts. Incidence of waterborne diseases may also rise in the vicinity of private, commercial farms.

Small-group farms are organized by village landholders as a way to benefit from the availability of a pump. Villagers often consolidate contiguous plots in a shareholding arrangement with a pump owner. Capital investment in a small-group farm is limited to the cost of the pump. Infrastructure is developed by hand by group members. Small-group farms have a positive impact on local food availability and local incomes. They do not generate foreign exchange. Incidence of waterborne diseases may also rise in the vicinity of small-group farms.

Increasing efficiency of irrigated state farm production will require further inputs and a reliable supply of fuel, technical and managerial expertise, labor, and foreign exchange for spare parts and replacement of equipment. Increasing their efficiency is desirable and can be helped by building the Baardheere Dam. However, JESS strongly recommends that no more state farms be created in the Jubba Valley.

JESS recommends encouraging small-group irrigation as one model for future development of the valley. Small-group farms are very productive, require little input from outside, and do not drain national reserves of foreign exchange. Small-group irrigators substantially add to national food supplies

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and improve the diet by adding variety to the foods available for purchase. Small-group irrigation is the most compatible form of irrigated agriculture with the needs of livestock production—allowing foraging on crop residues and better access to riverbank watering sites. Small-group irrigators have been very successful in Jubba Valley with little or no outside intervention; they illustrate the resourcefulness of independent entrepreneurs.

In addition to small-group irrigation, JESS recommends a second model of irrigation for replication in Jubba Valley—household-level irrigation. Currently, many households independently practice simple techniques of flood-recession agriculture in the dhesheegs and on riverbanks, relying mainly on floods to deposit water and soil nutrients. Closing Baardheere Dam will prohibit flood-recession irrigation unless dam management includes directing water to these areas. JESS strongly recommends that water periodically be supplied to flood-recession areas so that household-level irrigation can continue. There are basically three options for supplying water to these areas: using pumps (preferably electrical when electricity is supplied to the valley); digging canals to connect the river with some dhesheegs; and engineering an overbank flood. Given the variety of land irrigated by flood recession, different options will be appropriate in different locations. All three options must be studied in more detail.

Urban growth will have an impact on several aspects of socioeconomic life in Jubba Valley. Urban food consumption patterns will transmit demand signals to food producers in the region to change their agricultural and livestock production patterns. Urban dwellers will consume more fruit, vegetables, meat, and dairy products per capita than rural dwellers do.

Growth of urban areas will also have an employment effect. To a great degree, transportation, trade, and retailing will be the most rapidly expanding employment sectors in growing urban areas if recent growth in Kismaayo and Jilib is representative.

Growth of urban areas will also have an impact on the health of residents. Concentrations of people generate problems of waste disposal which creates environments for communication of disease. In particular, safe water for human consumption will be a problem in the rapidly growing urban areas.

Balanced growth of the urban centers will require planning in several sectors. The most important of these will be in public health and planning for new residential subdivisions. The concentration of numbers of people at one site always raises issues of disease control and sanitation. Water supply and water quality questions will be particularly urgent along the Jubba River with increases of people dependent on it for agricultural, personal hygiene, and water supply needs.

Health care facilities should also be installed at urban centers to help ameliorate epidemiological conditions which may become worse with urban growth. Dispensaries should be installed wherever possible to provide better health care.

Planning for the physical growth and extension of the towns is essential so that public services will be in place when new residents need them. Authorities will have to lay out subdivisions and develop the infrastructure to meet residents' needs.

Development of a road network and an electrical grid in Jubba Valley will further spur agricultural production forward. Roads will drive down the cost of transporting goods and people. In particular, they will decrease the cost in time and cash outlay of taking agricultural production to market.

Electricity will further decrease the costs of agricultural production under irrigated conditions. Electrically driven pumps have a number of advantages—in particular, cost and reliability—over diesel driven pumps.

Maintaining the infrastructure from the beginning will be important to gain maximum sustained benefit from its development. In addition, residents in Jubba Valley should benefit from electricity produced by Baardheere Dam. Electricity could play a major role in the conversion of Jubba Valley agricultural systems to irrigated production.

Monitoring

Monitoring in Jubba Valley should focus on identifying change in key variables in six different areas:

- health and nutrition;
- range condition, livestock numbers, and species mix;
- agricultural land use and crop yields;
- resource access;

- out-migration; and
- resettlement.

Health and nutrition parameters should be monitored by a unit of the Ministry of Health, with a special unit developed under the Ministry of National Planning and Jubba Valley Development to monitor all other factors recommended.

Monitoring methods should rely heavily on aerial reconnaissance with ground-truthing and spot surveys from the monitoring unit.

Monitoring should begin with implementation of development programs and continue for at least five years after closure of the Baardheere Dam.

II. INTRODUCTION

In the past two decades, Africa has experienced a succession of drought years that have undercut socioeconomic life in several regions of the continent. However, poor agricultural planning and questionable development priorities have exacerbated the vagaries of nature. As a result, Africa is the only major developing region to experience a decline in per capita food production over the past two decades (Eicher and Staatz 1984). In spite of Africa's broad range of resources, the continent exhibits a general pattern of food production deficits.

Somalia has experienced the crises encountered elsewhere in Africa with the recent succession of drought years. The effects of drought have been compounded in the past decade by the influx of as many as 1,000,000 refugees from Ethiopia, which is roughly equivalent to a 20 percent increase in the population. These and other problems have had a strong impact on the economy and made achievement of development goals more elusive.

Somalia is consistently listed among the economically poorest countries in the world with a 1978 per capita income of U.S. $130 (Nelson 1982). However, the capital (Muqdisho), with approximately 1,000,000 inhabitants, has a conspicuous absence of urban squalor and an unusually low crime rate, particularly in comparison with other cities in Africa. The apparent discrepancy between the country's gross national product (GNP) and relative well-being of its people is a tribute to a dynamic, highly egalitarian culture, adapted to a harsh environment of perennial scarcity. A majority survive because of deeply ingrained cultural values which dictate that resources must be shared reciprocally and redistributed throughout a network of family and extended kin.

Somalia is unusual in Africa because much of its traditional culture and repertoire of values has survived, largely due to an inhospitable climate that has historically served as a barrier to change and outside influence. Colonialism in Somalia, in its various manifestations (including forced-labor programs), focused on the Benaadir Coast and lower reaches of the Shabeelle and Jubba rivers. Colonialism did not affect the majority of Somalis who inhabit the country's dry interior as severely as it affected the people in other African countries. Somali culture has remained essentially intact.

Following independence in 1960 and the revolution in 1969, the Government of the Somali Democratic Republic (GSDR) embarked on many ambitious social and economic programs to improve the lot of the rural majority. A majority of Somalis continue to practice traditional subsistence-oriented agriculture and pastoralism, and are mainly self-sufficient despite government and international donor support.

For over 50 years, the Jubba River has been a focus of efforts to develop Somalia's economy. It is the larger of Somalia's two perennial rivers. In principle, it could play a vital role in the agricultural economy of a semiarid country with such limited agricultural potential. From Italian colonial times to the present, planners have depended on the Jubba River to achieve national food self-sufficiency and augment foreign-exchange earnings.

The GSDR is prepared, with the support of the international donor community, to launch a comprehensive program for the development of the Jubba Valley. A key component of this program is the construction of a dam on the Jubba River near Baardheere. Planners anticipate that constructing this dam, among other things, will increase agricultural output by fostering irrigation development.

Baardheere Dam will bring about substantial changes that cannot be surmounted by traditional adaptive mechanisms alone. For example, no amount of cultural elasticity can enable the 13,000 residents of the future reservoir zone to maintain their present livelihoods in their home areas. As a result of the dam, altered river flow and flood control will change floodplain pastoral resources. Furthermore, reduction of seasonal floods will undoubtedly affect a major group of riverine farmers who rely on some form of flood-recession agriculture.

Technical innovations can help the country to adapt to some of these changes—for example, digging canals from the Jubba River to *dhesheegs* (depressions in the floodplain that are important as sites for recession agriculture and watering livestock), irrigating dhesheegs with pumps, engineering seasonal flooding from the dam, and distributing inputs of fertilizer to farmers at moderate prices.

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However, a question that cannot be answered at this point is the degree to which such measures will be sustainable with the limited human and financial resources available to the GSDR.

Future development must recognize the value of the knowledge collectively possessed by the valley's people as well as the significance of local social and governing institutions that have been self-sustaining and self-perpetuating up to now, at no cost to the government. These institutions and governing bodies lend themselves to local development-planning initiatives and regulatory functions. The success of transforming the valley's economy depends, in large measure, on the degree to which its people are integrated into the process.

A. Objectives

Objectives of the Socioeconomic Baseline Study (SEBS) report are to:

- present a body of new information on socioeconomic life in the Jubba Valley;
- to assess the impact of development efforts on this socioeconomic life;
- to recommend measures to enhance positive impacts and mitigate negative impacts; and
- to propose a program to monitor the progress of those impacts and interventions.

New information collected from the valley, specifically in the areas of social institutions and patterns of agricultural production and resource management, can serve as a foundation for planning Jubba Valley development as well as a point of reference for measuring the impact of development.

The Socioeconomic Baseline Study focused on assessing the impact of three specific development activities, as mentioned in the JESS Scope of Work: irrigation, dam development, and relocation and resettlement.

B. Scope of the Study

The Scope of Work of the USAID contract established a framework for SEBS which included indicating populations to be studied, information to be collected, and analyses to be conducted. This guidance served as the base upon which the SEBS study was built.

The frame of reference for SEBS analysis and recommendations was clearly the local level, as the Scope of Work oriented SEBS toward a consideration of impacts of development on the local population and measures to mitigate adverse impacts at that level. Additionally, the Scope of Work asked for recommendations on maximizing local participation in planning, monitoring, and evaluating future development activities. Larger macroeconomic and macrosocial considerations are out of the realm of this study.

The audience for this study consists primarily of development planners and project designers in the GSDR and international donor community; therefore, the report focuses as much as possible on information and analyses needed by those groups to carry out their responsibilities for the Jubba Valley.

C. Study Area

1. Political Regions

The study area for the Socioeconomic Baseline Study included the 120,000 km^2 comprising the three administrative regions transected by the Jubba River in a north-south direction from the Ethiopian border to its terminus in the Indian Ocean northeast of Kismaayo. The study area can be further delineated as the eight districts within these regions through which the Jubba River flows. Within Gedo Region, these districts are Luuq, Garbahaarey, and Baardheere. In Middle Jubba Region, they are Saakow, Bu'aale, and Jilib districts. The study area in Lower Jubba Region included Jamaame and Kismaayo districts. A ninth district, Afmadow, in Lower Jubba Region, was also included (even though the Jubba River does not pass through this district) because of its importance as a pastoral center and because of the seasonal dependence of the pastoral economy on Jubba Valley resources.

The three political regions and nine districts provided a framework for structuring data collection and analysis. These political entities represent spatially organized units which are a meaningful reality to valley inhabitants, administrators, and development planners. Consequently, analyzing data by existing political units provides an expedient framework for future socioeconomic planning for the valley.

The AHT Master Plan study area boundaries inscribe an area of 38,860 km^2 defined in sociogeographic units (SEBS Map #2). JESS

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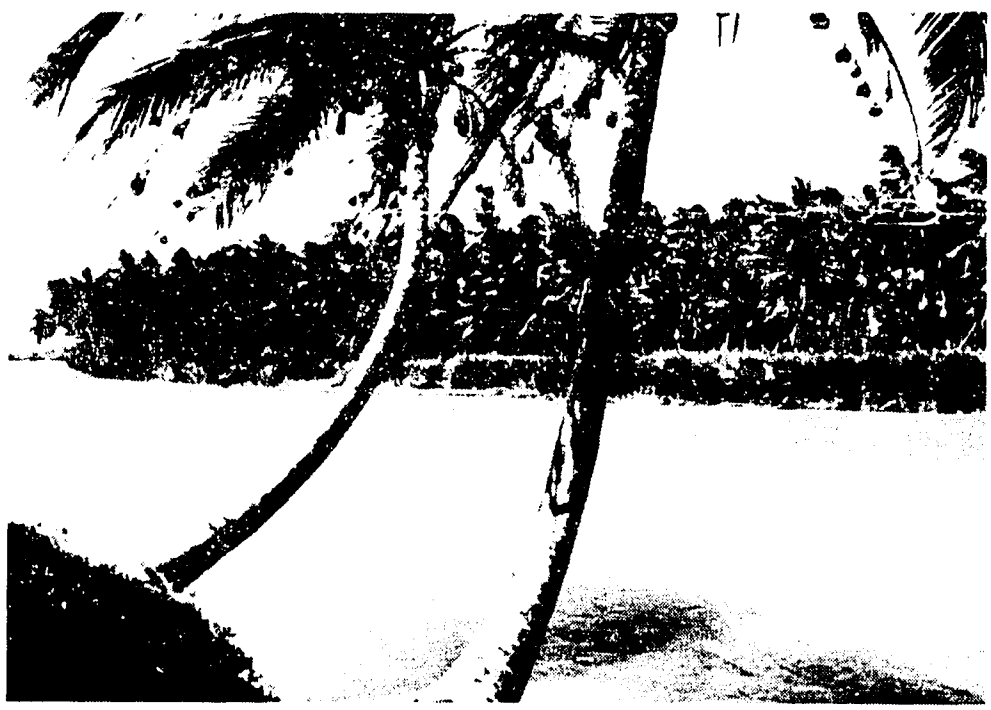
studies go beyond the precise Master Plan boundaries because JESS was charged with studying persons displaced by the dam and because the highly mobile patterns of pastoral populations made it necessary for JESS to accept more fluid boundaries in the course of sampling (see SEBS Maps #1 and #2).

2. Socioeconomic Regions

In addition to political boundaries imposed (and occasionally shifted) on the map of the valley by the Somali Government, there are also socioeconomic regions of the valley, which, in terms of their particular historic economic production patterns, have a legitimate reality of their own (see SEBS Map #3). These economic patterns deserve recognition and are useful reference points for planning. Fortunately, with few exceptions, the socioeconomic and political regions of the Jubba Valley are basically congruent. For future reference, socioeconomic and political regions will be distinguished by the respective use of lower and upper case first letters of these regions. For example, Lower Jubba is the political unit while lower Jubba is the socioeconomic unit.

Lower Jubba is the political region comprised of Jamaame and Kismaayo districts. It is the area of the valley with the longest exposure to externally imposed development from the colonial period onwards. Lower Jubba Region has the greatest infrastructure of roads and markets, and the largest city. Ecologically, socially, and developmentally, Jilib District, from Fanoole Barrage southward, has more in common with Lower Jubba Region than it does with Middle Jubba. Therefore, Jilib District from Fanoole south is included in the general socioeconomic region known as lower Jubba because of the existence of large-scale agricultural projects.

Middle Jubba, as a political region, encompasses Jilib, Bu'aale, and Saakow districts. However, in terms of sociological parameters of economic development, middle Jubba is defined as the area from Fanoole Barrage to within approximately 40 km north of Saakow town. The middle Jubba is distinguished by its paucity of development, lack of all-weather roads, and fragmentary infrastructure. The middle Jubba's lack of development is largely



The palm-lined estuary of the Jubba River north of Kismaayo.

a result of its poor roads which leave the area isolated for three to four months per year following the gu' and deyr rains. Since the mid-1980s, middle Jubba has been the valley's center of greatest land speculation in anticipation of economic opportunities following the development of Baardheere Dam and an all-weather road connecting middle Jubba from Jilib to Baardheere towns.

Gedo Region is comprised of the districts of Baardheere, Garbahaarey, Luuq, Dolow, Buulo Xaawo, and Ceel Waaq. However, for the purposes of the study, only the districts of Baardheere, Garbahaarey, and Luuq—through which the Jubba passes—were included in the study. These three districts, plus the northernmost 40 km of Saakow District, comprise the socioeconomic region of upper Jubba which is distinguished as the locus of small-scale private, irrigated farms which give rise to the valley's highest farm incomes. Irrigated farmlands extend from northern Saakow District to the dam site 35 km north of Baardheere town, and from Buurdhuubo to within a few kilometers of the Ethiopian border. This region has a socioeconomic subregion encompassed within its borders known as the Gorge. The Gorge consists of the 93-km riverine strip between the dam site and Buurdhuubo. Within this stretch, there is only one irrigation pump situated five km north of the dam site and one pump five km south of Buurdhuubo. Otherwise, agriculture with the remainder of the Gorge is dependent on riverbank flood recession and rainfall. The Gorge contrasts with the rest of upper Jubba due to its inaccessibility (except by foot or by boat). With the exception of sales of livestock, the Gorge's isolation has restricted cash-crop production.

The SEBS socioeconomic regions correspond to the Terrestrial Ecology Baseline Study's (TEBS) river sections in the following way: upper Jubba comprises River Sections I to III; middle Jubba, IV and V; and lower Jubba, VI to VIII.

3. Socio-ecological Sectors

Data from the SEBS study are analyzed from two perspectives. For the purpose of national and regional planning, data are analyzed by political region (Map #3). As such, they are comprised of three sequential, latitudinal strips. Secondly, data are also analyzed by production type or socio-ecological sectors (SES)(Map #1) . These sectors include riverine agricultural populations, non-riverine agricultural (or agro-pastoral) populations, pastoral populations, and urban populations. Urban populations are, in fact, a residence location type with a variety of economic options open to its members, including commercial trade, services, government service, agriculture, and livestock production.

In general, these socio-ecological sectors are located on or parallel to the river, running longitudinally north and south and forming a matrix by cross-cutting the horizontally placed political regions. By forming a matrix, it is possible to identify and describe each socio-ecological system as it varies in each of the administrative regions. Although each sector is described as a discrete system for the sake of analysis, in reality, the lines between the sectors are blurred and on more of a continuum. JESS data indicate that terms such as "pure pastoralists" or "pure agriculturalists" are externally imposed abstract constructs which have little basis in reality. An individual household, while focusing on a particular economic strategy, might have additional economic interests operating within several systems at any one time. For example, riverine agricultural households might have livestock herded outside the riverine zone, and a pastoral household might also claim riverine agricultural land. Production sector labels, though arbitrary, are useful for identifying particular populations with specific sets of economic strategies. In each socio-ecological sector, a range of strategies and options are available to households, as well as constraints that limit economic opportunities.

4. Physical Characteristics

Landform, Geology, and Soils

Geological maps are presented in Watson and Nimmo (1985) and LRDC (1985). Much of Gedo Region is comprised of limestone hills, terraces, and plateaus dating from *Jurassic* and *Cretaceous* periods (65 to 190 million years ago). Local variations include gypsum, basalt, sandstone, and shale. From north of Saakow to Bu'aale, a zone of pre-*Cambrian* (> 570 million years ago) basement granitic gneiss and schist crosses the area east to west. Most of the area is flatter than that underlaid by limestone, but this formation also contains granite inselbergs (*buur*) characteristic of part of Bay Region. South of Bu'aale are extensive alluvial plains of clays and marls deposited under oceanic condition in recent times (< two million years ago). The coastal strip is comprised of mobile sand dunes to the seaward side and stabilized dunes inland. Around Kismaayo and southward is a region of recent coralline limestone.

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SEBS MAP #1
SOCIO-ECOLOGICAL SAMPLING ZONES

0 5 10 20 30 40 50
SCALE IN KILOMETERS
R.F. = 1:1,000,000

LEGEND

- Surfaced Roads (Tarmac)
- Maintained Dirt Roads
- Bush Tracks (Alignment Approximate)
- Wetlands
- Inundation Area of Dam (Coincides with "Agricultural Riverine" between Dam Site and Luuq.)
- District Boundary
- Regional Boundary

Socioeconomic Baseline Study Socio-Ecological Sampling Sectors

- (3) Urban
- Agricultural Riverine
- Agricultural Non-Riverine
- Pastoral

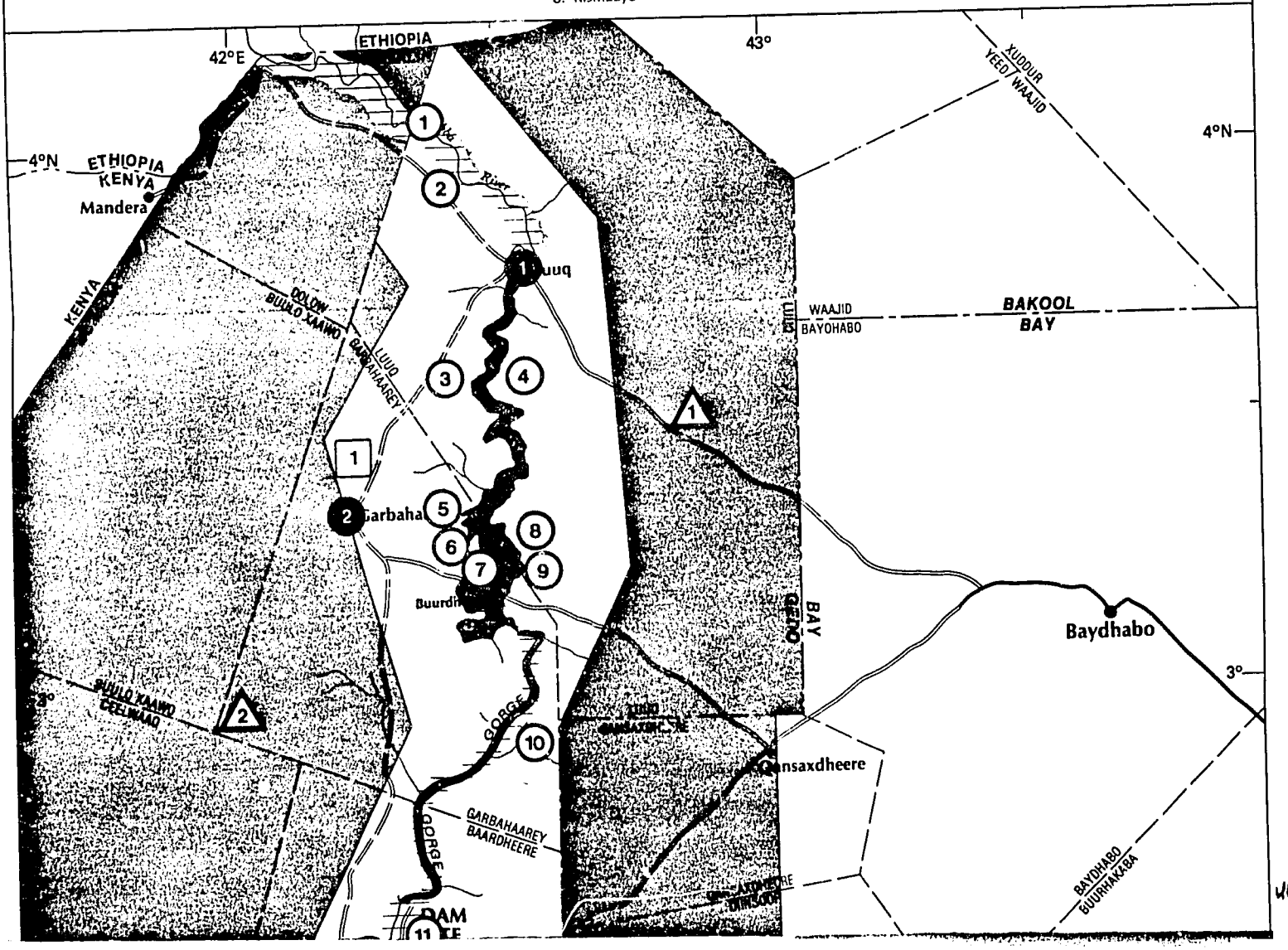
Socioeconomic Baseline Study Sample Population Site Locations

(1) Urban
1. Luuq
2. Garbahaarey
3. Baardheere
4. Saakow
5. Bu'aale
6. Jilib
7. Jamaame
8. Kismaayo

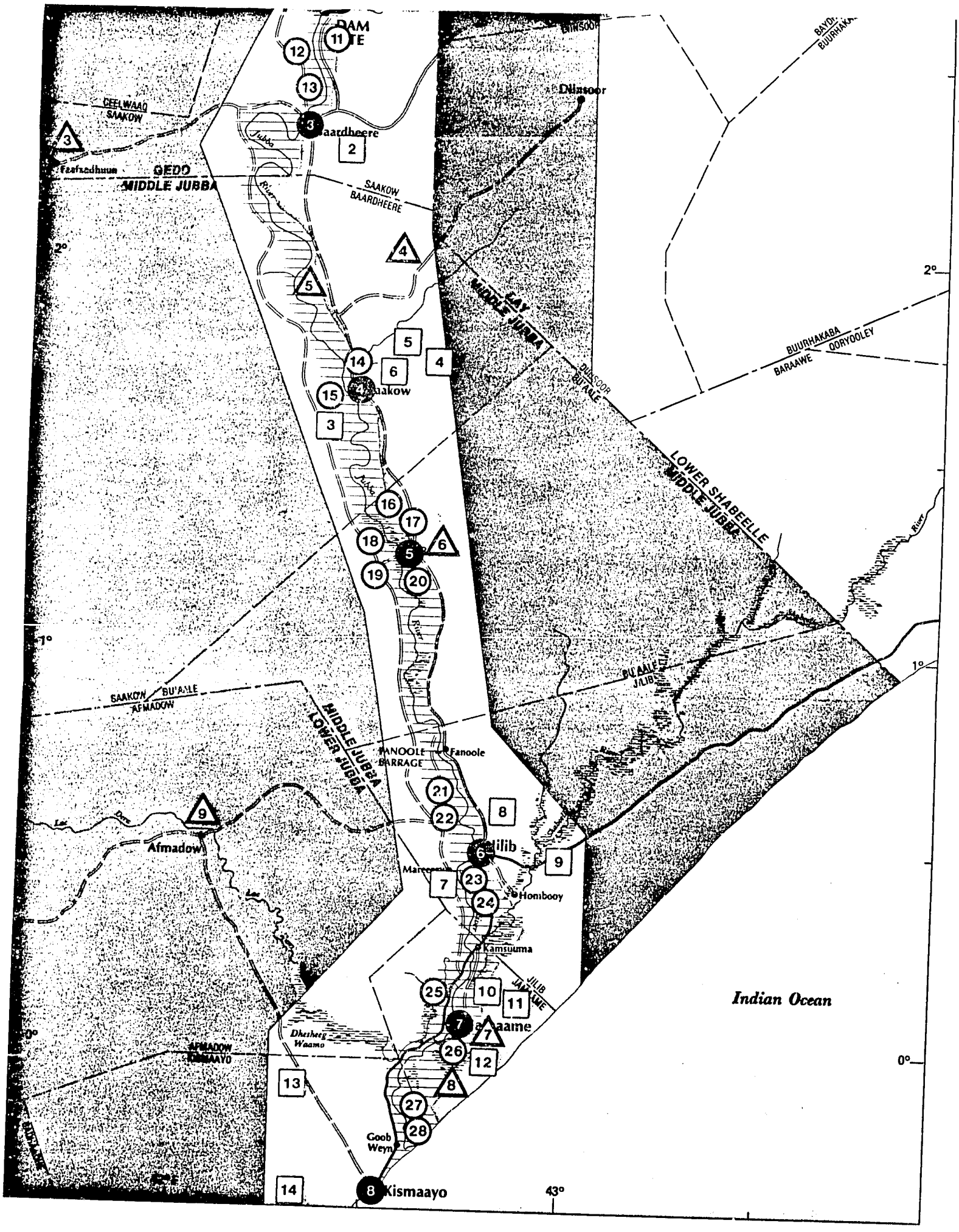
(8) Riverine
1. Dhaysiyow
2. Garboolow
3. Qolayle
4. Marayle
5. Golweyn
6. Saarsar
7. Kuudka
8. Mariile
9. Hufay
10. Gorge Area
11. Dugsilow
12. Kudug
13. Mardha
14. Buur Fuule
15. Kulmis
16. Dujuuma
17. Dalahelay
18. Jabbi
19. Banta
20. Qararecrey
21. Haraawe
22. Kumbareera
23. Gomeeni Yare
24. Nasiib Buundo
25. Sheekh Cambuulo
26. Buulo Maamow
27. Mokomane
28. Goob Weyn

(12) Non-Riverine
1. Maykoreebe
2. Xagai Buulo
3. Nus Duniya
4. Labi Buul
5. Qayd Cajuuso
6. Marmarka
7. Gaduudey
8. Hiloshiid
9. Arbay Cabdi
10. Honqorre
11. Nyiireey
12. Janaale Jaay
13. Canjeel
14. Fuuma

(4) Pastoral
1. Yurkut
2. Ceel Gaddud
3. Faafxadhuun
4. Banaada
5. Salagle
6. Dhesheeg Radiile
7. Qeraxey
8. Nafta Quur
9. Afmadow



40


DAM SITE
Dinsoor
BAYDHABO-BUURHAKABA
GEELWAAQ SAAKOW
Baardheere
Fanfadhuun
GEDO
MIDDLE JUBBA
SAAKOW BAARDHEERE
LAY MIDDLE JUBBA
DINSOOR BU'AALE
BUURHAKABA BARAAWE
OORYOOLEY
LOWER SHABEELLE
MIDDLE JUBBA
Saakow
BU'AALE JILIB
SAAKOW BU'AALE AFMADOW
MIDDLE JUBBA LOWER JUBBA
FANOOLE BARRAGE
Fanoole
Afmadow
Jilib
Marere
Honiboey
Kamsuuma
JILIB JAMAME
Jamaame
Dhesheeg Waamo
AFMADOW KISMAAYO
Goob Weyn
Kismaayo
Indian Ocean
2°
1°
0°
43°

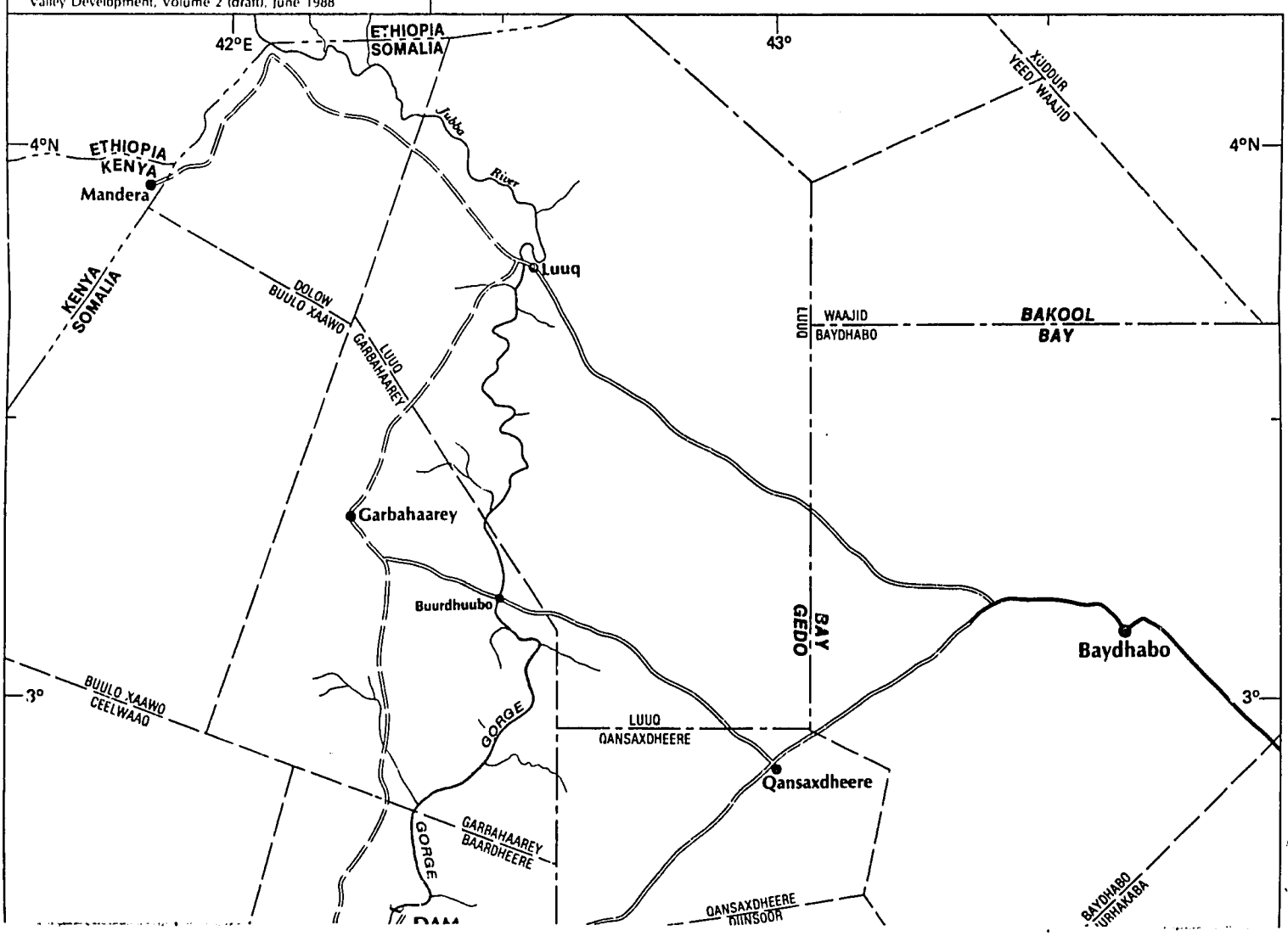
SEBS MAP #2
SOCIO-GEOGRAPHIC UNITS

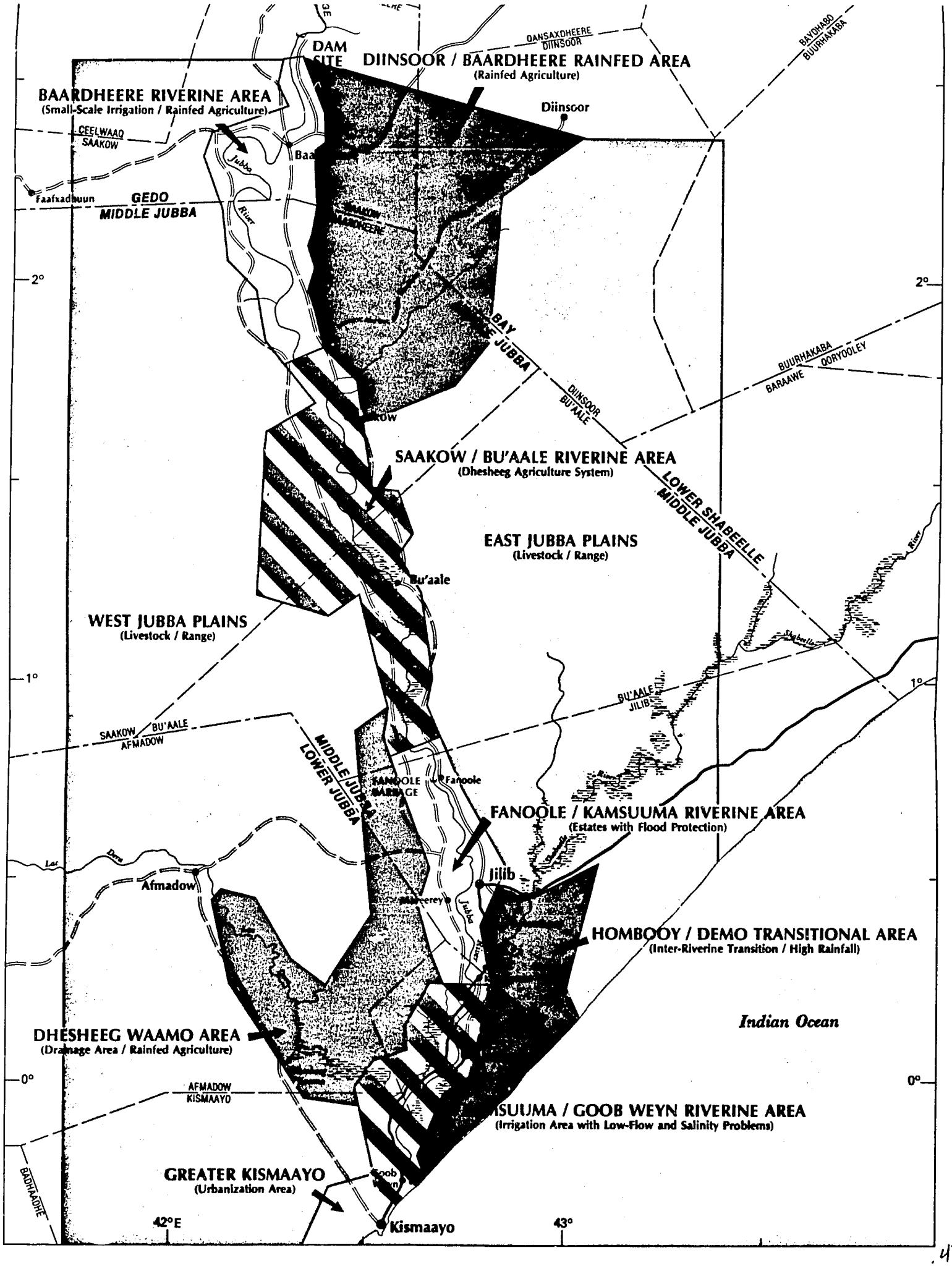
0 5 10 20 30 40 50
SCALE IN KILOMETERS
R.F. = 1:1,000,000

LEGEND

- Surfaced Roads (Tarmac)
- Maintained Dirt Roads
- Bush Tracks (Alignment Approximate)
- Wetlands
- Inundation Area of Dam
- District Boundary
- Regional Boundary

Source: Agrar-und Hydrotechnik GMBH, Masterplan for Juba Valley Development, Volume 2 (draft), June 1988



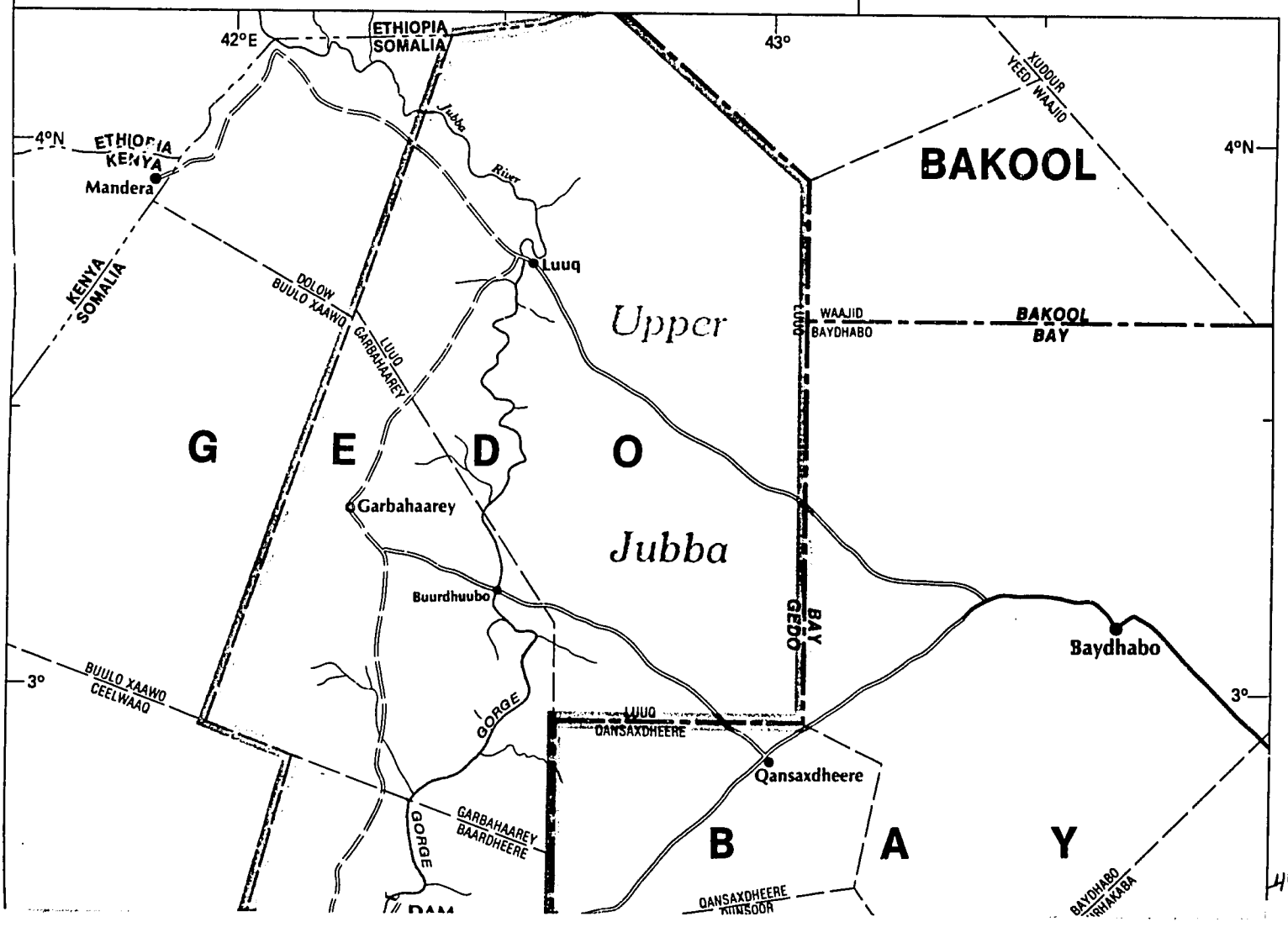

DAM SITE
DIINSOOR / BAARDHEERE RAINFED AREA
(Rainfed Agriculture)
BAARDHEERE RIVERINE AREA
(Small-Scale Irrigation / Rainfed Agriculture)
Diinsoor
CEELWAAQ
SAAKOW
Faafxadhuun
GEDO
MIDDLE JUBBA
Jubba
River
2°
BAY
JUBBA
DIINSOOR
BU'AALE
BUURHAKABA
BARAAWE
OORYOOLEY
SAAKOW / BU'AALE RIVERINE AREA
(Dhesheeg Agriculture System)
LOWER SHABEELLE
MIDDLE JUBBA
EAST JUBBA PLAINS
(Livestock / Range)
Bu'aale
WEST JUBBA PLAINS
(Livestock / Range)
1°
BU'AALE
JILIB
SAAKOW
BU'AALE
AFMADOW
MIDDLE JUBBA
LOWER JUBBA
FANOOLE BARRAGE
Fanoole
FANOOLE / KAMSUUMA RIVERINE AREA
(Estates with Flood Protection)
Afmadow
Jilib
HOMBOOY / DEMO TRANSITIONAL AREA
(Inter-Riverine Transition / High Rainfall)
Indian Ocean
DHESHEEG WAAMO AREA
(Drainage Area / Rainfed Agriculture)
0°
AFMADOW
KISMAAYO
KAMSUUMA / GOOB WEYN RIVERINE AREA
(Irrigation Area with Low-Flow and Salinity Problems)
GREATER KISMAAYO
(Urbanization Area)
BADHAADHE
42°E
Kismaayo
43°

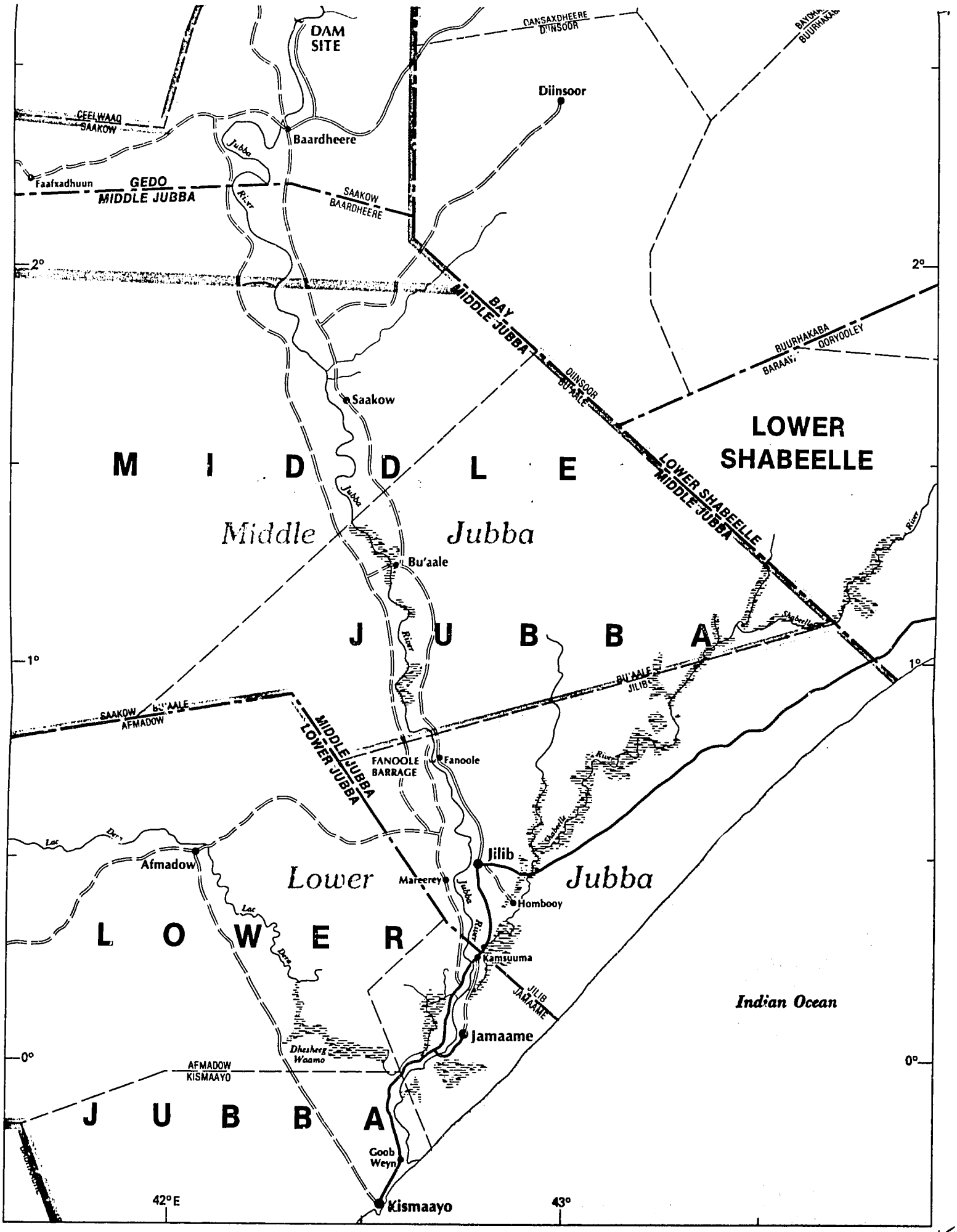
SEBS MAP #3
POLITICAL AND SOCIOECONOMIC REGIONS OF THE JUBBA VALLEY

0 5 10 20 30 40 50
SCALE IN KILOMETERS
R.F. = 1:1,000,000

LEGEND

- Surfaced Roads (Tarmac)
- Maintained Dirt Roads
- Bush Tracks (Alignment Approximate)
- Wetlands
- Inundation Area of Dam
- District Boundary
- Political Regions
- Socioeconomic Regions




DAM SITE
DANSAXDHEERE DIINSOOR
BAYDHABO BUURHAKABA
Diinsoor
CEELWAAQ SAAKOW
Baardheere
Jubba
Faafxadhuun
GEDO MIDDLE JUBBA
SAAKOW BAARDHEERE
River
2°
MIDDLE JUBBA BAY
BUURHAKABA QORYOOLEY
BARAAWE
DIINSOOR BU'AALE
Saakow
LOWER SHABEELLE
M I D D L E
LOWER SHABEELLE MIDDLE JUBBA
Middle Jubba
Bu'aale
J U B B A
1°
BU'AALE JILIB
SAAKOW BU'AALE AFMADOW
MIDDLE JUBBA LOWER JUBBA
FANOOLE BARRAGE
Fanoole
Afmadow
Jilib
Lower Jubba
Mareerey
Hombooy
L O W E R
Kamsuuma
JILIB JAMAAME
Indian Ocean
Jamaame
Dhesheeg Waamo
0°
AFMADOW KISMAAYO
J U B B A
Goob Weyn
42° E
Kismaayo
43°

45

Elevation differences in most of the study area are minor. Following the river southward, the disputed Somalia/ Ethiopia border is at 200 m, Luuq at 150 m, the dam site at 100 m, Bu'aale at 40 m, Jilib at 20 m, and Jamaame at 10 m above mean sea level. Local relief can be substantially greater in northern limestone areas, but only exceeds 500 m in a region 50 km west of the Jubba River north of Baardheere. South of Baardheere, 200 m is not exceeded and most land is virtually flat except for occasional inselbergs north of Saakow.

Soils vary in a sequence related to geological formations (USBR 1987). North of Baardheere, soils are often rocky or stony. Finer deposits are sometimes associated with *togga* (seasonal streams) and depressions containing gypseous soils (Hemming 1987). In flatter, southern sections of the limestone hills and plateaus, vertisols are the predominant soil type as they are in the marine plain. The intermediate zone of basement gneiss and schist has patches of lighter soils than other nonriverine areas. The surface consists of sand-loams to sand-clays. Gravel layers sometimes occur, leading to better drained soils than the surrounding vertisols. All these soils are neutral to alkaline and have low levels of organic matter, nitrogen, and available phosphate (LRDC 1985).

The Jubba River presents a major departure from this overall pattern. A complex mixture of recent alluvial deposits creates a floodplain ranging from less than 100 m to almost 15 km in width.

Climate and Hydrology

Rainfall is the most important climatic variable affecting biological resources in low-lying tropical, dry to semiarid areas, such as the Jubba Valley. Unfortunately, rainfall records are poor. Too few stations and too many gaps in data mean that only a coarse picture can be drawn of relationships between biological and climatic phenomena. Watson and Nimmo (1985) present the most extensive and critical rainfall data set for the study area.

Most of the study area demonstrates the bimodal pattern of rainfall typical of equatorial East Africa. The main rainy season (gu') is from April to June, followed by a moderate dry season (xagaa) from July to October. A minor and erratic rainy season (deyr) occurs in November and December, followed by an intense dry season (jiilaal) from January to early April. This pattern is modified near the coast where xagaa showers follow gu' until October, but deyr rain is slight. Xagaa rains usually penetrate approximately 50 km inland, but heavy showers occurred as far north as Baardheere in August 1987 and 1988. In 1987, Saakow and Bu'aale received significant xagaa rainfall of 51 mm and 103 mm, respectively, in August and September.

Between Dolow and Jilib, mean annual rainfall increases in a southerly direction from around 200 mm to more than 700 mm at Mareerey. South of Jilib, rainfall declines to 450 mm at Jamaame and 350 mm at Kismaayo.

Other commonly measured meteorological variables serve to emphasize the significance of low rainfall. Temperature and wind speed are high and cloud cover low most of the year. These factors all increase evapotranspiration, leading to severe water deficits throughout the study area. Mean annual temperatures at Luuq, Baardheere, Jilib, and Kismaayo are 30.5, 28.2, 27.6, and 26.2°C, respectively. The coldest months are July and August (monthly means 28.3, 28.6, 25.5, and 25.3°C) while February and March are the hottest (33.4, 30.8, 29.1, and 27.9° C). Mean annual wind speeds are 1.0, 2.8, 1.1, and 5.4 m/second $^{-1}$ for the same stations and mean daily sunshine hours are 10.6 at Luuq and 8.2 at Jilib. These factors combine to produce a potential evapotranspiration rate in excess of 2,000 mm/year $^{-1}$ over most of southern Somalia (Watson and Nimmo 1985; AHT 1988).

The most important hydrological feature of the study area is the Jubba River. This river is the only perennially flowing water body in Somalia to reach the Indian Ocean. Even the Jubba bed is occasionally dry in late jiilaal, but subsurface flow continues. Within the floodplain, soil and available water are altered considerably. More than 90 percent of river water flows from the highlands of southern Ethiopia. Discharge is bimodal, more or less coinciding with rainfall seasons in southern Somalia. However, highest river flows occur on average during deyr season, although overbank flooding can occur in both wet seasons. Average annual total flow at Luuq is 6,200 km^3. Extensive floods occur at discharges above 700 m^3/second $^{-1}$. Floods of sufficient magnitude to cause serious economic damage occurred in 1977, 1981, and 1985 (AHT 1988). The study period was marked by a large gu' flood in 1987 which inundated most of the floodplain. This flood was the most extensive since 1977. During other seasons of 1986 and 1987, overbank flooding was negligible. Relationships be-

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tween river discharge and extent of flooding are poorly understood as the riverbed morphology and floodplain microtopography have not been determined.

Dhesheeg Waamo is a periodically large body of water (60 km^2) which receives water from *Lac Dera*, a seasonal channel flowing from north and west. This small catchment may also receive subsurface flow from Mount Kenya via the Ewaso Nyiro and Lorian swamps in eastern Kenya (LRDC 1985). During high floods, as in May 1987, Dhesheeg Waamo is filled from the Jubba. Prior to that flood, the dhesheeg bed was dry and the water table several meters below ground level. Local reports indicate that this dhesheeg was last dry in 1977, before the last major Jubba River flood. These observations indicate the importance of Jubba River water for maintaining the water regime of Dhesheeg Waamo. Channels dug between the Jubba River and Dhesheeg Waamo during the colonial era are no longer functional (LRDC 1985).

East of Jilib, the Shabeelle River ends in a series of swamps. At times of high flow, Shabeelle River water may enter the Jubba River along togga and by surface flooding. These swamps are important natural flood protection for parts of Lower Jubba. They are also wildlife areas worthy of protection and important dry-season grazing areas for livestock.

Surface hydrology south of Fanoole Barrage and floodplain hydrology along the whole river are complex. It is important that the other water bodies and special nature of the floodplain be taken into account when planning developments on the Jubba River following construction of Baardheere Dam.

D. Field Methods

JESS began its socioeconomic studies at the end of 1985 with a review of literature on the Jubba Valley. SEBS then proceeded to collect its field data through three separate field studies. These studies and their methodologies are more thoroughly discussed in Appendix A.

The first of the studies was the *Socioeconomic Baseline Study (SEBS)*. This study began with a six-month phase of rapid reconnaissance of the Jubba Valley. Rapid reconnaissance field investigations focused on local-level social and economic production systems and their relationship to valley resources. Information pertinent to this topic was gathered principally through village meetings—open-ended forums conducted in 26 villages throughout the Jubba Valley. The rapid reconnaissance also included compilation of nearly complete lists of villages and *beels* (subdistrict units) for each district. Sample villages were later randomly selected from these lists.

Based on information and understanding from the rapid reconnaissance, the JESS team developed a socioeconomic baseline questionnaire. It underwent three pretests before being finalized. The final questionnaire was 27 pages long and consisted of several hundred possible questions, depending on the particulars of an individual respondent's family size and economic holdings (copy in Appendix B).

SEBS covered all resident populations of the eight districts transected by the Jubba River, plus Afmadow District, in the three political regions of Gedo, Middle Jubba, and Lower Jubba.

The first stage of sampling involved stratifying the population by political regions and socio-ecological sectors. The second stage of sampling involved the random selection of population clusters within each SES. The third stage consisted of randomly choosing household heads from the selected clusters, from whom specific survey information was to be elicited for each member of the household.

A SEBS field team typically consisted of an expatriate SEBS team leader, seven male Somali enumerators, an expatriate Women's Baseline Study (WBS) team leader, five female enumerators, two drivers, and a cook. The duration of a typical field trip was 10 to 15 days. The team made a total of eight trips, in addition to numerous trips devoted to rapid reconnaissance and pretests prior to the actual survey. The survey covered one political district per field trip.

The questionnaire reproduced in Appendix B details the survey's content, but the focus of each subsection is summarized here. The SEBS survey was comprised of 10 subsections:

- *individual*—to provide demographic information as well as data on educational levels, occupations, languages spoken, and some cursory health questions;
- *absence*—to find out where absent family members have gone, why they are absent,

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and whether they send or receive aid from the family group;

- *marriage*—to trace each marriage of the household head, when it occurred, what kind of exchanges took place at the time of marriage, how long it lasted, and if it ended, whether this was due to divorce or death;
- *household*—to elicit information about property held by the family, housing and sanitary facilities, and sources of water;
- *income*—to gather detailed information on family income and expenditures over the last year, as recalled by the household head;
- *livestock*—to focus on what happened to a family's animal holdings over the past year;
- *farm plot*—to provide information on each agricultural landholding possessed by a family, how it was obtained, current tenurial status, size, and what kind of crops are usually grown;
- *crop A and crop B*—to follow what happens to a crop from the time it is planted to the present in the two preceding cropping seasons. Sales, consumption, gifts, and storage of a crop are all recorded, as are purchases of the same kind of crop, so the team could determine how self-sufficient a particular family or area is in terms of specific crops in each of the two seasons; and
- *labor*—to focus on a few details about labor used for farm work: which tasks, whether it was volunteered or hired, and what type of payment was offered.

Details on the design of data entry and the program are provided in a separate report, *Data Management Report* (Malczynski 1987).

The second of the field studies was the *Women's Baseline Study (WBS)*. For WBS, JESS used the team approach with expatriate social scientists and Somali enumerators (male and female). To encourage open discussion of women's concerns, the WBS and women's village meetings were conducted by an expatriate female social scientist and Somali female enumerators.

Socioeconomist, Kathryn Craven and JESS field assistant conduct an interview among women in an agro-pastoral village east of Saakow.

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The women's questionnaire (see Appendix B) was developed after the final revision of the socioeconomic baseline questionnaire. WBS was designed to focus on issues relating specifically to women and children and household topics on which women would likely be the most knowledgeable informants. The questionnaire was intended to mirror the SEBS instrument by duplicating the "individual," "absence," and "marriage" sections to elicit marriage and reproductive histories from the woman's perspective. The questionnaire also included a section on "family" to gather information on polygyny, inheritance, and family assistance. The "divorce" and "widow" sections focused on a woman's means of support for herself and her children during periods without a spouse. The section on "economic activities" concerned women's control of economic resources and participation in cash-earning activities. The "health and nutrition" section emphasized children's and women's health, reproduction, and family consumption patterns. The questionnaire was revised three times following field trips.

Two hundred seventy-two women were interviewed in nine districts of the Jubba Valley—128 agricultural, 54 pastoral, and 90 urban interviews. Thirty-eight women's village meetings were held.

The third field study was the *Market Study (MARS)*. To gather price information for the Jubba Valley, it was decided initially to establish market surveyors in three major valley towns, expanding to another seven towns if this proved to be logistically possible. The first three towns selected were Jilib, Kismaayo, and Baardheere. Buurdhuubo was added later in the year.

The survey began in 1987. The market questionnaire (see Appendix B) was composed of checklists and price lists for a number of different commodity groups including vegetables, grains, meats, milk, fruits, dry goods, fish, live animals, wood, thatch, and fodder. Checklists were used to see if items were present in the market at a point in time, and the price lists were used to gather more detailed information concerning wholesale and retail prices and places of origin.

In Jilib, Baardheere, and Buurdhuubo, the three checklists were filled cut every other week and price lists and more detailed interviews on alternate weeks, thus providing availability and price information at least twice monthly for each item sold in a particular town. In Kismaayo, the surveyors covered one major and one minor market each week by completing the checklist one week and then the price list (see Appendix E).

III. INVENTORY AND DESCRIPTION OF EXISTING CONDITIONS

This section presents an inventory and description of socioeconomic conditions that exist in the Jubba Valley as observed by the JESS team through its field studies.

A. Historical Overview

The purpose of this overview is to identify and trace the main historical currents that are shaping socioeconomic life in the Jubba Valley. These historical currents have generated the socioeconomic backdrop to future development efforts in the valley and provide the context which future efforts will have to accommodate.

The focus is on the most important historical themes, particularly of the last century, that have been shaping socioeconomic life in the Jubba Valley:

- population movements and peopling of the Jubba Valley;
- evolution of village agriculture;
- emergence of commercial agriculture; and
- government actions as they have played out in the Jubba Valley.

Examination of these themes is followed by a discussion of current trends.

Examination of Jubba Valley history reveals the evolution of local environments in several senses and how human populations have adapted to and molded it. By considering longer-term trends in the Jubba Valley, planners gain insight into interventions most likely to enhance local production systems and complement long-term development aspirations of resident populations. In the process, planners also increase the likelihood of meeting national development goals.

The text draws heavily on recent historical research in lower Jubba which has been published as a separate volume of the JESS reports (Menkhaus 1989). Menkhaus examines the history of agricultural people in what today are Kismaayo, Jamaame, and Jilib districts. The southern part of the valley has experienced a greater degree of change due to economic development than other parts of the valley. The change is particularly related to the development of commercial agriculture geared to foreign export and foreign-exchange earnings as well as the substitution of domestically produced sugar and rice for their imported equivalents. Economy and society in the lower Jubba Valley have been subject to more extensive penetration and changes than in its upper reaches.

1. Population Movements and the Peopling of Jubba Valley

The Jubba Valley has been an arena of continuous change, particularly in the last century, when many diverse populations moved in and out of the area. Many villages in Middle and Gedo Regions are less than 50 to 75 years old, although a few, like Luuq, are considerably older.

According to Cassanelli (1982), there is linguistic evidence that Somali speakers have lived on the Horn of Africa for at least two millenia. However, habitation near the life-sustaining waterways of the Jubba and Shabeelle rivers is of much greater antiquity. For example, JESS cultural heritage studies (Brandt 1986; Brandt and Gresham 1988) conducted along the 160-kilometer riverine strip between the dam site and Luuq indicate a pattern of continuous human habitation for the past 35,000 to 75,000 years.

Major Precolonial Population Movements

During the last half of the nineteenth century, according to scholarly sources (Cassanelli 1973, 1982; Laitin and Samatar 1987; Lewis 1965, 1971; and Turton 1970) as well as Somali oral accounts, what is known today as northern Kenya, southern Ethiopia, and southern Somalia became an arena of intense conflicts, shifting power balances, and major population displacements.

With the exception of riverine agriculturalists, the Jubba Valley was then inhabited by pastoral people, whose mobility and competing demands for grazing resources ensured an enduring climate for conflict. However, hostile encounters were only one of the variables accounting for the area's social dynamics. In the late nineteenth century, this area and a major portion of Africa's other livestock-rearing regions witnessed the great rinderpest epizootic, which resulted in a dramatic reduction in cattle populations of seemingly unprecedented proportions (J. Merryman 1984). The livestock disaster was followed by human devastation in the form of a smallpox

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epidemic. This period of calamity culminated with the beginning of European colonialism in eastern Africa. The impact of colonialism was differentially experienced at that time but, ultimately, had long-lasting effects in shaping the lower Jubba Valley for much of the twentieth century.

Related to the colonial conquest were waves of pastoral migration south from Ogaden, Ethiopia, to the interriverine area (between the Jubba and Shabeelle rivers) of southern Somalia. The reasons for this exodus are varied, but European colonialism cannot be overlooked as a force affecting Somali pastoral expansionism out of Ogaden. It is likely that the departure of Somali pastoral groups from Ogaden was also influenced by interethnic animosities that originated in quests for pastoral resources (Lewis 1980). Further, there was the need to feed a population estimated to have been rapidly expanding (Merryman 1984).

In addition to pastoral migrations, there was a confluence of people migrating into Middle and Upper Jubba regions who mingled with long-term inhabitants of the valley. Their culture and ecological adaptations are similar to those of riverine people of Kenya's Tana River. In the mid-nineteenth century, many runaway slaves, brought to Somalia from Kenya, Tanzania, and Mozambique, fled plantations on the Shabeelle to seek refuge in forests along the Jubba River (Menkhaus 1989). They were joined in the early twentieth century by people from Lower Jubba and groups from Bay Region working on the Shabeelle River, who escaped the forced-labor programs of Italian colonialists.

The Peopling of the Lower Jubba Forests

The riverine area of lower Jubba Valley in the early nineteenth century formed a long ribbon of dense forest winding through the semiarid plains of southern Somalia. The forested area was often several kilometers wide on either side of the riverbank, and included swamps and flood depressions (dhesheegs). The riverine forest was dense and extended from present-day Yontooy (in Kismaayo District) to what is today, Saakow District.

Somali pastoral groups dominated the plains on either side of the forest, but impenetrability of the forest and prevalence of tsetse fly prevented them from controlling it. The ecological niche of the forest thus provided protection for nonherding populations to develop societies autonomous from pastoral hegemony in southern Somalia.

The first group of people to seek refuge in the forest were hunters/gatherers, an ancient population that has been increasingly marginalized by the expansion of pastoral and agricultural societies in East Africa. By the nineteenth century, hunters/gatherers inhabiting the plains of southern Somalia were subjects of pastoral groups in the area, supplying them with ivory and skins in return for food and protection.

In the nineteenth century, a plantation economy rose along Somalia's Benaadir Coast by drawing on slave labor. These slaves originated predominantly from Tanzania, Mozambique, and Malawi. They aspired to return to their East African homelands, but after escaping down the coast, settled along the Jubba River. By the turn of the century, there were an estimated 30,000 to 40,000 inhabitants of Goshaland (another name for the lower Jubba), populating the riverbanks from what is today, Yontooy, up to the southern portion of Bu'aale District (Dundas 1893).

Enslavement left a legacy of tension that was exacerbated by a long series of wars fought by the ex-slaves against the pastoralists on either side of the forest. The conflict lasted for 30 years, ending around 1895 with a colonially-imposed peace. Most fighting occurred in the area now known as Jamaame District. Consequently, relations between herders and settlers in the southern portion of the river valley differed markedly from the patron-client relationship that characterized herder-cultivator interaction elsewhere in southern Somalia.

Along the river south of Jilib town, freed slaves took advantage of protection of the forest to establish a society independent from surrounding pastoralists. They retained their East African ethnic identities rather than affiliate with the Somali groups that had once enslaved them, as ex-slaves did along the Shabeelle River.

Precolonial Political Organization and Authority in Lower Jubba

The ecological setting of riverine forest, with its uncleared land, favored development of decentralized political authority (Cassanelli 1987). Village authorities were limited in their power since discontented villagers were free to pick up and move to other locales.

In the southern part of Goshaland, constant threat of raids by pastoralists forced people to settle in larger, often fortified villages, thereby increasing political

consolidation. It is not surprising then to find that traditional accounts of powerful regional leaders are to be found predominantly in southern Goshaland. However, the authority of regional leaders, known as *duqaarafs*, was not particularly strong. Many villages reportedly recognized no higher authority than the village headman, except in times of war. Once peace was imposed in the valley in the 1890s, fortified southern villages quickly dispersed into smaller hamlets further reducing prospects for centralized power. By 1910, one Italian official noted that most of the Gosha villages had fewer than 100 inhabitants (Ferrari 1910).

The Spread of Islam

An important development occurred near the turn of the century with the arrival of Islamic teachers into the region and the subsequent conversion of the population (many of whom were nominally Muslim already) to Islam. This conversion was accompanied by introduction of Islamic laws and other social structures into village life.

Islamic establishment had notable effects in the valley. First, it provided a vehicle for improved relations between the cultivators and herders.

Second, the *sheikhs* (Islamic religious leaders) who came to populate the region became an alternative source of authority to the village headmen. Sheikhs spent much of their time arbitrating disputes for both cultivators and nearby pastoral populations. Sheikhs were often sought to arrange marriages as well.

Finally, several communal religious farms provided farmers in their areas with a unique form of social security. In addition to farming their own plots, villagers contributed their own labor to the sheikh's farm once or twice a week. From this farm, a harvest was gathered which the sheikh used to provide food and other assistance to families in need. Pastoralists also joined in this system by supplying the sheikh with meat and milk.

Linguistic changes in the lower Jubba Valley during this same period also served to increase the scale of local society. The multiplicity of languages that characterized precolonial Goshaland society steadily gave way to a new *lingua franca* in Middle Jubba—the Somali dialect *AfMaay-Maay*.

Growth of Population Centers

In the late nineteenth century, hundreds of Arab and Indian traders settled in Kismaayo, Goob Weyn, and Margherita (today known as Jamaame), as well as in dozens of Gosha villages in the valley, to take advantage of the Gosha grain trade. These traders established shops all along the river where Gosha farmers traded their grain for items such as cloth which the traders brought up from Goob Weyn. The importance of Goob Weyn eventually decreased with the decline of the grain trade in the 1920s and 1930s.

Located in the center of the plantation sector and on the road from Kismaayo to Muqdisho, Jamaame became the trade center of the lower Jubba in the 1950s and 1960s. The export of bananas to Italy constituted the most important agricultural trade of the region.

During the 1960s, a paved road was constructed between Kismaayo and Jilib which opened up year-round access to the Kismaayo port. Markets as far away as Muqdisho and Hargeisa could be reached by fruit and vegetable producers. The road bypassed Jamaame and stayed on the west bank of the river to Kamsuuma which cut Jamaame off from the main trade route and essentially caused Jamaame's decline in the 1970s. Today, Jamaame is a depressed town with much less economic activity than it enjoyed in the past as the road opened up the previously isolated west bank from Mana Moofa to Mareerey.

Meanwhile, in the 1950s, many pastoralists settled in valley towns and villages, altering the composition of the towns and greatly increasing town population in Jamaame and Kismaayo. Most of these former pastoralists reported that they settled following a drought which had depleted their herds. Mixed villages and towns were marked by separate hamlets for each group, with little integration occurring.

By the 1960s, the lower Jubba (including Jilib District), possessed a number of primary schools, as well as a secondary school at Kismaayo. Regional health service included many small health posts, as well as three functioning hospitals at Kismaayo, Jamaame, and Jilib.

Recent Population Movements

Throughout the twentieth century, the Jubba Valley has been the site of a continuous process of pastoral sedentarization, particularly since the severe droughts of 1965 (known in Somali as *Jimce Baasto*, Friday year of pasta) and 1974 (*Abaar Dabadheere*, long-tailed drought). Many former pastoralists have settled in areas beyond the Jubba Valley's

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tsetse-infested vegetation belt and adopted an agro-pastoral way of life, herding limited numbers of livestock within a set radius of a permanent homestead.

Recently, Middle Jubba Region has experienced a major population movement with the temporary settlement from 1974 to 1980 of 55,000 former pastoralists who were airlifted from drought-ravaged areas of northern Somalia and resettled at Dujuuma near Bu'aale. This settlement project was later dismantled, and thousands of Dujuuma settlers were again resettled—this time on the large estates of the Juba Sugar and Fanoole Rice projects.

Of greater significance were the more than 150,000 refugees settled in camps in the upper Jubba near Buurdhuubo and Luuq. Although the effect of these refugees on the Jubba Valley's local populations outside the camps has been slight, except for exchange of commodities, refugee demand for fuelwood, building materials, and grazing resources has caused extensive degradation—to the point of desertification within a radius of up to 10 kilometers around the refugee camps (Blumgart, Merryman, and Resch 1985; Synnott 1987).

2. The Evolution of Village Agriculture

In precolonial times, village agricultural land was under the control of the council of elders instead of privately owned. Most villages were situated along the river and near a dhesheeg. Each village had exclusive farming rights on its section of land, which was determined by inter-village negotiation. Households were allocated riverbank and dhesheeg plots by the council. At the turn of the century, although generally ample amounts of fertile land were available, riverbank land was all claimed in more heavily populated areas so that newcomers had access only to dhesheeg and rainfed land.

Although land was allocated by the council of elders and could be reclaimed by them (in theory), this rarely occurred. Cultivators were apparently free to rent cleared land to other families, and some village historians report that the sale of land has occurred since precolonial times. In addition, the council had no authority over inheritance—the most common means of land acquisition.

Precolonial village economies of lower Jubba Valley rested almost exclusively on agriculture. Principal crops grown at that time were maize and sesame, but sorghum, tobacco, cotton, beans, sweet potatoes, and bananas were also seen by nineteenth century European explorers. These crops were grown primarily on riverbank and dhesheeg land, employing recurrent flooding of the river to secure the water necessary for the crops. Though less important, rainfed agriculture was also practiced—probably as a form of insurance in the event of damaging floods.

Precolonial Gosha agriculture featured a diversified agricultural system which minimized the risk of complete crop failure. This system included irrigated plots which permitted secure yields on soil that was periodically fertilized by the flooding river. Villages produced surplus grain which was traded downriver at Goob Weyn where it was exchanged with Arab and Indian traders for cloth, ammunition, and other goods. From there, the maize and sesame made its way on to the Zanzibari market of coastal East Africa and South Arabia.

Except in years of drought or severe flood, villagers remained capable of producing ample grain for consumption, storage, and trade. They enjoyed access to irrigated riverbank, dhesheeg, and rainfed land while the surrounding forest provided medicinal plants and emergency food in bad years. Their staple crops were supplemented by the introduction of new fruits, especially mangos, by the British. Protected by colonial decree from pastoralist raiding, cultivators were free to move about and clear new land, which encouraged the development of small, decentralized villages and hamlets.

When world prices for cotton soared from 1952 to 1956, the lower Jubba Valley, already a source of some cotton production, rapidly responded by stepping up production. The cotton "boom" occurred mostly to the south of Jilib town, where soils are most favorable for cotton cultivation. Since most village crops at that time were grown on dhesheeg and riverbank land, the increased production of cotton did not directly interfere with staple crop production as cotton was grown on rainfed land. Cotton was the first significant rainfed farming taken on by local farmers.

Increased cotton production was constrained by a chronic labor shortage in the valley. Most villagers south of Jilib District reported that it was in this period that the system of shared labor, *goob*, was terminated and wage labor between villagers became the norm. This transformation from traditional relations of production to wage labor within the villages was the result of inflow of cotton profits.

Simultaneous with the end of the cotton boom, new banana plantations pushed villages away from most of their riverbank land. Consequently, village agriculture south of Jilib District became increasingly dependent on a combination of dhesheeg and rainfed land beginning in the late 1950s. As villages cleared new land, most of the forest south of Kumtiire was cut down. Smallholder agriculture concentrated again on maize and sesame after cotton faded in importance. In good years of rain, high yields of maize on rainfed land provided surplus for trade. In bad years, villages turned to wage labor on plantations. They sought plantation work not so much for the wages but because workers were permitted to take home a stem of bananas unsuitable for the export market. Though *soor* (a maize or sorghum porridge) remained as the staple food of the region, the "famine food" of the villages shifted from wild edibles from forests to boiled, unripe bananas from plantations.

3. The Emergence of Commercial Agriculture

Early Plantation Agriculture

South of Goshaland, from Yontooy to Goob Weyn, the British and Italians attempted to establish European plantations. However, most of these plantations failed.

A small number of concessionaires who attempted to produce cotton in this period were frustrated by the chronic labor shortage problem that has continued to plague plantation agriculture. Local people found that in a year of good rainfall, wage labor on plantations was not as remunerative as working their own farms. Unable to entice the free peasantry of Goshaland to work for wages, and unable to coerce them, these plantations floundered.

Using the Ethiopian war of the 1930s as an excuse, the Italians ultimately resorted to a forced labor system in 1935 to resolve the labor shortage.

The Colonya Period, 1935-1941

In the early and mid-1930s, the fascist colonial administration stepped up its efforts to encourage Italian plantations along the Shabeelle and Jubba rivers. Although most of the Italian concessionaires settled at Janaale on the Shabeelle River, by 1941, 32 plantations on the Jubba River were concentrated on the west bank between Jamaame and Goob Weyn (Lewis 1946). All along that stretch, prime riverbank land was taken from Gosha villagers and planted with bananas, which were bought by a state monopoly in Italy at a greatly subsidized price (Hess 1966). Cotton, earlier considered the prime export crop of the region, was largely abandoned after world prices dropped in the early 1930s.

Agriculturalists were taken from their villages, relocated on the grounds of new plantations, and forced to work in a system of forced labor known as *colonya*. Colonya provided a solution to the labor shortage on the new Italian plantations.

Payment to the laborers was in the form of rations of maize (which was also grown on the plantations) and lire. With the rapid transformation of the riverine area from staple crop production to either banana plantations or deserted villages, by 1938, Italian colonial officials were reporting a severe food deficit in Somalia (Institute of Tropical and Subtropical Agriculture, Archives, Florence, Italy).

Colonya was a traumatic period in the history of the lower Jubba Valley. It uprooted thousands of people from their villages; it imposed an authoritarian system of forced labor on what had been a consensus-oriented, decentralized society; it introduced a process of land alienation; and it brought to the region for the first time a man-made food shortage.

British Military Administration, 1941-1950

When the British took over the administration of Somalia in early 1941, East Africa was in the midst of a serious food shortage. The overriding concern of officers new to the area was to make Somalia self-sufficient in food.

The British chose the Jubba Valley as the area with the greatest potential for rapid production of staple foods. They hoped to encourage most of this production from smallholders. However, the British also attempted to put back into production the Italian plantations, which confronted them with the same labor shortage that had beleaguered the Italians and had led them to impose the forced labor system. After a year of frustration, the British reinstituted forced labor in the valley.

The British system of forced labor was known locally as *bagas*. It did not entail the uprooting of entire villages, and village households were still able to produce ample food on their plots. Conscripted laborers were again paid in maize and money and employed under Italian plantation owners. However, throughout the 1940s, plantations were used to grow maize and rice as their principal crops, using the irrigation system earlier meant for bananas.

By 1943, British officials reported excellent yields along the Jubba River, and Somalia was again in a position to export grain (Public Records Office: War Office, London). Much of this production was carried out by smallholders who had to sell to a state market monopoly at a fixed price.

Expansion of Commercial Agriculture, 1950-1969

The two decades following the British Military Administration were formative years in the lower Jubba Valley's contemporary political economy, particularly for the area south of Jilib District. While most of Jilib District continued to be used for smallholder agriculture and was isolated by an underdeveloped infrastructure, an export-oriented commercial market in bananas transformed the landscape and economy in Jamaame and Kismaayo districts. Banana plantations flourished, taking over nearly all riverbank land from Yontooy to Kumtiire and drastically reducing traditional village irrigation farming.

With the return of Italian administration under U.N. Trusteeship from 1950 to 1959, Italian farmers who had been forced to produce rice and maize under the British immediately reverted to the more profitable cultivation of bananas. The Italian government subsidized the marketing of Somali bananas, which otherwise could not compete with Central American bananas.

Italian-owned plantations occupied the same region as in the 1930s (from Yontooy to Jamaame town), with most plantations on the west bank. However, the "banana belt" lengthened considerably in the late 1950s and early 1960s, when a number of Somali citizens invested in riverbank land and started banana plantations.

The new influx of plantations pushed dozens of villages off prime riverbank land. Usually, this land was sold by the villagers or uncleared land was simply ceded by them but, in some cases, villagers were also reportedly coerced to sell.

Under U.N. Trusteeship, labor could no longer be coerced and the plantations often suffered from a shortage of labor, especially in planting seasons. Adult villagers continued to find work on their own plots much more remunerative than wage labor and usually only worked on plantations in times of drought or when there was little farmwork. As a result, children were the bulk of the labor force on plantations.

In the meantime, agriculture in Middle Jubba and Gedo regions was based on individual farms using flood-recession plots on the riverbanks and in dhesheegs. Colonialism had little effect on this area except for labor press gangs which occasionally reached into the southern part of Middle Jubba in the 1930s and 40s.

From 1970 on, areas immediately north and south of Baardheere and Luuq experienced the start and rapid proliferation of small-group irrigation and the advent of major cash-cropping activities—particularly onion production—which have given this area of the Jubba Valley the highest farm income (see AHT 1988).

4. Government Actions

The revolutionary government that came to power in 1969 sought to transform the agrarian economy of Somalia with a series of far-reaching reforms, policies, and projects. This program of action included:

- nationalization of the banana industry;
- initiation of several large state farms;
- passing of the 1975 Land Law;
- state support for the formation of cooperatives;
- establishment of the state monopoly for the marketing of maize, sesame, and other grains, known as the ADC (Agricultural Development Corporation); and
- resettlement of drought-stricken herders into agricultural projects as well as resettlement of flood-stricken Goshaland villages into new locales.

Nationalization of the Banana Sector

In 1970, the revolutionary government declared a state monopoly over the banana industry. The goal of nationalization was to gain Somali control of the marketing process by substituting the National Banana Board for the Italian-controlled *Societa Agricola del Guiba*. Italian farmers were permitted to continue cultivating the land. Nonetheless, over half left for Italy after the revolution (IBRD 1975).

Initially, the government board was able to maintain production of bananas, but by 1974, costs of inputs began to outstrip prices offered by the state board and production became unprofitable. Plantations began to cut back or eliminate production of

bananas, cultivating instead maize and sesame. By the late 1970s, all but a few Italians along the Jubba River abandoned their land. In addition to the unprofitability of bananas, bad flooding, salinization, and soil exhaustion had crippled the Italian farms on the lowest section of the valley between Sungunni and Yontooy. Ownership of that land reverted to the state although, recently, concessions have been awarded to civil servants who are beginning to reclaim the land.

By 1980, the government negotiated a new marketing arrangement with the Italian government and a group of private Italian investors in order to rejuvenate the banana industry. This arrangement led to the birth of Somalfruit.

Large-scale Agricultural Projects

The idea of stimulating national agricultural production through establishment of large, mechanized state farms and parastatals preceded the socialist program. The Fanoole state farm had been designed years before the socialist government came to power; the two later projects, Juba Sugar Project (JSP) and Mogambo Irrigation Project (MIP), were financed with loans from western and Arab countries. However, the concept of such state-run projects suited the new government's preference for centralized control over the economy.

The projects were designed with the intent to achieve several national objectives: to reduce or eliminate importation of rice and sugar, thereby relieving pressure on scarce foreign exchange and rendering the country more self-sufficient in food; to increase state revenues from sales of state farm commodities; to generate employment opportunities; and to provide an industrial base (including electricity in the case of the Fanoole hydroelectric barrage) to stimulate regional business and industry. Large foreign loans and grants were procured for the development of these projects, including U.S. $71 million for MIP and U.S. $210 million for JSP.

The serious difficulties these projects have faced in achieving and maintaining viable levels of production and profitability include:

- a constant and increasingly serious shortage of foreign exchange for the acquisition of imported inputs such as fertilizer and spare parts;
- an inability to retain Somali staff because of inadequate salaries—rendering the projects dependent on expensive foreign management;
- an inefficient, overstaffed, and highly bureaucratic system of management;
- chronic problems of absenteeism, theft, and corruption; and
- great difficulty in attracting wage laborers from the local community because of low wages.

The projects have had a number of significant effects. First, and most importantly, land expropriation without compensation has severely reduced the quantity and quality of land available for subsistence farmers to cultivate. Using conservative standards to estimate, the amount of land lost by villagers to the three projects is more than 3,500 hectares, consisting almost exclusively of prime riverbank and dhesheeg land. As a result, local farmers have been forced to farm much smaller plots and can no longer afford to fallow their land. They must travel much longer distances to cultivate available land. Scarcity of land in project areas has encouraged the development of sharecropping. In some areas, villagers have become essentially landless, dependent on wage labor as their primary source of income (Evans, Cullen, and Little 1988).

Additional village dhesheeg land has been lost due to permanent flooding because the projects use dhesheegs to store runoff water. Village land in surrounding areas has become increasingly prone to flooding because the bunds protecting the project areas increase flooding in unprotected areas. In summary, village agriculture in the project areas of Jilib and Jamaame districts has suffered severe setbacks as a result of the projects.

There are secondary effects accompanying the decline in local agriculture. Village income is lower than in the past, particularly in villages which now depend on wage labor from the plantations and projects as their primary source of income. Nutritional standards in landless villages have suffered considerably. Boiled, unripe bananas, once the "famine food" of the area, have become the staple food, replacing maize which the villagers can no longer produce in self-sufficient quantities or afford with the wages they receive. Meanwhile, health problems related to the presence of standing water in irrigated fields are common. A recent study of bilharzia in Jamaame District found a 74 percent

rate of infection among children (Klumpp 1988), and a 20 percent rate of malarial infection in the same zone (Warsame 1988).

At the same time, there are numerous benefits from the projects: improvements in transportation, health facilities, electrification, and employment and training opportunities. However, these benefits have been unevenly distributed and have not necessarily reached everyone in the villages.

The Impact of the 1975 Agricultural Land Law on Village Land Tenure

The Land Law of 1975 declared that all land resources are owned by the state which, through the Ministry of Agriculture, can allocate concessions or leaseholds on land to cooperatives, state farms, and private individuals or companies. Leaseholds are limited in size to 30 hectares of irrigable land and 60 hectares of nonirrigable land per household, and 100 hectares for banana plantations. The size of leaseholds for cooperatives, state farms, and private companies is unrestricted. The law made the sale and rental of land illegal, and registration of land compulsory.

Only a small portion of the riverine population registered their land; most of those who did were banana plantation owners or large landowners. Villagers rarely registered land for a variety of reasons. At first, they were often ignorant of the law or misunderstood it. Later, as the importance of the registration process became more evident to the villagers, they could seldom afford the expense. Therefore, while the large-scale agricultural sector and a minority of smallholders registered their land under the new law, the vast majority of smallholders continued to rely on a customary land-tenure system. Through the late 1970s, the law had minimal impact on the lives of the riverine population.

Cooperative Movement

Although the riverine population had a long history of cooperative agricultural practices, these were rarely formalized into agricultural cooperatives. The revolutionary government sought to stimulate agricultural productivity through a cooperative movement which would give smallholders greater access to modern technology and agricultural practices.

The 1973 Law on Cooperative Development provided a legal framework for administration and support of cooperatives. It gave legal status to two types of cooperatives: multipurpose cooperatives, in which farmers jointly marketed produce and purchased supplies and group farms, in which members shared access to farm machinery and an irrigation network. Prior to that legislation, the government had already begun to encourage development of agricultural cooperatives through distribution of pumps to villages forming cooperatives.

Along the lower Jubba River, cooperatives quickly sprang up in most villages and some villages possessed several. In most cases, these cooperatives involved riverbank land which could be irrigated easily, although some villages irrigated land which was formerly rainfed. The movement toward cooperatives was brought about largely by incentives offered by the government. When the Land Law was passed in 1975, cooperatives provided a more secure form of land tenure to smallholders. Land belonging to cooperatives was registered under the Ministry of Agriculture, Department of Agricultural Cooperatives, and thereby protected by law.

Some large landholders—in particular, plantation owners—registered their private land as cooperatives in conjunction with local villagers. In reality, the large landowner retained control of this land.

After initial success, the cooperative movement gradually faded in importance. The government was unable to provide the necessary inputs and technical assistance to sustain the cooperatives. As a result, most village cooperatives disbanded within a few years. Only a few continued to function through the 1970s.

Agricultural Development Corporation and Agricultural Commodity Price Controls

Another aspect of state intervention into the economy of lower Jubba Valley in the 1970s was the establishment of a state monopoly of marketing and distribution of agricultural produce. Under authority of ADC (Agricultural Development Corporation), established in 1971, the purchase, sale, and distribution of maize, sorghum, and sesame by private persons was forbidden. All marketing activities of these staple products was assumed by ADC, and selling prices for grains were fixed by the state. Farmers were permitted to retain no more than 100 kilos of maize or sorghum per season for each member of the family; the rest was to be sold to ADC (LaBahn 1986). However, ADC had little effective means of verifying production levels.

State-controlled wholesale prices for agricultural produce were kept low to secure low food prices in urban centers. By 1982, black market prices for maize were three times greater than the ADC price, and for sesame, over four times the ADC price (Haakonsen 1983). Along the lower Jubba River, villagers shifted toward greater cultivation of onions, tomatoes, pumpkins, watermelons, and a variety of fruits. Not only could these products be sold at free market prices, but demand for such produce began to increase with a rapidly expanding urban population. Villagers reported that by the 1970s, traders from as far away as Hargeisa and Djibouti were arriving in Jubba Valley to purchase fruit, such as mangos.

Resettlement and Population Migration

Thousands of refugees from Dujuuma have been resettled on government projects in lower Jubba Valley. Thousands of skilled and unskilled laborers have migrated into Jilib and Jamaame districts seeking work, and Jilib town has expanded rapidly. Out-migration has occurred in villages hit hard by land expropriation.

Though the population movements caused by the arrival of the state farms are the most significant of the period, they are not the only ones. In many areas of lower Jubba Valley, the government carried out a policy of consolidating small villages into larger ones in an effort to provide social services to a greater portion of the rural population.

5. Current Trends

In addition to expanding agricultural lands by long-term residents, large tracts of valley land have been registered in what appears to be a land rush. This rush has been stimulated by the promise of an economic boom related to the proposed dam and the valley's subsequent development. One of the most important developments is an all-weather road through the Middle Jubba Region which will significantly stimulate the production and marketing of cash crops.

Contemporary Economy and Society

Today, the economy and society of lower Jubba Valley are in the midst of rapid change. Land, for generations a nearly limitless commodity, is scarce. Expropriation of thousands of hectares of land by state farms, expansion of the rejuvenated banana sector, and the recent "rush for land" by outside investors and speculators have put tremendous pressure on land access for villagers. Few lower Jubba Valley villages continue to cultivate as much land as they did a generation ago. Most cultivate on much smaller plots or on land of lower quality. A growing portion of the population has become landless.

Meanwhile, policy changes in Muqdisho have stimulated production for the market but exacerbated a critical conflict between customary village land tenure and formal land laws. New market forces—particularly rising demand for fruits and vegetables in urban centers—have brought smallholders into the market economy to a greater extent than before. While villagers with continued access to irrigated land have responded quickly to new market opportunities, those dispossessed of their land are adopting strategies to avoid a permanent condition of landlessness and dependence on wage labor.

Liberalization of the Economy and Land Speculation

In 1983, price controls and the ADC monopsony on the grain market were dissolved so that producers of cereals were again permitted to sell their goods at market prices, and private traders could legally compete with ADC for purchase of grain. As a result, prices rapidly rose for agricultural commodities, rendering the agricultural sector lucrative. In turn, this encouraged investors to purchase large tracts of land for agricultural production. The trend toward investment in the agricultural sector quickly became a "rush for land" wherein civil servants and urban businessmen registered land along the Shabeelle River and, particularly, along the Jubba River, where anticipation of construction of Baardheere Dam and new roads fueled land value and speculation.

The process and problems of contemporary land tenure in Somalia—particularly the issue of smallholder dislocation as a result of land speculation—is treated in detail in Besteman and Roth (1988).

The zone hit hardest by land speculation has been the east bank of the river, north of Jilib into Middle Jubba Region. This area is north of the banana belt and the project zones. Until recently, villages enjoyed unimpeded access to riverbank and dhesheeg land. Today, from Jilib town north to the Fanoole Barrage, villages have lost or are in the process of losing their best land.

In addition to this new land pressure, the expansion of banana production in the 1980s has placed further pressure on smallholder cultivation. The conclusion

of a new marketing agreement between the Somali government and a private Italian interest resulted in the creation of Somalfruit which has improved profitability in the banana sector and stimulated increased cultivation on plantations.

Today, villages enjoying the greatest continued access to land are located in far southern areas of lower Jubba Valley, from the Sungunni area down to Goob Weyn. There, villagers can cultivate large plots of dhesheeg land at Dhesheeg Waamo on the west bank. Many also have access to irrigated riverbank, either beyond the banana belt (south of Yontooy or on the isolated east bank), on sharecropping farms, or as "squatters" on the large tract of abandoned plantation land from Sungunni to Yontooy.

A zone of irrigated, medium-size farms (20 to 50 hectares) exists in the area near the mouth of the river where Goob Weyn traders have more capital to invest in agriculture. Another area which features intensive smallholder cultivation relatively unconstrained by land scarcity is the Turdo region on the east bank in Kismaayo District.

Another section of the valley population enjoys access to land but in zones that are slated for large-scale development. For example, both Juba Sugar Project and Mogambo Irrigation Project have "Phase Two" expansion plans which, if implemented, will expropriate land in three zones: on Labadaad Island north of Haraawe; from the Kumtiire area south to the northern edge of the MIP project; and from Mana Moofa south to Kobon.

Meanwhile, the free market prices which helped fuel the "rush for land" in lower Jubba Valley have recently been revoked by the government. In February 1988, price controls were again reinstated for sale of staple foods such as maize, rice, sugar, and pasta. An active black market immediately arose in the regional markets.

Expansion of the Market Economy

Despite recent setbacks to traditional grain production by riverine smallholders, the new market for fruits and vegetables in Somalia has provided smallholders who have access to riverbank and dhesheeg land with a profitable market. Watermelon, tomatoes, onions, and papayas are some of the most frequently grown crops destined for sale. Usually, they are intercropped with maize so that farmers produce for subsistence needs as well as for cash. This is the most popular cropping pattern in sharecropping arrangements, which is often the only means available for village farmers to gain access to irrigated land. Trade for these goods usually takes place at regional markets such as Kismaayo, Kamsuuma, Jamaame, and Jilib.

However, enhanced profitability of the mango market is of much greater significance to village income. Mangos were introduced in the valley in the 1920s by the British; today, large mango trees line the riverbanks in lower Jubba Valley. In the past decade, the price of mangos has risen dramatically. Households owning mango trees along the riverbanks have made large profits. Traders come with trucks from as far away as Muqdisho, Hargeisa, and Djibouti to purchase mangos from villages. As a result of this boon, mango owners rely on mango sales as their primary source of income—replacing traditional dependence on the sale of maize and sesame. However, this windfall is not universally shared among villagers as only a portion of the households of each village own mango trees. In some instances in Middle Jubba Region, villagers have lost this important source of income when outside speculators, claiming title to riverine land, have forced them to sell their mango trees.

Environmental Changes

Rapid socioeconomic changes occurring in recent years have had a major impact on the riverine environment as well. In the 1980s, Jubba Valley has experienced dramatic environmental changes as tracts of riverine forest have been felled to prepare additional land for cultivation.

Environmental studies conducted by JESS identified two trends in the valley: rapid decline of denser vegetation and conversion of dryland or flood-recession farming to pumped irrigation. Between 1983 and 1987, these changes occurred at 10 times the rate estimated for the period 1960 to 1983.

In many parts of lower Jubba Valley, environmental change has not been as significant as farther upriver, in part, because lower Jubba Valley experienced large-scale development earlier. By 1960, nearly 90 percent of the riverbank land south of Jilib town was under cultivation. However, dense forest and bush still existed in many areas beyond the immediate riverbank, and villagers recall that wild animals were numerous.

Today, almost no areas of forest canopy remain in this region. Elephants and lions (and other wild cats), once common in the area, have become increasingly rare.

Disappearance of riverine forest and much of its wildlife is the result of expanding agriculture in the region. In part, this expansion is due to large-scale projects, which have developed thousands of hectares of land. In addition, smallholders have felt pressure to clear new land as well. As a result of extensive clearing, firewood has become scarce, and forests are no longer accessible. The loss of forests is a significant loss for the villages—for generations, they have been a source of medicinal plants and famine foods in times of crop failure.

Social Services

The level of educational and health facilities enjoyed in lower Jubba Valley in the 1950s and 1960s dropped sharply in the 1970s and 1980s. The public health sector has been improved recently in the lower Jubba Valley, although a recent report still describes regional health care as "terribly lacking" (Weidleplan 1987). Health care is most developed in Jilib District. Since 1983, two private voluntary organizations, World Concern and *Comitato Internazionale per lo Sviluppo dei Popolo (CISP)*, have provided expatriate staff, salary supplements to Ministry of Health employees, manpower training, equipment, and drugs to support a total of 13 health posts in the district. In Middle Jubba Region, Swedish Church Relief has provided improved village-level health care by constructing health posts and providing staff training, as well as by providing hand pumps for clean water.

State farms also provide some medical services. At JSP, full-time staff have access to a physician; casual laborers may use the project health services only if injured on the job. MIP used to provide a physician to full-time staff, but currently, only a dispensary exists.

Adaptation and Response at the Village Level

In the wake of profound changes in regional economy and society, villagers have responded and adapted in a variety of ways. The most common response to increased land scarcity has been an active strategy to avoid landlessness and dependence on wage labor. Local farmers have been willing to hand-clear dense brush in unclaimed areas of the valley—most often in rainfed areas—and walk several hours every day to distant fields in order to cultivate land. However, this determination to continue to farm a plot to at least ensure self-sufficiency has not been universal.

In the search for new farmland, villagers show a marked reluctance to leave their own village and resettle in less-developed regions of the valley. For instance, there are no indications that lower Jubba Valley residents are migrating north to find open land in the less-developed districts of Bu'aale and Saakow. Instead, they show a preference for traveling many hours a day to distant farms in their home territories. When villagers do leave the village, it is almost always to a town in Somalia, the Arabian Gulf, or to East Africa.

With much less access to riverbank and dhesheeg land, farmers have become more susceptible to the negative effects of drought. In response, there is increased competition for participation in sharecropping projects on irrigated land. Although the fieldwork is more difficult than rainfed agriculture, and half of the harvest is paid to the landowner, villagers willingly participate in sharecropping projects to ensure a harvest in the event of drought and gain entry to cash-cropping.

Much intervillage cooperation on land-tenure arrangements has occurred. In areas dislocated by state farms, village councils have met and agreed on new allocation of remaining land. At MIP, boundaries on uncleared land beyond the project area were established by intervillage accord, so that no disputes would arise over land rights between villages. At JSP, unused project land was allocated to each village in a similar manner. Very few land disputes have occurred, and no "rush for land" took place at the local level.

Family heads send women and children to work on projects and plantations when they are not needed on the family farm, but village men prefer not to work at all than to work for low wages. Those who do work on the plantations and projects are described by villagers as "poor"; they may not have sufficient access to enough land for self-sufficiency, or may be in debt.

B. Demographic Overview

The following is an overview of the demographic characteristics of Jubba Valley populations. The purpose of this overview is to provide broad, general information that can orient readers to the valley's human context and leave a baseline repository that planners can draw on in the course of making development choices now and in the future. Demographic characteristics of valley populations most relevant to the dam and subsequent dam-related development are highlighted.

This section is intentionally data-oriented. For more in-depth, narrative accounts of the valley's history and social systems, see the preceding and following sections.

1. Population

An accurate census of the Somali population is not currently available. A general national census was carried out in 1975. AHT (1984) estimated that only between 60 to 85 percent of the true population was recorded in it.

Technital (1977) and Impresit (1979) studies attempted to address the difficulties in the population data then available by making adjustments and updating the figures. However, AHT (the German Advisory Team on Jubba Valley development), notes several inconsistencies in population figures within the Impresit report. Despite this, AHT felt that the Impresit figures were the best available, and went on to use them as the basis for their own estimates for population and labor force.

Because of problems with the 1975 Census figures, JESS did not feel that these figures could be used as a reliable basis for sampling for its own baseline study. However, JESS did use an updated version of the Census (Impresit 1979), to delineate the proportion of urban population in the various valley towns since population estimates for several towns necessary to the SEBS survey were missing from the other data set used in sampling. Another national census was carried out in 1986, but the results still have not been released.

Another source of population figures comes from aerial reconnaissance work done by Watson and Nimmo (1983, 1984). This work was done for nine regions of southern Somalia and consequently, extends well beyond Jubba Valley. The purpose of the survey was to sample and assess human and animal population numbers, visible man-made features such as houses, villages, and ponds, and distinctive variations in land use. Both fixed and pastoral-style houses were counted with subsequent work done on the ground ("ground-truthing") to verify the numbers of inhabitants per dwelling. The results of the Watson and Nimmo survey are compared below with figures from the 1975 Census that have been updated to 1984 using an assumed growth rate of 3.1 percent per annum.

Table 1 shows a 40 percent difference in the overall population counts between the updated 1975 Census and the Watson and Nimmo survey. Major population shifts between 1975 and 1984—most importantly, the airlifting of 50,000 to 60,000 drought-afflicted herders from the north to Middle Jubba Region—and the sedentarization of many thousands of pastoralist families following the droughts of the late 1970s and early 1980s, although significant, cannot account for such large gaps between the two data sets. As a result, JESS decided to adopt the figures of the Watson and Nimmo Census as the basis for its own sampling and population estimates.

Table 1. COMPARISON OF TWO SOURCES FOR JUBBA VALLEY POPULATION FIGURES

WATSON & NIMMO (1983, 1984)*	GEDO	MIDDLE JUBBA	LOWER JUBBA	TOTAL
urban	80,689	98,008	138,936	317,633
rural	34,079	194,666	232,929	461,674
nomadic	109,552	70,018	75,356	254,926
all	224,320	362,684	447,285	1,034,233
GENERAL CENSUS**				
urban	34,895	16,306	77,338	128,539
rural	58,306	78,133	110,376	246,815
nomadic	172,391	72,569	120,031	364,991
all	265,592	167,008	307,745	740,345

**Mean of wet and dry seasons, 1983, 1984*

***1975 Census updated at 3.1 percent per annum to 1984*

Source: Both data sets, Southern Rangelands Survey, Vol.3, part 1, Watson and Nimmo, 1985, Table 4.25, p.47.

World Bank estimates of population growth rates vary between 2.6 percent and 3.1 percent for the nation as a whole. JESS has opted for a rate of 3.0 percent per annum for the majority of its demographic calculations.

2. Population Profiles

Sex Ratios

The sample population enumerated by JESS consists of 8,492 individuals, or a 0.9 percent sample of the valley population estimated in excess of one million. The sex ratio of the sample population is 48.5 percent male to 51.5 percent female. However, in the birth to five-year age cohort, males outnumber females 55 percent to 45 percent (Table 2). This pattern is consistent across regions and socio-ecological sectors—except for pastoralists where females outnumber males 52 percent to 48 percent in this cohort.

Within the six to 14-year age cohort, males represent 52 percent and females,48 percent. Within the

15 to 45-year age cohorts, women outnumber males with the greatest difference occurring among the 26 to 35-year age cohort where women outnumber men 62 percent to 38 percent. The substantial sex ratio imbalance across the valley may be partially explained by male out-migration and greater incidence of disease or accident risk associated with male tasks. A nearly identical pattern of sex imbalances among children and adult populations was also recorded in the Bay Region Socioeconomic Study (Massey *et al.* 1984).

Table 2. SEX RATIO FOR JUBBA VALLEY POPULATION BY COHORTS

AGE	PERCENT OF THIS COHORT: MALE	FEMALE	THIS COHORT PERCENT OF TOTAL POPULATION
0 - 5	55	45	23
6 - 14	52	48	23
15 - 25	43	57	22
26 - 35	38	62	13
36 - 45	43	57	9
46 - 55	54	46	5
56 - 65	62	38	3
OVER 65	59	41	2

The ratio of males to females is reversed among the 46 years and older age groups to the point that males age 56 to 65 outnumber women 62 percent to 38 percent (Table 2). The early age of death for adult women in the SEBS sample is illustrated in Table 3. Of wives and daughters of childbearing age (14 and above) who have died, 60 percent died by age 30. This figure is nearly double that found in the Bay Region where 33 percent died by age 29 (Massey *et al.* 1984). For women between age 14 and 30, the most common causes of death were malaria (14 percent), polio (10 percent), troubled pregnancy (nine percent), and cholera (six percent).

Age

The population of Jubba Valley is a relatively young population: 46 percent is under the age of 15 (Table 2). The median age of males and females is 14 and 18, respectively. Not only does the valley have a young population, but it is characterized by the potential for rapid growth considering that much of it is just approaching reproductive age. Sixty-eight percent of the population is under age 25. Over age 25, each cohort represents a decreasing percentage of the total population. Those over 65 years old account for less than two percent of the population (Table 2); see population pyramid (Figure 2). Average life expectancy in Somalia is 46 years (IBRD 1985).

Table 3. AGE OF DEATH FOR WOMEN FOURTEEN AND OVER

AGE	NUMBER OF DECEASED WOMEN OVER 14	PERCENT OF ALL DECEASED WOMEN OVER 14
14 - 20	38	21
21 - 25	36	20
26 - 30	34	19
31 - 35	21	12
36 - 40	20	11
41 - 45	10	6
46 - 50	11	6
51 - 55	6	3
56 - 60	0	-
61 - 65	1	<1
66 - 70	1	<1
OVER 70	1	<1
TOTAL	179	100

3. Fertility, Mortality, and Population Growth

Women's Baseline Study (WBS) survey information regarding women's reproductive histories identified an average of 4.6 offspring per woman. Table 4 presents information on 89 women from the WBS survey age 40 and over who were mostly finished reproducing. The mean number of live births per woman for this sample was 6.5. However, including miscarriages, stillbirths, and live births, the mean number of conceptions per woman was 7.1. The miscarriage/stillbirth rate was highest among pastoralists and in the Gedo Region.

Of the live births among the WBS sample, of women 40 years and over, an average of 25 percent of women's offspring died by the time of the interview. The smallest percentage of sons and daughters died among pastoralists where the highest miscarriage/stillbirth rate occurs. The greatest percentage of offspring die in the urban sector (29 percent) followed by the agricultural riverine sector (25 percent).

The last column on Table 4 presents the overall failure rate of all conceptions. This rate includes miscarriages, stillbirths, and deaths of offspring. This failure rate of all conceptions averages 31.9 percent for the WBS sample of women over age 40. The highest failure rate occurs among urban women (34.8 percent). Although more medical services are

Table 4. REPRODUCTION RATES OF WOMEN 40 YEARS AND OLDER FOR VALLEY, SOCIO-ECOLOGICAL SECTORS, AND REGIONS

REGION OR SES	NO. WOMEN	MEAN AGE	TOTAL LIVE BIRTHS[1]	MEAN LIVE BIRTHS/ WOMAN	# OF MIS-CAR-RIAGES AND STILLBIRTHS	TOTAL CON-CEP-TIONS	PERCENT FAILED CONCEP-TIONS[2]	MEAN CON-CEPTIONS PER WOMAN	TOTAL DEATHS[3]	PER-CENT DEATHS[4]	FAILURE RATE OF CONCEP-TIONS[5]
Jubba Valley	89	48.4	575	6.5	55	630	8.7	7.1	146	25	31.9
Urban	29	46.9	184	6.2	17	201	8.5	6.9	53	29	34.8
Ag Riverine	41	48.8	272	6.6	29	301	9.6	7.3	69	25	32.6
Ag Nonriverine	16	50.7	98	6.1	5	103	4.9	6.4	22	22	26.2
Pastoral	3	43.7	21	7.0	4	25	16.0	8.3	2	10	24.0
Lower Jubba	35	48.6	197	5.6	11	238	5.3	5.9	57	29	32.7
Middle Jubba	20	47.8	124	6.2	10	134	7.5	6.7	30	24	29.9
Gedo	34	48.4	254	7.5	34	238	11.9	8.5	59	23	32.3

[1] *Total Live Births does not include number of miscarriages and stillbirths.*
[2] *Percent Failed Conceptions is number of miscarriages and stillbirths divided by total conceptions.*
[3] *Total Deaths does not include number of miscarriages and stillbirths.*
[4] *Percent Deaths is total deaths divided by total live births.*
[5] *Failure Rate of Conceptions includes number of miscarriages and stillbirths plus total deaths divided by total conceptions.*

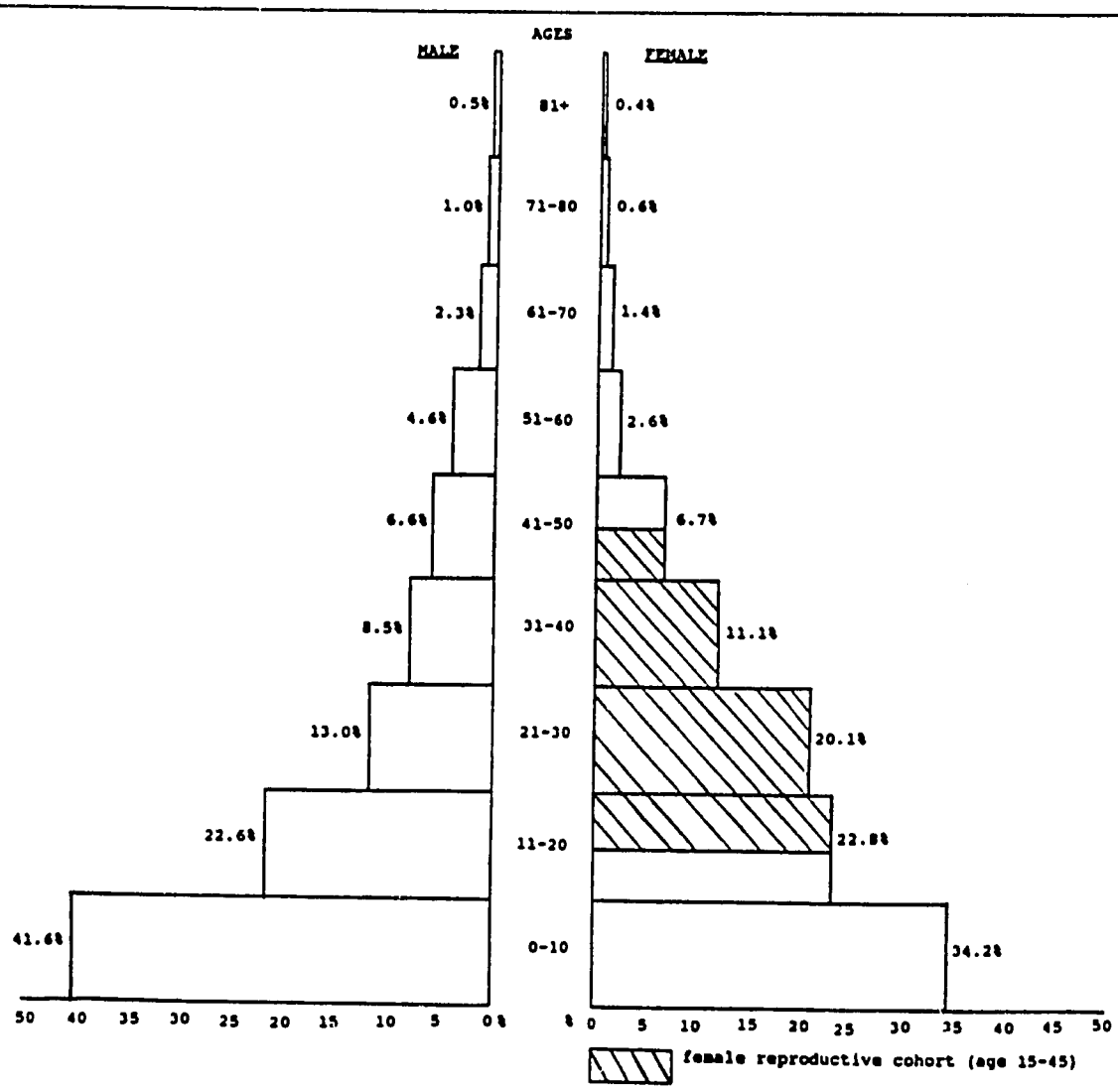

Figure 2. Jubba Valley population pyramid.

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available in urban areas than in villages, the quality of care and availability of medicines vary greatly. Also, a higher level of malnutrition exists in urban areas than might be expected (UNICEF Nutrition Surveys 1987, 1988). The highest death rate of offspring and failure rate of all conceptions occur among urban residents of Middle Jubba Region. Deaths also increase among children who live in urban areas due to communicable diseases.

Table 5 shows the age of death for all deceased offspring of SEBS and WBS respondents. From the SEBS sample, 40 percent of all deceased offspring die before their second birthday; from the WBS sample 53 percent of offspring deaths occur before the age of two. In the SEBS sample, 73 percent of offspring deaths occur below five years and 82 percent for the WBS sample.

Table 5. PERCENTAGE OF DECEASED OFFSPRING BY AGE OF DEATH

FROM SEBS AND WBS SURVEYS

	SEBS			WBS		
AGE	% M	% F	TOTAL %	% M	% F	TOTAL %
Under 2	24	16	40	29	24	53
2 - 5	18	15	33	17	12	29
6 - 10	6	5	11	3	4	7
11 - 15	3	2	5	2	2	4
Over 15	6	5	11	4	3	7
TOTALS	57	43	100	55	45	100

The infant mortality rate for Somalia is generally recorded as about 150 per thousand (IBRD 1985; Massey *et al.* 1984; LaPin *et al.* 1988). The rate of infant mortality is the probability of dying during the first year of life. JESS cannot present information on the number of deaths occurring before the first birthday because birth dates are not usually recorded especially in villages. Tables 6, 7, and 8 represent JESS' estimates of deaths occurring under two months, under two years, and under five years old.

There is a great deal of variation between SEBS and WBS data for mortality rates. In a society with polygynous households, with over seven conceptions per wife and births not regularly written down, it is reasonable to assume that women would remember deaths of infants and young children better than male household heads. For this reason, only the WBS data is presented in the tables.

Table 6. MORTALITY OF CHILDREN LESS THAN TWO MONTHS OLD

FROM WBS SURVEY

	NUMBER BORN	MORTALITY RATE/1,000
1982	54	111
1981	66	61
1980	52	96
1979	62	48
1978	48	42
1977	65	46
1976	29	69
1975	48	42
	TOTAL BORN: 424	MORTALITY RATE: 64

Table 7. MORTALITY OF CHILDREN LESS THAN TWO YEARS OLD

FROM WBS SURVEY

	NUMBER BORN	MORTALITY RATE/1,000
1982	54	130
1981	66	152
1980	52	173
1979	62	129
1978	48	104
1977	65	92
1976	29	241
1975	48	63
	TOTAL BORN: 42	MORTALITY RATE: 130

Table 8. MORTALITY OF CHILDREN LESS THAN FIVE YEARS OLD

FROM WBS SURVEY

	NUMBER BORN	MORTALITY RATE/1,000
1982	54	204
1981	66	227
1980	52	212
1979	62	226
1978	48	167
1977	65	123
1976	29	241
1975	48	125
	TOTAL BORN: 424	MORTALITY RATE: 189

The parent replacement ratio is 1:2.15 or more than double the parent generation. The number of births per year (averaged over a five-year period) in the sample population is 352.8 or 4.3 percent of the total population. Number of deaths per year (averaged over five years) is 63.4 or .77 percent of the total population. Birth rate minus mortality rate yields a population growth rate of up to 3.5 percent per annum based on SEBS. The Somali population growth rate quoted by World Bank is three percent per annum (IBRD 1985); however, there are few detailed demographic studies for the country. If, in fact, infant mortality approaches the higher levels recorded by WBS, then population growth is concomitantly lower. Actual rate of growth for the valley is probably on the order of three percent per annum.

4. Valley Population Aggregations and Dynamics

The population of Jubba Valley is overwhelmingly rural, composed largely of settled agricultural, agro-pastoral, and pastoral populations. The pastoral population is least consistent in number due to its seasonal shifting in and out of the greater valley throughout the year. During the most severe droughts, the interriverine areas—particularly the area between the Jubba River and the terminus of the Shabeelle River—provide one of the most valuable sources of graze for a major portion of Somalia's cattle herd.

Settlement Patterns

Pastoral population numbers vary within the valley throughout the year. Numbers of households within individual herder hamlets also fluctuate considerably over annual cycles and drought cycles. Size of herder hamlets or encampments is a function of pastoral resources of water and forage to sustain each camp's total herd population. Pastoral households fuse and fission throughout the year in response to wet and dry seasons. Pastoral encampments are often largest at the seasonal extremes of wet and dry and smallest in-between. Units of extended kin households aggregate at the onset of the rains when herds from outlying grazing areas are reconsolidated. During dry seasons, particularly jiilaal, large pastoral groups aggregate near permanent water sources, including the river, wells, and wars. In-between the environmental extremes, pastoralists and their herds disperse widely to optimize use of forage and surface water. Throughout an annual cycle, pastoral clusters vary from a single household to as many as several hundred.

Nancy Merryman talks with herdsmen involved in morning veterinary chores in a pastoral camp in the Deex east of Jamaame.

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The town of Baardheere, just south of the dam site. (Air Survey and Development, GMGH)

Nonriverine, agro-pastoral villages located outside the riverine forest are often equal in size to riverine villages, ranging from a dozen to several hundred households; however, agro-pastoral villages have less settlement density than riverine villages. Riverine villages are typically compacted within a forested area nestled between the river on one side and the dhesheegs and inland dryland cultivation on the other. Agro-pastoral villages have fewer spatial constraints but are limited to locations in proximity to heavy clay soils for cultivation and war construction and well-drained sandy soils for their house and corral sites. Consequently, agro-pastoral villages, with their ubiquitous livestock enclosures, are typically scattered over a one-half kilometer radius.

Towns are densely settled but generally have sufficient space to accommodate each household's outdoor work, social areas, and livestock corrals. District capitals are local administrative centers that, in most cases, comprise the largest towns in each district. All district centers have a core commercial center along a main thoroughfare lined with concrete buildings with corrugated iron roofs that distinguish the district centers from outlying villages lacking market orientation. In addition to the core downtown areas of *dhukaans* (shops), established residences, and government buildings, most district centers have outlying peri-urban areas marked by new urban residents living, typically, in less permanent housing.

Housing Types

A discussion of housing types common in Jubba Valley is an important contribution toward determining requirements in building materials that will likely ensue as people change their housing with changing economic patterns as the valley develops.

The valley's most common architectural style is the *hoori* or *aqal*. It is a portable, domed-shaped structure, two to three meters high and two and one-half to four meters in diameter, with a lashed stick frame infrastructure covered with mats made of natural fibers. The hoori is least common in urban areas where they are used by four percent of households sampled and most common among pastoral households where they are used by 86 percent. Lower Jubba Region has the fewest households

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living in hooris (23 percent), and Gedo Region has the most (70 percent)(Table 9).

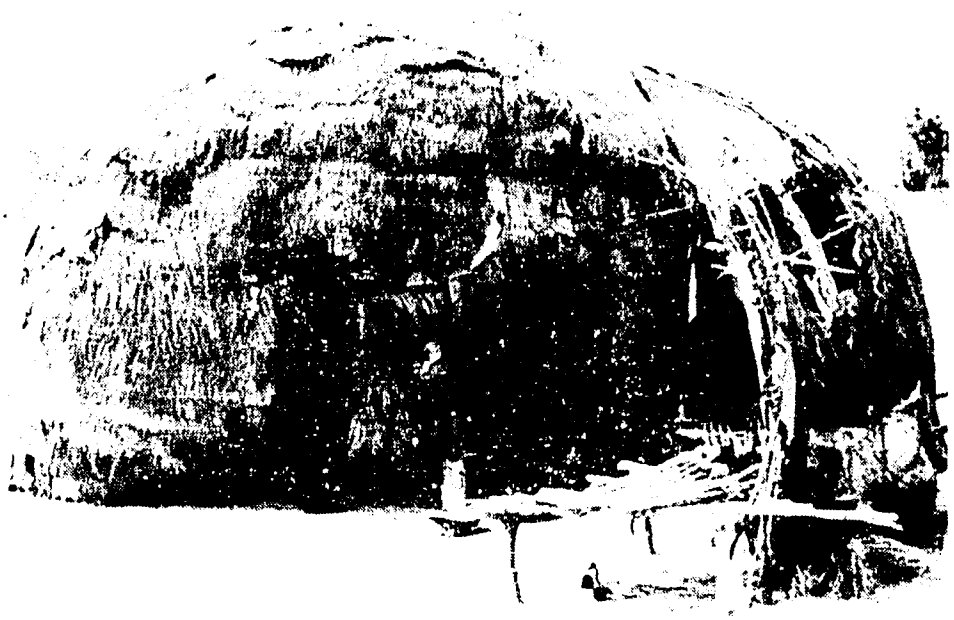
The second most popular housing style is the *cariish*, a rectangular mud and stick frame structure with a pitched roof of thatch. Cariishes are equally common among 38 percent of urban, agricultural riverine, and agricultural nonriverine households. They are least common among pastoralists (six percent). Constructing an cariish requires up to ten tons of wood (TEBS data).

Munduls are the third most common housing style. Munduls are round, cylindrical, fixed structures of mud and sticks with cone-shaped thatched roofs. A mundui consists of a single circular room. They are typically three to four meters in diameter and three to four meters in height. Mundul construction requires three to six tons of local materials. As structures, individual munduls and cariishes last up to 30 years (TEBS data). Munduls are equally common among agricultural riverine and nonriverine populations where they are used by 37 percent of households. They are least common among pastoralists with 15 percent of households representing the more settled end of the pastoral spectrum.

A *baraako* is a rectangular mud and stick structure identical to a cariish except for a corrugated iron roof replacing thatch. Baraakos are inhabited by 39 percent of urban households, but only three percent among both riverine and nonriverine households. More permanent dwellings constructed of concrete blocks or rock are known as *sar* and are used by only two percent of valley households. Sars are more common among urban households.

As Table 9 shows, housing styles change gradually between lower and upper Jubba. In lower Jubba, the rectangular cariish, thatched with coconut palm, is most common followed by an increased popularity of munduls in middle Jubba and hooris in upper Jubba.

The vast majority of people of Jubba Valley live in simple, traditional-style dwellings fabricated from naturally occurring materials. With increasing population pressure and continued clearing of riverine forests and other vegetation for agriculture, it is probable that future housing standards will



A pastoral dwelling known as a hoori *or* aqaal, *constructed of lashed sticks and woven mats, can be disassembled and loaded on a camel for transport to a new location.*

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Coastal village composed of thatched structures called cariish. *These dwellings are found most commonly in Lower Jubba and valley urban areas.*

Munduls *are fixed structures used most by riverine agriculturalists and agro-pastoralists of Middle Jubba.*

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Table 9. MEAN NUMBER AND TYPE OF HOUSING STRUCTURE FOR PERCENT OF HOUSEHOLDS HAVING STRUCTURE TYPE

STRUCTURE TYPE	JUBBA VALLEY N=1028 % *	MEAN # HOUSES	URBAN N=282 %	MEAN # HOUSES	AG RIVERINE N=360 %	MEAN # HOUSES	AG NONRIVERINE N=176 %	MEAN # HOUSES
Mundul	28	1.7	25	1.8	37.0	1.7	37	1.7
Cariish	32	1.6	38	1.6	38.0	1.6	38	2.7
Hoori	42	1.5	4	1.2	47.0	1.5	48	1.5
Baraako	14	1.7	39	1.8	3.4	1.9	3	2.0
Sar	0	1.6	13	1.4	1.2	1.5	1	1.5
	PASTORAL N=210		LOWER JUBBA N=345		MIDDLE JUBBA N=307		GEDO N=376	
Mundul	15.0	1.5	12	1.6	39.0	1.9	32	1.6
Cariish	6.0	2.1	45	1.5	42.0	1.7	13	1.4
Hoori	86.0	1.5	23	—	29.0	1.3	70	1.5
Baraako	6.0	1.0	—	—	8.4	1.0	1	1.5
Sar	1.2	1.0	—	—	1.3	1.0	4	3.0

N=NUMBER OF HOUSEHOLDS IN EACH ANALYSIS SECTOR
**PERCENTAGE OF HOUSEHOLDS HAVING TYPE OF STRUCTURE*

change, as currently preferred natural building materials become more scarce (Deshmukh 1987; Synnott 1987). For more detailed information on housing and building materials, see Deshmukh, *Terrestrial Ecology Baseline Studies*, JESS Final Report, Volume II; and Madany's thorough description of housing types and construction materials in lower Jubba (1988).

Grain storage facilities are present in most residential compounds in the Jubba Valley. The most common type of grain storage facility is the *bakaar*, an underground storage pit. Bakaars are dug near homesteads on sites that are slightly raised to facilitate moisture runoff. Bakaars are typically one to three meters deep and two to five meters in diameter. Tops of pits are covered by poles supported by a central upright similar to the support beams of a mundul. Maize and sorghum are stored in bakaars on the cob or head.

Farmers rarely reported having grain in storage from more than one or two preceding harvests. Although 42 percent of urban households have farms, only 16 percent have bakaars. In addition to bakaars, urban households use other kinds of storage more appropriate to urban environments such as 200-liter steel drums. Bakaars are found in 69 percent of riverine and 74 percent of nonriverine households. They were recorded among 44 percent of the pastoral sample, again reflecting the increasing agricultural diversification of pastoral economies (Table 10).

5. Material Goods Inventory

Survey respondents were asked if they owned items compiled from a standardized list. Frequency of ownership for all imported consumer items was highest in urban areas and lowest in pastoral areas, with riverine and nonriverine households in-between (Table 11). For example, 68 percent of urban

Table 10. GRAIN STORAGE TYPE PER HOUSEHOLD

STORAGE	JUBBA VALLEY % WITH TYPE	MEAN	MEDIAN	URBAN % WITH TYPE	MEAN	MEDIAN	AG RIVERINE % WITH TYPE	MEAN	MEDIAN	AG NONRIVERINE % WITH TYPE	MEAN	MEDIAN
Bakaar	49	22	15	16	26	20	69	23	12	74	21	15
Drom	12	8	4	15	10	4	13	6	4	12	7	4
Pot	0.2	2	2	—	—	—	—	—	—	—	—	—
Tree	3	2	1	—	—	—	5	2	1	6	2	1
Raar	3	3	2	—	—	—	4	3	2	7	3	2
Other	8	20	5	7	18	8	11	21	4	7	24	6
	PASTORAL % WITH TYPE	MEAN	MEDIAN	LOWER JUBBA % WITH TYPE	MEAN	MEDIAN	MIDDLE JUBBA % WITH TYPE	MEAN	MEDIAN	GEDO % WITH TYPE	MEAN	MEDIAN
Bakaar	44	20	16	30	18	10	73	21	15	46	27	20
Drom	4	4	4	24	6	4	8	14	4	5	5	3
Pot	—	—	—	—	—	—	—	—	—	—	—	—
Tree	1	1	1	2	2	1	6	2	1	0.8	1	1
Raar	—	—	—	3	4	5	4	3	2	1	3	2
Other	4	2	1	3	34	5	4	14	7	15	19	5

households had radios, followed by 22 percent of riverine households, 13 percent of nonriverine households and 8 percent of pastoral households.

Watches, perceived more as a luxury item than a necessity, followed the same pattern as radio ownership with 71 percent of urban households having an average of two watches per household, while only 10 percent of pastoral households have watches.

Ownership of motorized vehicles is rare within the valley. Cars and trucks are owned by two percent of all valley households. The majority of motor vehicles (owned by five percent of households) are found in towns. Motor vehicles in rural areas are owned only by one percent of riverine and nonriverine households. No vehicles were reported among the pastoral sample.

Generally, low levels of agricultural production are exacerbated by a severe lack of mechanization of smallholder farms. Personally owned tractors are found among only .3 percent of valley households which are all concentrated in urban areas.

Fewer households have bicycles (1.4 percent) than motor vehicles (2.0 percent). Even in urban areas where streets are adequate for bicycle travel, only 2.5 percent of households have a bicycle. Bicycles are seen more as toys for children's amusement than as a legitimate mode of transportation.

Use of animal-drawn carts is fairly evenly dispersed across urban and settled sectors (six to 10 percent of households) where they are used to transport many goods ranging from town water delivery to rural marketed produce. Only 2.9 percent of pastoral households have animal carts.

Material possessions of most valley households are relatively sparse. Among permanently settled populations, material goods are few in number and limited to tools, cookware, and a modest number of garments per adult, reflecting the generally low income levels and subsistence-based economy of the valley.

6. Household

A household consists of all persons habitually resident within a particular compound who are generally economically interdependent, share meals, and socially interact with other members occupying that compound. Household heads are generally male; however, at least 10 percent of households in vil-

Bull cart–type of transport most commonly owned by households in Jubba Valley.

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lages sampled are headed by women. Female heads of households are typically divorced, widowed, or those whose spouses are habitually absent. In addition to a household head, a household includes spouse(s), offspring, and any other persons related or unrelated who are present for a sustained period.

Household size for the valley averages 6.2 as shown in Table 12. Mean household size across socio-ecological sectors is consistent, ranging only between 6.0 among urban households and 6.2 among agricultural nonriverine households. Regionally, the smallest households are in Lower Jubba with 5.8 and the largest in Gedo Region with 6.9.

At the level of valley analysis 97 percent of households are nuclear families represented by household heads (16 percent), wife/spouse (19 percent), sons (34 percent), and daughters (28 percent). Proportions of family members are consistent across sectors and regions, except for Gedo Region where spouse/household head ratios are two to one, whereas for the rest of the valley, spouses outnumber household heads by only 16 percent. The higher rate of polygyny in Gedo Region could be due to the greater wealth of that area and lower divorce rate. The remaining three percent of household membership is composed of close relatives, especially mothers of household heads and spouses.

There are 20 percent more sons than daughters present in households. This is explained, in part, by the fact that daughters marry and leave home earlier.

7. Marriage

Throughout the valley, a high value is placed on the social and economic importance of marriage and the procreation of children. A union without offspring is considered unfortunate, and assumed barrenness in wives is common grounds for divorce. All but the most severely physically and mentally disabled are married. Appendix C, Tables 10 and 13, list marital status for males and females 15 years and older.

The average valley age of a woman at her first marriage is 18 and 26 for a man. Responses from women's village discussions indicated that 15 or 16 was the ideal age to marry. Males, too, would prefer to marry younger. The age data for both sexes is homogeneous across regions and socio-ecological sectors (see Appendix C, Tables 17 and 19).

As may be seen in Appendix C, Tables 20 and 21, age differentials between husbands and wives for females' successive marriages begin with an 11-year difference and remain within an eight to 11-year span for the first five successive marriages. In contrast, looking at the marriage pattern for men, the age differentials of marriage partners begin with an eight-year difference for first marriages and increase up to 33 years for a male's seventh marriage (with an extreme of 45 years in one case) with increased increments of two to four years age difference for the first five successive marriages.

The data indicate that divorced women continue to be married to men who, on the average, are a decade older. However, men have preference for younger women throughout their marital history. Successive marriages to young women ensure that male fertility is not tied to the limited reproductive span of an aging spouse. Men continue fathering children into their sixth and seventh decades. By continuing to provide for their own labor needs, males maintain authority over viable economic units throughout all or most of their lives. This fact is supported by data showing few older males who are not household heads, in contrast to aged females who become widowed or divorced and are more likely to become dependent members of their offspring's households.

Although polygyny continues to be valued, mean number of marriages per males for the valley is only 1.5 and 1.3 for females with upper extreme cases of 10 and 11 marriages reported for males and females, respectively (Tables 13 and 14). Marriage pattern data is consistent for men and women across sectors and regions. The average number of cohabiting wives per valley household head is a low of 1.0 for Lower Jubba Region and a high of 2.0 for Gedo Region (Table 15).

The rate of multiple marriage increases in small increments with age. For example, at a valley level, average number of marriages per male age 20 to 29 is 1.1 wives. Number of marriages per male increases by .1 for men in their thirties and an additional .2 for men in their forties. By the time men reach fifty, they have had 1.5 wives; by sixty, the average jumps to 4.8, apparently corresponding with menopause in first wives (Table 16).

Table 11. INVENTORY OF HOUSEHOLD ITEMS AND PERCENT OF HOUSEHOLDS HAVING ITEM TYPE

ITEMS	JUBBA VALLEY N=1028 % HAVING TYPE *1	JUBBA VALLEY N=1028 MEAN *2	URBAN N=282 % HAVING TYPE	URBAN N=282 MEAN	AG RIVERINE N=360 % HAVING TYPE	AG RIVERINE N=360 MEAN	AG NONRIVERINE N=176 % HAVING TYPE	AG NONRIVERINE N=176 MEAN
Radios	30.4	1.2	68.4	1.2	22.4	1.1	13.1	1.3
Watches	32.0	1.6	71.0	1.8	23.0	1.2	15.3	1.4
Bicycles	1.4	1.0	2.5	1.0	1.2	1.0	1.7	1.0
Tractors	0.3	1.0	1.1	1.0	—	—	—	—
Vehicles	2.0	1.1	5.3	1.0	1.0	1.0	1.1	2.0
Animal carts	7.0	1.1	6.4	1.0	9.2	1.1	9.7	1.2
Hand carts	5.7	1.2	11.0	1.2	3.0	1.5	5.0	1.0
Yambos	73.0	5.0	43.0	5.8	96.0	5.1	95.0	5.0
Axes	77.0	1.7	50.0	1.5	88.0	1.8	90.0	1.6
Pangas	57.0	1.5	42.0	1.5	68.0	1.7	73.0	1.3
Fishlines	9.0	1.8	3.0	2.6	20.0	1.6	5.0	1.6
Gill nets	1.0	2.5	1.0	1.3	1.2	1.5	—	—
Fish traps	2.0	1.7	1.7	2.0	6.0	1.5	1.0	3.5
Canoes	1.0	1.0	1.0	1.0	3.0	1.0	—	—
Spears	17.0	1.2	5.0	1.0	20.0	1.1	—	—
Hunt/Gath. equip.	18.0	1.7	—	—	2.0	1.7	2.0	2.5

	PASTORAL N=210		LOWER JUBBA N=345		MIDDLE JUBBA N=307		GEDO N=376	
Radios	8.2	1.1	38.6	1.2	22.5	1.2	29.0	1.2
Watches	10.0	1.8	41.4	1.6	24.8	1.6	28.7	1.6
Bicycles	—	—	0.6	1.0	2.6	1.0	1.1	1.0
Tractors	—	—	—	—	—	—	—	—
Vehicles	—	—	4.1	1.0	1.0	2.0	1.1	1.0
Animal carts	2.4	1.0	8.4	1.0	5.9	1.1	6.4	1.2
Hand carts	3.0	1.2	2.6	1.0	9.0	1.2	5.0	1.2
Yambos	62.0	4.0	58.0	4.3	91.0	5.1	71.0	5.3
Axes	84.0	2.1	67.0	1.3	97.0	1.7	84.0	2.0
Pangas	43.0	1.3	59.0	1.4	70.0	1.6	44.0	1.5
Fishlines	—	—	4.0	2.4	20.0	1.7	4.0	1.7
Gill nets	—	—	1.2	4.5	2.0	1.2	—	—
Fish traps	—	—	1.5	2.4	7.8	1.6	—	—
Canoes	—	—	0.6	1.0	2.0	1.0	1.0	1.0
Spears	30.0	1.4	16.0	1.1	20.0	1.1	16.0	1.3
Hunt/Gath. equip.	2.0	1.3	0.6	1.0	3.0	2.0	1.0	1.4

Table 12. AVERAGE HOUSEHOLD SIZE

HOUSEHOLD COMPOSITION	JUBBA VALLEY N=1028 MEAN	URBAN N=282 MEAN	AG RIVERINE N=360 MEAN	AG NON RIVERINE N=176 MEAN	PASTORAL N=210 MEAN	LOWER JUBBA N=345 MEAN	MIDDLE JUBBA N=307 MEAN	GEDO N=376 MEAN
Gross household*	8.1	7.9	8.3	8.3	7.7	7.7	8.2	8.5
Number deceased	1.0	0.9	1.3	1.1	0.7	0.9	1.1	0.8
Total household	7.8	7.0	7.1	7.3	7.0	6.8	6.8	7.7
Members absent	0.9	0.1	0.9	1.0	0.6	0.9	1.0	0.7
Net household size	6.2	6.0	6.1	6.2	6.1	5.8	5.8	6.9

N=NUMBER OF HOUSEHOLDS IN EACH ANALYSIS SECTOR
**Including deceased, divorced, and absent*

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Table 13. AVERAGE NUMBER OF MARRIAGES FOR FEMALES

JUBBA VALLEY N=1664		URBAN N=458		AG RIVERINE N=593		AG NONRIVERINE N=286		PASTORAL N=327		LOWER JUBBA N=504		MIDDLE JUBBA N=495		GEDO N=665	
RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
1/11	1.27	1/4	1.2	1/11	1.3	1/4	1.3	1/7	1.2	1/11	1.2	1/5	1.4	1/7	1.2

Table 14. AVERAGE NUMBER OF MARRIAGES FOR MALES

JUBBA VALLEY N=1604		URBAN N=417		AG RIVERINE N=541		AG NONRIVERINE N=293		PASTORAL N=353		LOWER JUBBA N=508		MIDDLE JUBBA N=471		GEDO N=625	
RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
1/10	1.5	1/5	1.3	1/7	1.7	1/10	1.7	1/7	1.5	1/10	1.4	1/7	1.7	1/7	1.5

Table 15. AVERAGE NUMBER OF WIVES PER HOUSEHOLD

	JUBBA VALLEY N	URBAN N	AG RVERINE N	AG NON RIVERINE N	PASTORAL N	LOWER JUBBA N	MIDDLE JUBBA N	GEDO N
Number Current Wives	1.16	1.06	1.25	1.19	1.18	1.05	1.18	1.95

Table 16. AVERAGE NUMBER OF WIVES EVER MARRIED TO MALES BY AGE DECILES FOR MALES

AGE DECILES	JUBBA VALLEY MEAN WIVES	JUBBA VALLEY N	URBAN MEAN WIVES	URBAN N	AG RIVERINE MEAN WIVES	AG RIVERINE N	AG NONRIVERINE MEAN WIVES	AG NONRIVERINE N
20	1.1	231	1.1	45	1.1	115	1.0	32
30	1.2	775	1.1	210	1.1	261	1.2	140
40	1.4	372	1.3	86	1.6	138	1.3	73
50	1.5	179	1.4	29	1.5	77	1.3	37
60	4.8	63	1.7	12	8.6	32	1.2	9
>60	1.7	25	2.0	2	1.7	16	1.0	3
	PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
20	1.2	40	1.0	70	1.2	80	1.1	81
30	1.2	163	1.1	223	1.2	253	1.1	299
40	1.2	77	1.4	127	1.5	119	1.4	126
50	1.3	32	1.5	49	1.6	64	1.4	66
60	1.6	13	1.9	18	1.9	27	1.1	18
>60	1.0	3	1.8	4	1.7	17	1.5	4

Bridewealth

Bridewealth is the gift of livestock and/or cash given by the groom's family to the bride's family that has traditionally featured prominently in Somali marriage. The nature of bridewealth has changed in recent history—mostly in the form of an increase in cash and a decrease in numbers of livestock given. An increasing emphasis on cash exchange has placed a greater burden of responsibility on the groom and his immediate family to acquire the cash to negotiate a marriage while decreasing interdependency on and importance of extended kin networks.

Although the value of bridewealth persists in the valley, the shift toward cash exchange is one indicator of an economy traditionally geared to subsistence moving toward greater market involvement.

Camels are used as a medium of exchange in less than a third of bridewealth exchanges involving livestock. The valley trend for the past 50 years would indicate that the average number of camels given per marriage has decreased by more than half. However, the number of camels given in the pastoral sector has remained essentially unchanged at an average of two camels per first marriage (Appendix C, Table 16).

Cattle are used in one-half to two-thirds of bridewealth payments involving a livestock component. The mean exchange in recent decades has remained consistently near 2.5 cattle per marriage, with a slight decline in the 1980s (Appendix C, Table 14).

Sheep and goats continue to figure in one-half to two-thirds of bridewealth payments involving livestock, but in absolute numbers given, they show a steady decline over the past few decades (Appendix C, Table 5).

The overall significance of livestock in bridewealth exchange is more clearly understood by combining camels, cattle, sheep, and goats into more comparable Tropical Livestock Units (TLUs) based on 250 kg of live weight per TLU. For the valley as a whole, TLUs given have declined from 2.5 per marriage in 1950 to one in 1988. The decrease in livestock exchange is greatest among urban marriages where it declined tenfold. Livestock, as a medium of exchange, has remained stable in the pastoral sector where there is little evidence of change since 1930 (Table 17).

While livestock given for first marriages have declined, exchanges for second marriages have remained constant or increased slightly so that payments for second marriages are roughly equal to first marriages (Appendix C, Table 6).

The amount of cash involved in valley bridewealth exchange has increased more than 400 percent since 1950. However, due to rapid rates of inflation over the same period, the net worth of the cash exchange has not increased (Appendix C, Table 15). The cost of setting up a household, represented by a growing value placed on commercial furnishings, increased eighteenfold between 1940 and the present (Appendix C, Table 7).

Divorce

The valley's low rates of polygyny and total numbers of marriages per household are matched by relatively low divorce rates. Nineteen percent of valley marriages have ended in divorce. The divorce rate is quite consistent across socio-ecological sectors, but varies regionally between a low of 13.6 percent for Gedo Region and a high of 25 percent for Middle Jubba Region (Table 18). In cases of divorce, length of marriage is relatively brief, with a valley mean of 3.3 years for first marriages of males and 2.4 years for first marriages of females. Briefest first marriages ending in divorce are recorded among urban dwellers with 1.5 years for men and 0.8 years for women. At the valley level, there is no major change in the length of second and third marriages ending in divorce, with an average of two to four years per marriage (Appendix C, Table 8).

Marriages Ending in Death

For the valley, average length of first marriage which ends in death of a spouse is 15.3 years for males and 14.7 for females. Longest first marriages ending in death are among urban populations with 18 years for both men and women. Length of successive marriages ending in death shows no pattern (Appendix C, Table 9).

8. Education

Somali National Literacy Campaign of 1974 was a major effort on the part of the government to extend basic literacy in Somali to all its people, including Somalia's pastoral majority. A year later, the Ministry of Information and National Guidance estimated the national literacy rate had grown to 55 percent from its prior five-percent level before the

Table 17. AVERAGE NUMBER OF TROPICAL LIVESTOCK UNITS GIVEN AS BRIDEWEALTH BY YEAR OF FIRST MARRIAGE

DECADES	JUBBA VALLEY MEAN	N	%	URBAN MEAN	N	%	AG RIVERINE MEAN	N	%	AG NONRIVERINE MEAN	N	%
1980-88	1.0	194	19.3	0.4	57	19.2	1.0	75	21.0	1.0	29	15.9
1970-79	1.5	311	31.0	0.6	36	38.6	1.3	107	29.5	1.3	51	29.3
1960-69	1.8	282	28.1	1.1	87	29.9	2.0	92	26.0	2.5	54	31.1
1950-59	2.0	148	14.7	3.5	35	11.4	1.9	63	17.2	1.2	30	16.5
1940-49	2.5	55	5.5	4.1	17	5.0	2.0	21	5.0	0.9	12	5.5
1930-39	4.3	9	0.9	8.3	7	1.4	—	—	—	0.8	1	0.6
1920-29	3.8	5	0.5	4	1	0.4	6.6	2	0.6	3.0	2	1.2
	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
1980-88	2.1	45	18.3	0.7	61	18.1	0.5	50	17.4	1.6	83	21.8
1970-79	3.0	69	29.6	0.7	110	32.6	0.6	81	28.2	2.8	120	31.5
1960-69	2.1	63	30.8	0.9	94	27.0	0.9	94	27.0	0.8	82	28.6
1950-59	1.9	31	13.0	2.2	50	14.8	0.6	49	17.1	3.2	49	12.9
1940-49	3.1	15	7.1	2.1	17	5.0	1.0	19	6.6	4.2	19	5.0
1930-39	2.4	2	1.0	0.2	4	1.4	0.2	4	1.4	11.9	3	0.8
1920-29	—	—	—	2.5	2	0.1	2.5	2	0.7	13.2	1	0.3

Table 18. NUMBER AND PERCENT OF DIVORCED MEN

JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
312	19	64	16.8	127	18.4	61	20.8	54	16.6	96	19.6	135	24.1	81	13.6

national script was adopted (Laitin and Samatar 1987).

Of the Jubba Valley population 15 years and older, 36 percent of males and 15 percent of females reported ability to read and write Somali. Literacy rates were highest in urban areas where the rate rose to 77 percent for men and 37 percent for women. The pastoral sector responded that 10 percent of men and three percent of women were literate (Table 19). Regionally, the highest literacy rates were recorded in Lower Jubba Region. Lowest regional levels were recorded in primarily pastoral Gedo Region. Women in Jubba Valley continue to have lower levels of literacy with less than half that of men.

Other Languages

The literacy campaign was handicapped in Jubba Valley mainly because Maxadtirey, the Somali dialect of the majority which was taught in the campaign, is not the first language of most of the valley. Afmaay-maay is the first language spoken by the majority of riverine and nonriverine agriculturalists. There are additional minority languages spoken in the valley. Swahili (spoken by six percent), is spoken mainly at the coast, portions of inland Lower Jubba, and by some pastoral populations coming from Kenya. Arabic is spoken by 11 percent of the population. Italian is spoken by a mean of eight percent, and English is spoken by four percent of the sample population (Tables 20 and 21).

Formal Education

A minority of the population has had exposure to formal education. Fifty-nine percent of school-age valley males and 81 percent of females have had no education. Exposure to education is highest in urban areas where 21 percent of males and 59 percent of females have no formal education and least in pastoral areas where 86 percent of men and 94 percent of women have never been to school. Primary school enrollment across Somalia is estimated at 30 percent.

In the upper level of schooling, the gap between the sexes is smaller among the minimal segment of the population receiving education. Five percent of men and three percent of women have completed a maximum of eight years of primary education and had no further schooling. An additional six percent of males and two percent of females have completed the full 12 years of education. Post-high school degrees have been earned by 0.7 and 0.3 percent of males and females (Tables 22 and 23).

Table 24 shows the percentage of Jubba Valley men and women by five-year cohorts with no formal education. For males, the cohort from ages 31 to 35 has the greatest degree of school attendance with only 49 percent having no formal education. How-

Table 19. SOMALI LITERACY FOR MALES AND FEMALES 15 YEARS AND OLDER

READ/WRITE	JUBBA VALLEY MEAN AGE	N	%	URBAN MEAN AGE	N	%	AG RIVERINE MEAN AGE	N	%	AG NONRIVERINE MEAN AGE	N	%
MALES												
Read yes	32.7	580	36.2	33.3	321	77.0	31.2	161	29.7	32.8	72	24.6
Read no	35.9	946	59.0	42.7	85	20.4	34.2	354	65.3	37.0	204	69.6
Read a little	39.1	72	4.8	41.6	10	2.4	40.2	26	4.8	38.6	17	5.8
Write yes	32.8	580	36.3	33.3	322	77.2	31.3	138	27.5	33.0	73	24.9
Write no	35.9	949	59.3	42.5	84	20.1	34.2	338	67.5	36.9	204	69.6
Write a little	39.4	71	4.4	41.6	10	2.4	39.9	27	5.0	38.8	16	5.5
FEMALES												
Read yes	25.2	246	14.8	25.1	171	37.3	25.9	50	8.4	24.0	19	6.7
Read no	32.8	1353	81.3	36.0	267	58.3	31.1	517	87.3	32.4	258	90.5
Read a little	32.5	54	3.2	33.8	19	4.1	32.1	18	3.0	31.1	7	2.5
Write yes	25.3	245	14.7	25.2	170	37.1	25.9	50	8.4	24.0	19	6.7
Write no	32.9	1362	81.9	36.0	270	59.0	31.1	519	88.0	32.4	259	90.9
Write a little	32.2	50	3.0	33.3	18	3.9	30.8	17	2.9	31.1	7	2.5
MALES	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
Read yes	33.4	34	9.6	32.4	236	46.5	32.4	151	32.1	33.5	193	30.9
Read no	35.1	298	84.8	39.1	248	48.8	37.9	288	61.1	32.7	410	65.6
Read a little	35.7	17	4.8	41.9	20	3.9	38.0	31	6.6	38.1	21	3.4
Write yes	33.3	35	9.9	32.4	236	46.5	32.7	151	32.1	33.6	193	30.9
Write no	35.2	300	85.0	39.2	250	49.2	37.9	288	61.1	32.6	411	65.8
Write a little	36.7	16	4.5	43.4	20	3.9	37.5	31	6.6	38.3	20	3.2
FEMALES												
Read yes	28.8	8	2.5	24.2	120	23.8	26.1	54	10.9	26.5	72	10.8
Read no	33.9	305	93.6	35.3	364	72.2	33.4	42	85.3	30.9	572	85.3
Read a little	32.0	8	3.4	32.2	20	4.0	33.4	13	2.6	32.4	18	3.2
Write yes	33.0	8	2.5	24.1	118	23.0	26.5	55	11.1	26.5	72	10.8
Write no	33.3	257	94.5	35.2	368	73.0	33.4	422	85.3	31.0	572	86.0
Write a little	31.6	7	2.8	32.8	18	3.6	31.7	14	2.8	32.1	18	2.7

Table 20. LANGUAGES SPOKEN BY HOUSEHOLD HEADS

LANGUAGE	JUBBA VALLEY MEAN AGE	N	%	URBAN MEAN AGE	N	%	AG RIVERINE MEAN AGE	N	%	AG NONRIVERINE MEAN AGE	N	%
Maxadtiriy	44.1	919	91.8	44.1	261	97.0	42.6	303	86.8	46.1	168	94.8
Maymay	43.5	592	59.1	45.2	143	52.8	41.7	277	79.4	45.9	86	48.3
Arabic	45.1	111	11.1	44.2	84	30.7	49.4	16	4.6	49.8	9	5.2
Italian	47.3	79	7.9	46.3	63	22.8	49.5	10	3.1	46.0	4	2.3
English	37.6	38	3.8	37.8	37	13.5	34.0	2	0.6			
Swahili	47.1	64	6.4	46.0	32	11.6	54.0	16	4.6	35.8	4	2.3
Amharic	47.1	8	0.8	47.1	6	2.2	47.0	2	0.6			
Oromo	47.1	18	1.8	39.8	4	1.5	42.0	7	2.2	37.0	5	2.9
Mushunguli	42.9	14	1.4	30.0	2	0.7	48.0	10	2.9	40.0	1	0.5
Other	44.1	17	1.7	47.6	8	3.0	40.0	3	0.9	41.0	3	1.7
	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
Maxadtiriy	44.9	192	92.8	45.4	322	98.2	45.0	262	86.5	42.0	339	90.6
Maymay	44.6	84	40.6	45.3	106	32.5	44.5	239	78.5	41.8	249	66.7
Arabic	30.5	2	1.2	43.6	57	17.5	44.3	27	8.9	49.0	27	7.3
Italian	58.8	4	2.4	46.1	46	14.1	45.0	15	5.0	52.2	18	4.8
English				38.3	29	8.9	36.7	6	2.0	33.0	3	0.8
Swahili	43.5	8	3.9	44.5	38	11.7	55.9	14	4.6	45.0	12	3.2
Amharic				44.0	3	0.9	39.5	2	0.2	55.3	3	0.8
Oromo	54.0	2	1.2	39.7	6	1.8	49.0	2	0.7	41.4	10	2.7
Mushunguli				38.0	6	1.8	46.6	8	2.6			
Other							37.8	6	2.0	53.0	3	0.8

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Table 22. SCHOOL LEVEL FOR MALES

YEARS AT SCHOOL	JUBBA VALLEY MEAN AGE	N	%	URBAN MEAN AGE	N	%	AG RIVERINE MEAN AGE	N	%	AG NONRIVERNE MEAN AGE	N	%
None	35.8	951	59.3	42.2	87	20.9	34.0	350	66.5	37.0	204	69.6
Literacy campaign	42.4	201	12.5	46 1	64	15.3	41.3	76	13.6	40.3	37	12.6
1	38.6	13	0.8	26.0	1	0.2	43.7	6	1.2	31.8	4	1.4
2	32.4	36	2.2	48.0	8	1.9	29.8	15	2.8	29.5	10	3.7
3	35.3	47	2.9	43.5	15	3.6	29.2	21	3.9	33.3	8	2.7
4	31.2	50	3.1	35.1	18	4.3	28.3	18	3.3	25.5	11	3.8
5	31.8	24	1.5	37.6	15	3.6	21.0	9	1.7	30.0	1	0.3
6	25.4	25	1.6	26.9	16	3.8	21.0	5	0.9	24.3	3	1.0
7	22.5	13	0.8	22.3	7	1.7	23.8	5	0.9			
8	29.6	85	5.3	31.9	48	11.5	25.1	23	4.2	29.6	12	4.1
9	28.3	8	0.5	28.3	8	1.9	—	—	—	—	—	—
10	20.9	14	0.9	20.9	14	3.4	—	—	—	—	—	—
11	21.3	9	0.6	18.0	8	1.9	—	—	—	48.0	1	0.3
12	27.4	100	6.2	27.6	89	21.3	25.8	9	1.7	26.0	2	0.7
Bachelor's degree	36.3	8	0.5	36.2	8	1.9	—	—	—	—	—	—
Master's degree	41.0	3	0.2	41.0	3	0.7	—	—	—	—	—	—
Less than 1 year	23.50	6	0.4	—	—	—	33.0	2	0.4	—	—	—
Unknown	39.2	6	0.4	31.7	3	0.7	46.0	3	0.6	—	—	—

	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
None	35.3	303	85.8	38.9	262	50.2	37.9	296	61.4	32.5	414	65.1
Literacy campaign	40.0	27	7.6	44.3	65	12.4	43.7	50	10.2	40.4	92	14.4
1	45.0	1	1.0	46.0	1	0.2	41.1	9	1.9	28.7	3	0.5
2	21.6	5	1.4	34.0	14	2.8	37.4	1	2.1	26.3	13	1.9
3	36.7	3	0.8	41.8	17	3.1	26.0	18	3.6	39.2	15	2.2
4	39.4	5	1.4	33.5	22	3.9	28.8	25	4.9	32.6	8	1.1
5				33.6	15	2.6	21.3	7	1.5	44.0	4	0.6
6	23.5	2	0.6	25.5	10	2.0	27.8	9	1.7	22.6	7	1.1
7	18.0	1	0.3	21.0	7	1.4	27.7	3	0.6	21.0	3	0.5
8	22.5	2	0.7	29.6	34	6.5	29.2	24	4.9	29.8	31	4.6
9	—	—	—	20.8	4	0.8	—	—	—	17.5	2	0.3
10	—	—	—	18.0	8	1.6	—	—	—	25.5	2	0.3
11	—	—	—	—	—	—	—	—	—	24.4	5	0.8
12	—	—	—	25.4	53	10.4	31.6	14	3.0	26.9	7	1.1
Bachelor's degree	—	—	—	37.8	5	1.0	46.0	1	0.2	27.5	2	0.3
Master's degree	—	—	—	41.0	3	0.6	—	—	—	—	—	—
Less than 1 year	18.8	4	1.1	—	—	—	23.5	6	1.3	—	—	—
Unknown	—	—	—	21.0	1	0.2	46.7	3	0.6	37.0	2	0.3

Table 21. LANGUAGES SPOKEN BY WIVES/SPOUSES

LANGUAGE	JUBBA VALLEY MEAN AGE	N	%	URBAN MEAN AGE	N	%	AG RIVERINE MEAN AGE	N	%	AG NONRIVERINE MEAN AGE	N	%
Maxadtiriy	33.3	981	84.4	34.1	266	93.6	31.8	321	74.3	33.8	190	91.8
Maymay	33.2	647	55.7	35.4	137	48.6	31.9	338	78.2	32.3	75	36.2
Arabic	37.6	41	3.5	36.7	36	12.6	44.2	4	0.9	45.0	1	0.5
Italian	38.2	6	0.5	37.4	5	1.8	—	—	—	—	—	—
English	36.7	7	0.6	36.7	7	2.5	—	—	—	—	—	—
Swahili	35.1	29	2.5	38.9	15	5.3	29.4	7	1.6	29.0	1	0.5
Amharic	21.0	1	0.1	21.0	1	0.4	—	—	—	—	—	—
Oromo	39.1	7	0.6	40.0	2	0.7	50.0	1	0.2	23.5	2	1.0

	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
Maxadtiriy	34.3	215	89.2	34.2	333	96.5	34.6	264	74.6	31.5	384	82.9
Maymay	34.7	89	36.9	34.5	86	24 9	34.1	271	76.6	31.8	200	62.6
Arabic	—	—	—	33.7	23	6.7	42.5	11	3.1	42.9	7	1.5
Italian	42.0	1	0.5	32.3	3	0.9	45.0	2	0.6	42.0	1	0.2
English	—	—	—	28.6	5	1.4	57.0	2	0.6	—	—	—
Swahili	21.0	1	0.4	33.6	19	5.5	38.6	7	2.0	36.7	3	0.6
Amharic	—	—	—	21.0	1	0.3	—	—	—	—	—	—
Oromo	48.5	2	1.0	25.7	3	0.9	55.0	2	0.6	43.5	2	0.4
Mushunguli	—	—	—	24.0	6	1.7	34.7	3	0.8	—	—	—
Other	—	—	—	46.5	2	0.6	24.0	2	0.6	60.0	1	0.2

Table 23. SCHOOL LEVEL FOR FEMALES 15 YEARS AND OLDER

YEARS OF SCHOOL	JUBBA VALLEY MEAN AGE	N	%	URBAN MEAN AGE	N	%	AG RIVERINE MEAN AGE	N	%	AG NONRIVERINE MEAN AGE	N	%
NONE	32.8	1348	81.0	35.9	272	58.7	31.1	510	86.1	32.3	258	89.8
Literacy campaign	32.5	111	6.7	32.4	53	11.4	33.7	29	5.6	32.4	15	4.6
1	32.8	8	0.5	25.0	1	0.2	34.0	5	0.8	27.3	3	1.1
2	28.9	19	1.1	37.4	5	1.1	26.4	9	1.5	21.0	3	1.1
3	24.8	19	1.1	27.9	8	1.7	22.7	7	1.5	22.5	2	0.7
4	26.1	25	0.5	32.1	11	2.2	21.8	12	2.0	23.3	3	1.1
5	24.4	8	0.5	24.2	7	1.3	25.0	2	0.3	—	—	—
6	20.3	6	0.4	21.7	3	0.7	18.5	2	0.3	20.0	1	0.4
7	21.2	5	0.3	20.8	4	0.9	23.0	4	0.2	—	—	—
8	23.5	54	3.2	23.8	47	10.0	18.8	4	0.7	19.3	3	1.1
9	20.6	5	0.3	17.0	4	0.9	—	—	—	35.0	1	0.4
10	17.7	9	0.5	17.3	9	1.7	—	—	—	—	—	—
11	19.0	7	0.4	19.0	7	1.5	—	—	—	—	—	—
12	22.8	32	1.9	22.8	33	7.0	—	—	—	—	—	—
Bachelor's degree	26.0	3	0.3	35.0	1	0.2	—	—	—	—	—	—
Master's degree	—	—	—	—	—	—	—	—	—	—	—	—
Less than 1 year	—	—	—	—	—	—	—	—	—	—	—	—
	PASTORAL			**LOWER JUBBA**			**MIDDLE JUBBA**			**GEDO**		
NONE	32.5	307	94.2	35.4	366	71.8	33.3	422	84.0	30.8	575	85.7
Literacy campaign	32.8	14	4.3	32.2	46	8.7	33.1	21	4.0	32.5	49	7.1
1	—	—	—	—	—	—	32.8	8	1.6			
2	29.3	3	0.9	21.5	4	0.8	28.4	9	1.8	34.5	6	0.9
3	—	—	—	23.4	7	1.4	30.2	6	1.2	21.2	6	0.9
4	—	—	—	26.5	11	2.2	28.1	8	1.6	22.7	6	0.9
5	—	—	—	27.0	2	0.4	24.0	4	0.8	22.5	2	0.3
6	—	—	—	21.7	3	0.6	19.0	3	0.6			
7	—	—	—	20.8	4	0.8	23.0	1	0.2			
8	42.0	1	0.3	22.9	37	7.1	18.0	5	1.0	27.3	14	2.0
9	—	—	—	20.6	5	1.0	—	—	—			
10	21.0	1	0.3	17.5	4	0.8	18.5	4	0.8	15.0	1	0.2
11	—	—	—	—	—	—	—	—	—	21.0	2	0.3
12	—	—	—	21.3	6	3.2	30.0	6	1.2	21.0	10	1.5
Bachelor's degree	—	—	—	—	—	—	35.0	1	0.2			
Master's degree	—	—	—	—	—	—	—	—	—			
Less than 1 year	—	—	—	—	—	—	—	—	—			
Unknown	—	—	—	—	—	—	55.3	4	0.8	72.0	1	0.2

Table 24. PERCENTAGES OF FIVE YEAR COHORTS WITH NO GOVERNMENT SCHOOL EDUCATION FOR JUBBA VALLEY MALES AND FEMALES

NO GOVERN EDUCATION %	AGES 6-10	AGES 11-15	AGES 16-20	AGES 21-25	AGES 26-30	AGES 31-35	AGES 36-40	AGES 41-45	AGES 46-50	AGES 51-55	AGES 56-60	AGES 61-65	AGES 66-70	AGES 71 & UP
MALES	84	68	60	51	51	49	55	51	62	70	72	68	76	86
FEMALES	92	80	77	75	81	84	86	93	92	93	91	95	97	97

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ever, there is little difference at all in the 20-year interval between those aged 21 to 25 and those aged 41 to 45 with approximately one-half of each cohort lacking all formal education. For males under twenty, the percentage of those not attending school increases to 84 percent for those age six to 10, a figure equaled only by the eldest cohort (age 71 and above). This decrease in school attendance reflects a decline in funds allocated to the education sector.

Reflecting the Revolution's support of education for women, Jubba Valley women had the greatest degree of school attendance among the cohorts aged 16 to 20 and 21 to 25 with 25 percent attending school. However, school attendance declined steadily for younger cohorts with only eight percent attending school among girls aged six to 10. This figure equals that for women aged 41 and above.

Most villages sampled have no schools, and where schools were found, they were invariably not in session. Because of general lack of support, the quality of education in most of the valley is at a low ebb.

Low levels of literacy and formal education in the valley reflect a population of minimal skills which is qualified to perform few tasks beyond cultivation, herding, and unskilled labor.

Koranic Education

Islam is adhered to by virtually the entire population of the valley. Teaching of the Koran by *macalins* (teachers) in *dugsis* (Koranic schools) is well-established in most every community. At the valley level, 68 percent of males and 17 percent of females have had some Koranic training. The valley rate of Koranic training for females is one-half the national average for females (National Education Study 1982). Exposure to Koranic training, as with formal education, is highest in towns and lowest among pastoralists, but even among pastoralists, Koranic education is highly valued for males, of whom 63 percent have had some training.

Table 25 shows the percentage of five-year cohorts with exposure to Koranic education. For males, there is little variation in the percentage with no Koranic education for those age 11 to 15 and above; the percentage without religious training ranges from 25 to 43 percent. For males, the percentage completing Koranic education also has little variation beginning with the 16 to 20 cohort; the percentage ranges between 32 to 44.

Women have substantially less exposure to Koranic education than males. Among female cohorts, the maximum completing Koranic training is six percent.

Substantially more Jubba Valley males have religious than secular education, but little difference exists between the number of women who have received religious or secular training. Traditionally, it has not been a value for women to be educated by either means.

C. Economic Overview

This overview presents economic activity in Jubba Valley in the context of the Somali national economy. It establishes a backdrop for economic activity in the valley with a discussion of the development of the Somali national economy since the 1969 revolution, and focuses on evolving government policies and challenges that the economy has had to confront. An analysis is provided of food commodity subsectoral marketing systems. At present, marketing of agricultural production is the most important economic exchange activity that takes place in Jubba Valley on a regular basis.

1. Somali Economy Since the 1969 Revolution

Orientation of the Government

The present government in Somalia has been in power since it seized control in a military *coup d'état* in 1969. Originally, the government proclaimed a Socialist Revolution and aligned itself with the Soviet Union, taking advice from Soviet

Table 25. EXPOSURE TO KORANIC EDUCATION FOR JUBBA VALLEY MALES AND FEMALES PERCENTAGES OF FIVE-YEAR COHORTS

	AGES 6-10	AGES 11-15	AGES 16-20	AGES 21-25	AGES 26-30	AGES 31 35	AGES 36-40	AGES 41-45	AGES 46-50	AGES 51-55	AGES 56-60	AGES 61-65	AGES 66-70	AGES 71 & UP
NONE %														
MALES	57	34	33	26	31	26	28	25	32	36	36	43	41	33
FEMALES	82	71	76	80	87	88	88	92	94	84	90	95	87	87
COMPLETED														
MALES	1	16	33	37	40	44	43	32	41	36	35	38	33	37
FEMALES	<1	4	6	6	3	5	2	2	0	2	1	5	3	3

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advisors who promoted centralized government of the nation, central planning for all sectors, and "Scientific Socialism". The government's policies presupposed that closely following the path of planned socialism would lead to Somalia's economic development. It intended to develop the country economically and socially. It also wanted to dismantle what was left of the colonial legacy.

The economy inherited by the government was dependent on the livestock sector for the livelihood of approximately 65 percent of the nation's population and on agriculture for the nation's food supply. Livestock was, by far, the largest foreign exchange earner. Export of bananas was the second main source of foreign exchange earnings, though its importance never approached that of livestock.

Soon after coming to power, the government nationalized many private assets, creating a windfall that helped finance the deficits left by the previous government. It also enlarged the public sector greatly by expanding government structures, starting up government-controlled industries, and creating parastatals to intervene in many economic activities. Though it spoke repeatedly of a socialist economy, in practice, the economy remained mixed as some private-sector activity continued, especially in the agriculture and livestock sectors. Nevertheless, dramatic changes occurred as the government promoted the philosophy that the state was central to developing the country by taking a leading role in investment and capital formation.

Development Plans

The government's first development plan emphasized manufacturing and industrial production, which it hoped would transform the economy. But the economy remained dependent on livestock and agriculture despite the government's rhetoric and programs to the contrary.

The drought of 1973 and 1974 was the culmination of several years of poor rainfall that devastated herds and pastoral families and severely reduced agricultural output as well. It necessitated food aid shipments and created severe financial problems for the government, requiring foreign assistance for debt relief and financing of its investment programs. Resources that would have otherwise gone for development projects were diverted into drought relief. The drought made the government aware of the importance of agriculture and livestock to the nation's economic health and this was reflected in the 1974 to 1978 development plan. However, investments and projects emphasized the creation of cooperatives for pastoral development that fit a socialist model, and promoted resettlement of herders who had lost their herds, often into agricultural projects. These projects did little to improve the lives of the pastoral population or the productivity of the sector.

Effects of the Ogaden War

Towards the end of the decade, the country's economic situation worsened with the 1977 to 1978 Ogaden War against Ethiopia. The enormous cost of the war severely burdened the economy since it required more borrowing, it pushed up imports which the country could ill afford, and left the government with few resources for financing its normal operations and investment programs. Its dwindling resources were insufficient to meet all of its needs. Food aid shipments were again needed, and after a temporary halt of foreign economic assistance during the war, outside financial assistance was also resumed. Inflation suddenly became an important factor as the government's control of the economy weakened. Mounting deficits, declining export revenues, and an increasing need for outside economic and development assistance became the main features of Somalia's economic scene and were carried into the 1980s.

Economic Performance During the 1970s

Throughout the 1970s, the economy grew little with real Gross Domestic Product (GDP) rising at an estimated 2.8 percent from 1972 to 1978, or just about at the estimated population growth rate. The productive sectors grew only modestly with livestock increasing at 2.7 percent and crop production approximately two percent, though the service sector grew at seven percent while public consumption, as a percentage of GDP, grew from 10 percent in 1970 to 16 percent in 1978. Domestic savings declined and the investments made in the productive sector prompted little improvement in output. Foreign aid was used to finance much of the new investments since government revenues declined with falling exports of livestock and bananas. The poor performance of the economy was not only affected by the drought, the Ogaden War, and generally unfavorable production conditions for much of the 1970s, but also by the international energy crisis. The oil price surges in 1974 and 1979 hurt Somalia's economy by boosting its import fuel bill and absorbing increasing levels of foreign exchange.

One feature of Somali economic life that was not part of the official economy and therefore, not recorded in official statistics, was remittances from abroad. During the 1970s, when the world oil economy expanded and boosted the economies of the oil-producing Gulf states, many Somalis sought work in these countries. Remittances from these migrant workers became a vital feature of economic life in Somalia, sustaining many families and businesses during periods when the nation's economic situation was weak.

However, most of the activity sustained by the remittances was outside of the government's control since it was conducted under the *franco valuta* system. The system was one in which livestock traders and migrant workers purchased goods in the country where they were selling and working, imported them, or sent them to businessmen in Somalia who paid them in foreign currency overseas or in shillings at market exchange rates. Because the government had no control over such transactions, it could not tax or regulate them in any way. Moreover, imperfect control of foreign exchange transactions and the flow of foreign exchange made its obligation to pay its debt and thereby, maintain the official economy even more difficult.The political need to control such business led to the abolishment of the system in 1985. However, remittances still remain an important part of the Somali economy even though conditions in many Gulf countries have changed and many migrant workers have returned. Currency control and exchange rate restrictions have made transferring and changing money more difficult, but they have not curtailed the flow or remittances and unofficial exports.

Performance in the 1980s

An increasing gap between revenues and expenditures that began in 1979 and has lasted through the 1980s has meant that Somalia has had to rely on grants or borrow larger sums from outside lenders. The effects of poor economic performance in the 1970s carried over into the 1980s. It became apparent that the government was having increasing difficulty controlling the economy, reducing its spending, curtailing imports, or limiting its debt obligations. Between 1980 and 1984, the agriculture sector, which contributed 54 percent to the GDP, grew by an estimated .4 percent per year and livestock output by only slightly more. External debt rose to $1.5 billion—almost equal to the nation's GDP. The debt resulted in balance of payment problems and foreign exchange shortages which affected imports.

The government signed an agreement with the International Monetary Fund (IMF) in 1980, and others in subsequent years, to help remedy some of its economic problems. Various economic policies were followed to decrease public outlays and increase the productive capacity of the economy. However, exports steadily declined and imports rose, further exacerbating efforts to control the government's debt burden. Inflation became a permanent feature of the economy as devaluations occurred that were prescribed by the IMF agreements and as various currency control restrictions were put in place. Some aspects of economic performance improved as a result of particular measures, but progress was often set back by ambiguous and changing policies and outside forces that were beyond the control of the nation, such as drought, floods, and the ban on Somali livestock exports to Saudi Arabia and that country's termination of its oil grant to Somalia. The latter seriously hurt the livestock sector and the country's foreign exchange earnings.

Economic Liberalization

At the behest of the donors, and with a recognition by the government that centralized control of the economy was not building the nation's economic health, liberalization of the entire economy was initiated in 1982. Its effects were most drastically felt in the agriculture sector which coincidentally enjoyed ample rainfall for the growing season in 1984 and dramatically increased crop production and sales. The critical importance of the livestock and agriculture sectors was once again reaffirmed as government intervention in markets was curtailed and incentives for producers increased through market mechanisms. The system of state economic control was slowly disassembled. However, despite the important reorientation of its policies, productivity in the agriculture sector remained low, a large balance of payment deficit lingered, the terms of trade for Somali products continually deteriorated, and the debt burden remained enormous. As a result, Somalia still faces the economic conditions that began the decade and which will possibly worsen, given the unstable financial situation.

Recent Developments

In recent years, the government was encouraged to institute foreign exchange auctions to unify the of-

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ficial and unofficial exchange rates, make them more flexible and responsive to market forces, and increase the availability of foreign exchange. Such new policies helped to regularize and regulate the foreign exchange markets more consistently, and consequently, ease the flow of imported goods. The new system was in place for much of 1986 and 1987, but was abandoned in September 1987 when the government suddenly reverted to its old system of fixed exchange rates and closer control of foreign exchange markets. At the same time, price controls were instituted. These two actions together disrupted markets for many products. The unofficial prices for many goods skyrocketed as did unofficial exchange rates. Shortages of many products and severe damage to the economy occurred as a new round of inflation was sparked. It also marked the unravelling of several years of careful policy reform which had helped to control the economy and reduce government intervention.

The government reentered negotiations with the IMF and agreed in July 1988 on a new reform program. Some parastatals are to be privatized and budget and credit ceilings observed, and there have been a series of devaluations. Whether this reform can be maintained remains to be seen, but over recent months, GSDR performance has met or exceeded expectations.

Policies and actual investments in recent years have emphasized livestock health and marketing, agriculture investments, banana production for export, and to a lesser extent, food production. Development assistance has been maintained at high levels with many projects and programs being undertaken in many areas of development. In many cases, positive results of projects have been very limited. Frequent changes in economic policies have played havoc with the economy, sending mixed signals to consumers and producers alike. Import restrictions have troubled Somalia's economy and hurt its prospects for growth and positive change.

2. The Role of Jubba Valley in the National Economy

Contribution of the Primary Sector

Livestock

The livestock subsector is an important part of the local economy, involving an estimated 254,900 people, or roughly 25 percent of the valley's total population. The contribution that livestock makes to the national economy is revealed in Table 26.

Table 26. JUBBA VALLEY AND NATIONAL LIVESTOCK POPULATION, 1988 (IN THOUSANDS)

Livestock Type	National Herd	Jubba Valley	% of National Herd
Cattle	1,437	4,463.8	32.1
Camels	711	6,703.3	10.6
Goats	1,289	18,870.7	6.8
Sheep	337	11,246.8	2.9

Source: Watson and Nimmo Data; Evans, Cullen, and Little Study, table 2.10

Jubba Valley contains the highest concentration of cattle in Somalia, representing nearly one-third of the national herd and over 10 percent of the national camel herd. Cattle are concentrated mostly in the Jilib and Kismaayo areas, while camels are found mostly in Gedo Region. Cattle are marketed for local consumption and slaughter in Muqdisho, and are exported to Kenya and overseas from Kismaayo. Camel's and cow's milk are marketed for local consumption through local marketing chains that supply the urban centers. Evans, Cullen, and Little estimated that marketing of animals and milk accounts for 75 percent of the marketed value of the four major agricultural commodities in Lower Jubba Region: bananas, maize, milk, and cattle. The livestock sector is thus responsible for generating substantial incomes for herders and traders alike. Moreover, the multiplier effect of livestock revenues to the valley is relatively high because the trade and income are locally based.

Small Farm Sector

The small farm sector consists of several types of farming systems using a mix of different kinds of land and water resources, but all using traditional seeds and techniques, hand labor, and no fertilizers or pesticides. Some farmers hire tractors for land preparation, particularly in Lower Jubba. Some farmers also irrigate their fields with pumps, particularly in Middle Jubba and Gedo regions. Yields for almost all crops remain very low. The contribution the agriculture sector makes to the national economy is presented in Table 27.

State Farm and Private, Commercial Farm Sector

In addition to the small-scale farms, commercial enterprises produce rice, maize, sugar, and bananas.

Three are public- funded state farms which produce particular crops whose contribution to the national economy is shown by the Jubba Valley production figures for rice and sugar noted in Table 27. Juba Sugar Project produces enough sugar to satisfy much of the regional demand, but not enough to satisfy demand outside the valley. Over one-half of the national rice production comes from the Fanoole Rice Project, while Mogambo produces both rice and maize. The three large projects combined provide an estimated five to six thousand jobs for local residents. This infuses the economy with sizeable income, although wages are low.

Table 27. CONTRIBUTION OF JUBBA VALLEY AGRICULTURAL PRODUCTION TO NATIONAL ECONOMY, 1987

Crop	Av.Yield (Tons/Ha) (000 Tons)	Jubba Valley (000 Tons)	National Production	% of Nat.Prod.
Maize	.7	21	382	5.4
Sesame	.5	7	52	13.4
Sorghum	.5	59	251	23.5
Rice	2.1	7	12	58.3
Bananas*	19.3	25	60	42.
Sugar	53.3	43	43	100.

* Total Yield

Source: Evans,Cullen, and Little Study table 2.9 and AHT production estimates.

Bananas are produced on 54 estates—some privately owned, some owned by Italian or Somali corporations. Four are owned and operated by the government. All estates export their bananas through Somalfruit, an Italian joint venture which has monopoly control over the marketing of inputs and monopsony control over exports. The banana estates are situated along the river, stretching from just above Jilib almost to the mouth of Jubba River. Quantities exported from the valley represent 42 percent of national production for export. The Evans, Cullen, and Little research results demonstrate that bananas represent only 15 percent of the estimated value of the principal marketed commodities. Banana production employs an estimated 9,400 people in Lower Jubba Region, but nearly 60 percent of revenues generated by banana exports leave the region.

Contributions of the Secondary and Tertiary Sectors

Contribution of Region to National Manufacturing

Though Kismaayo is the largest urban center of the valley as well as the southern part of the country, relatively little manufacturing takes place there. Various plants have been put into operation, such as a meat-packing plant, a hides and skins processing plant, and a fish-packing and freezing plant, but most are functioning at low capacity or not at all. Underutilization of these plants has meant that the valley is making a limited contribution to national manufacturing. The impact that such enterprises have on the region are equally limited since they provide only 4,300 jobs in a region of over one million, and the value of business done by these establishments is trivial compared to the total product of the entire valley. Table 28 reveals the impact of these operations.

Table 28. JUBBA VALLEY CONTRIBUTION TO NATIONAL MANUFACTURING, 1985

Variable	Jubba Valley	% National Total	National Total
No. of Establishments	11	5.7	193
No. of Workers	3,632	33.1	13,235
Earnings (SSh* 000)	74,800	32.3	292,458
Acquisitions (SSh, 000)	73,800	52.5	283,275
Value Added	542,085	32.8	1,772,175

Source: Evans, Cullen, and Little Study, table 2.11, citing Ministry of National Planning Industrial Survey, 1985

**The International Monetary Fund calculated the average official exchange rate for 1987 at 105.6 SSh to the U.S. dollar. The purchasing power parity during the same period, however, was just over 166 SSh to the U.S. dollar.*

Trade

The port of Kismaayo has been recently rehabilitated so that it can handle higher volumes of cargo than it did previously. It is currently used mainly for export of bananas, molasses, and occasionally livestock, and the importation of fuel. In recent years, it was also the point of departure for animal exports to the Gulf states, but that trade declined sharply in 1983 and has not yet recovered. Very little else is officially exported or imported.

The region's proximity to Kenya provides easy access to markets there for the sale of animals and the importation of many manufactured goods—especially foods and household goods. Most of this trade is unrecorded. However, it is clear that the volumes of trade are substantial because of the availability of goods throughout the valley. Prices also reflect ample supplies of most products. Since many products make their way to Muqdisho, the valley also serves as a transit zone through which much of the trade passes. Kenya supplies nearly all of the retail trade for the lower part of the valley since it is closer and more accessible than Muqdisho.

3. Macroeconomic Context for Prices and Markets in Jubba Valley

There are several agencies at the national level that are involved in the importation and distribution of foodstuffs and other commodities on the national market. Two of the most important agencies are the Agricultural Development Corporation (ADC) and the *Ente Nazionale Commercio (ENC).*

The ENC was created in 1962 to import cereal products and cooking oil on a competitive basis—storing and distributing these products to government agencies and parastatals, and exporting other goods on behalf of the government. The ADC was created in 1971 and given the monopoly over the purchase and sales of maize, sorghum, sesame, and rice. The creation of this agency followed Law No. 60 of September 1970 in which purchase, storage, sale, and distribution of those commodities by private persons for commercial purposes was prohibited (Abikar 1987). Each farm family was allowed to store up to one quintal (100 kg) of each product per family member; all other production was to be sold to ADC. However, ADC has rarely had sufficient funds at the proper time to effect this level of purchase (Abikar 1987).

The government monopolies on grain-marketing and commodity- importing discouraged national farm production and traditional long-term storage of cereals and may have contributed to rising rural-urban drift. Increased urbanization of the population and low urban food prices led to a rapid rise in domestic imports of foodstuffs from overseas. Farmers who stayed in the countryside shifted production from controlled cereals to fruits and vegetables which were not controlled. A parallel market in cereals developed with prices offered sometimes reaching three to four times the official price (Abikar 1987).

Some of the official trading restrictions were lifted by 1979, allowing private traders in rice, wheat, and wheat flour once more to import and distribute these commodities in the open market. In 1980, ADC also began to withdraw from purchasing local cereals, by increasing the producer price and limiting purchases to five percent of production. By 1982, ENC was handling only concessionary imports which it sold to wholesalers at prevailing market prices. By 1984, when prices were officially liberalized, ADC served only as a grain price stabilization board, buying surplus grain at harvest time and selling it on the market when prices exceeded the trend average. In 1985 and part of 1986, ADC paid farmers prices for grain that was above the private market. As a result, ADC was flooded with grain that needed to be stored.

From a steady level of approximately 600,000 ha of maize and sorghum from 1976 to 1980, the area planted increased to over 700,000 ha in 1981 after liberalization of price and marketing policies. The area planted then continued to expand each year until it reached 870,000 ha in 1985.

Reestablishment of controlled consumer prices for key foodstuffs in February 1988 has had an unclear effect on the agricultural sector and its production levels. Its initial effect was the disappearance of controlled foodstuffs from the market as traders and consumers began hording. Black markets soon developed for goods that could be acquired from Kenya, but local producers remained wary of the market and many commodities were soon hard to come by.

If prices remain controlled and black markets can be brought under control, production levels are likely to decline due to lack of market incentives. Low prices push producers back to subsistence cultivation causing domestic supplies on the market to dwindle. If the shortfall is not compensated by increased imports, consumers must either endure higher black market prices for goods or do without. Prior to the reestablishment of price controls, the selling price on imports was generally below local production costs (Guy Hill, IBRD, personal communication). With the current government price interventions in the market and the low import price factor, production levels for agricultural commodities are likely to stagnate. Farm incomes and

sources of investment in expanding local production will then drop. Import-related foreign exchange problems will become more acute.

4. Description of Jubba Valley Markets

There are few specialized or wholesale markets, or fixed places where bulking for wholesale takes place in Jubba Valley. Exceptions to this exist for livestock, and in some areas, for sesame and grain purchases (notably Jamaame). However, for the most part, Jubba Valley inhabitants produce food for their own consumption, bringing small quantities to sell into the marketplaces of small towns nearby (usually the district capital) when they need cash or wish to procure things that they do not themselves produce.

Most transactions take place for cash. Barter arrangements usually take place only at the village level between neighbors. Few Jubba Valley villages have dedicated marketplaces. The majority of the marketplaces that do exist are used primarily for the sale of milk by pastoral women from nearby encampments.

Market activity in each district capital in the valley shows that goods and produce are brought in from the outlying villages, and in sufficient quantities to make town markets dynamic sales points. The towns with the biggest populations or best transportation connections with the rest of Somalia have the largest and most dynamic markets. The markets in Baardheere and Jilib are large and offer a wide range of local and imported products for sale. Both of these towns have a direct road link with Muqdisho.

Markets of Luuq and Buurdhuubo are strongly influenced by the large number of refugees living in camps in the two areas. The goods offered for sale in these markets are dominated by refugee rations that are resold and exchanged for local goods, and products demanded by the large number of expatriates and civil servants who work on refugee problems in the area. Kismaayo is the largest market in the region with several daily markets for general foodstuffs as well as several specialized markets. The Jamaame market is also large and quite diversified.

All four major markets of lower Jubba—Kismaayo, Jamaame, Kamsuuma, and Jilib—serve as focal points for some bulking of fruit (particularly mangos) and the latter three sometimes engage in bulking of maize. At several periods during the year, traders converge on lower Jubba in order to purchase fruit for sale elsewhere. Since the advent of trucking in Somalia, traders have often come from as far away as Hargeisa and Djibouti to purchase fruit for resale in the north. It was formerly more common for truck-owning traders to drive through the area, village by village, filling their trucks with mangos. This still occurs, but more mangos are now being bulked in the roadside towns of Jamaame and Kamsuuma by local entrepreneurs. Traders from Muqdisho and the coastal towns of Baraawe and Merka, also frequently come to purchase fruits and grains—especially when supplies are low in Shabeelle Vailey. In 1987 and 1988, the reverse occurred: traders from Jamaame and Kismaayo districts were forced to buy maize in the agricultural towns of lower Shabeelle Valley because of a localized drought.

The presence of improved roads has had an important effect on the development of Jubba Valley towns and their markets. Jamaame town was much larger and more dynamic when the main road to Kismaayo ran through it. However, once bypassed by the paved Jilib-Kismaayo road in the 1960s, it went into a decline from which it has not recovered. The small size of the Bu'aale and Saakow markets is attributable to seasonal impassability of the main routes into these towns due to rain runoff and flooding. The market at Kamsuuma is much larger and more diversified than that of Bu'aale, despite the fact that the latter is both a district and regional capital. In fact, the market at Bu'aale offers little more in terms of quantity and variety than many large villages.

Baardheere has a large and fairly diversified market where goods and services are still oriented toward exchanges with pastoralists. A large part of the market is taken up with stalls selling locally produced products such as lead ropes, *hoori* mats, and wooden milk and water containers. Nonetheless, a number of cereal and sesame mills are housed in the center of the market, surrounded by a rich variety of fruits and vegetables coming in from the many irrigated farms in the area. Baardheere's position as one of the leading producers of onions in the nation is not specifically in evidence in the Baardheere market—probably because onion bulking operations take place in the field for direct shipment to Muqdisho and other large Somali towns.

The market in Jamaame is large and diversified. It was larger and more dynamic in former decades

when Jamaame was the center of colonial and post-colonial efforts in commercial plantation agriculture. Jamaame once contained a large cotton ginning operation as well as banana bulking stations. Now, although cotton is still grown in the area, raw cotton is trucked to Jowhar above Muqdisho for ginning and spinning in government mills. However, Jamaame market contains several diesel-run sesame presses and an ice manufactury. The live animal market is on the edge of town, and the market for firewood and building wood is also separate from the main market center.

Kismaayo town contains at least half a dozen general purpose markets, an official and unofficial fish market, a separate market for live animals (again on the edge of town), and separate sites for the sale of firewood, building poles, and fodder grasses. The livestock market sells animals almost exclusively for slaughter to Kismaayo butchers. There is another market and holding ground for animals destined for export. Traders will often buy animals for export out in the countryside as well as from herders who come to town.

One market, Suuq Yare, despite its name ("Little Market"), is the main market and demi-wholesale market from which some of the other markets procure their goods. These dependent markets include Suuq Weyne, Farjaano, Sinai, and Via Afmadow. The latter specializes in milk and animal products, as it is located on the main road that leads out to some of the most important pastoral areas. The main fodder market is located close to this market.

Kismaayo town has a meat-packing plant, a defunct hide- tanning operation, and a fish-freezing plant at the docks. The frozen fish—including shrimp and lobster—is exported. Bananas, hides, and dried shark are also occasionally shipped from the town's port. Kismaayo also receives a number of goods including tea and coffee from Kenya which is redistributed up the valley.

5. Internal Trade in Jubba Valley

Fish

Consumption of fish is not very important in the pastoral economy of Somali. However, fish are an important source of protein for certain groups, particularly in Jubba Valley.

Three kinds of fishing can be delineated in Jubba Valley: commercial ocean fishing, commercial fresh water fishing, and subsistence fresh water fishing.

A large group of people from Kismaayo, its southern coast and off-shore islands are involved in ocean fishing and have been for many centuries. Originally subsistence fishermen, these people are the main source of fish entering the Kismaayo domestic market and the Somali frozen fish export market. Generally, the more expensive types of seafood, such as shrimp and lobster, are frozen for export. Occasionally, ocean fish will be packed with ice and taken fresh to some inland markets, such as Jamaame and Jilib, but this is rare.

In Kismaayo, the producer and retail prices of fish are controlled. Commercial fishermen generally operate within cooperatives, and, as such, must sell fish at a fixed rate per kilogram—no matter what the type. However, seafood such as lobster sells for a much higher price. Cooperatives were organized by the FAO Fisheries Project which provides them with motorized trawlers, nets, and other equipment. The set price was initiated so the project could recoup monies invested in the cooperatives.

The main retail market for fish in Kismaayo is located next to Suuq Yare. A parallel market for fish exists just outside the walls of the concrete block fish house. Here, fishermen sell their catch directly to the public for a free-market price that is above what the fishermen can earn from the government. Fish here also costs the public less than the official price on the market. Producers are paid between 18 and 23 SSh/kg for fish sold in the government market. Retail prices are approximately three to four times the producer price. Table 29 below outlines the different types of fish (by local name) sold at the fish-processing plant and their average price in 1987.

Table 29. AVERAGE PRICE FOR KISMAAYO OCEAN FISH 1987

TYPE	RETAIL PRICE/KG	PRODUCER PRICE/KG	TYPE	RETAIL PRICE/KG	PRODUCER PRICE/KG
Booma	57.5	19.3	Taayo	48.3	17.8
Saafi	47.9	19.9	Birbirow	77.9	22.1
Toona	87.8	21.6	Sumaan	98.6	22.2
Tabadiin	77.6	21.8	Bayaad	72.1	21.2
Kisuumbe	80.0	20.8	Makeedi	57.5	19.0
Taraaqad	76.4	20.3	Kishaar	46.5	18.3
Kooma	43.7	17.8	Libaax	53.2	18.2
Aargoosto	195.8	20.6	Gubeyr	130.0	22.4

Construction of the Fanoole Barrage does not seem to have had a negative impact on ocean fisheries, either through sediment reduction or on blocked spawning paths.

Most of the small number of people involved in commercial fresh water fishing operate in Jamaame District through self-formed cooperatives. The largest of these operations centers on fishing at Dhesheeg Waamo. The groups have 20 to 50 members who come from different parts of the district. Within each group, members work in shifts for four days to one week. During this time, they catch fish and dry it for sale in the villages and towns of the district. A bundle of dried catfish (*Clarias*) weighing about 10 to 15 kg sells for approximately 1,000 SSh. The bundles contain between 30 and 35 fish (Meredith, Field notes 1987). A fish that sells for 35 SSh near Dhesheeg Waamo would sell for 100 to 135 SSh in the fishermen's towns of Jamaame and Kamsuuma. Fresh and dried fish from Dhesheeg Waamo are sold in several of the area towns, including occasionally Jilib.

People turn to river fishing only when the dhesheeg waters are too high, or when the river waters are low (Meredith 1989). A vehicle from Kamsuuma runs to Dhesheeg Waamo daily, to take fish from the fishermen and transport people and goods back and forth.

However, for the most part, fishing is done in Jubba Valley on an individual basis. People fish all along the river and occasionally sell some of their catch to their neighbors. Area dhesheegs are also important sources of fish. If someone wants fish, they will go to a known village fisherman to see if he has anything for sale. At times, people from Jilib will go out to area dhesheegs (mostly in the Shabeelle swamp area to the east) to purchase fish. In Baardheere, local fishermen will occasionally sell their catch in the marketplace. In such instances, there is no set price for fish—it follows the dictates of supply and demand. Table 30 shows the prices paid for river fish in the market at Baardheere. Fish are usually sold in small piles of two to three fish with prices varying according to the season, and the size and type of fish.

Jilib market is the only market in which the JESS marketing survey team found regular sales of dried fish. The JESS fisheries expert also found regular sales in Jamaame and Kamsuuma (Meredith 1989). In Jilib, the size of a pile of dried cuttings in the market was 80 pieces. Dried, half- fish were sold in piles of two to three pieces. The price per piece for the latter was between five SSh and 50 SSh. The average price for the small dried pieces was about 1.4 SSh. The wholesale price for small cuttings was just over one SSh per piece.

Table 30. AVERAGE PRICES FOR FRESH FISH IN BAARDHEERE MARKET, 1987

TYPE	NUMBER/PILE	(SSH/PIECE)
Shaarub	2.5	78.0
Ballan	2.8	81.6
Mallay Madow	2.4	68.3
Mallay Qolofle	3.7	24.9
Mallay Libin	2.2	77.5

In general, demand is low for fish except among people who live on the coast or immediately along the river. Most other groups have a marked preference for meat. Some riverine groups are dependent on fish as a source of protein. Those living in areas which are cut off from herder contact and whose livelihood has declined are particularly dependent upon fish for their own consumption and sometimes as a source of cash. This is particularly true in the areas in Jilib and Jamaame districts close to the large-scale irrigation projects.

Meat and Milk

The markets for milk and, to a lesser extent, meat, are very important in the economic life of Jubba Valley. In villages that have no other formal market place, a spot in the center often exists where pastoral women bring in milk and ghee to sell. Larger villages often have an irregular butchery that serves smaller satellite villages with meat for sale, even if there are a few shops in the area.

Herders have exchanged livestock products for agricultural products for centuries. While past exchanges of grain for milk, meat, and ghee were made through barter transactions, increasingly, such transactions have taken place for cash in the market places of the larger towns. Drawn by the higher prices offered for their products in the towns, and the greater availability of other goods requiring cash there, herders often ignore agricultural villages with which they have made exchanges in the past. Farmers who want to procure milk and other animal products must go more often to the larger settlements and towns to find them. Construction of roads, large government projects, and the greater

availability of transportation between various points in Somalia have all encouraged this trend. In poorer agricultural areas that are deprived of contact with passing herders and where people cannot afford to purchase their products in the towns, these changing trade relations are having an impact on nutritional levels.

The three most popular types of meat sold in Jubba Valley are beef, camel, and goat. Mutton is much rarer. Prices on meat in urban markets are set by the government. During most of the JESS study period, in principal, this price was 80 SSh per kilo for beef or camel meat with the bone and 160 SSh for boneless meat. Goat meat is usually sold by the leg or a piece of the side, always with some bone. Goat liver and kidneys are often sold together and are a preferred breakfast food for those who can afford it. On a per kilo basis, goat liver and kidneys sold for an average of between 212 and 300 SSh in 1987. The control of butchers' prices depends on the isolation and size of the market town, as the average prices for 1987 (indicated in Table 31) show.

Table 31. AVERAGE PRICES FOR MEAT IN JUBBA VALLEY, 1987 (SSh/kg)

TOWN	CAMEL	CAMEL BONED	BEEF	BEEF BONED	GOAT
Buurdhuubo	201.0	230.0	208.0	230.0	218.0
Baardheere	99.6	151.7	95.4	150.0	193.5
Jilib	102.9	186.7	102.9	115.0	187.7
Kismaayo	95.5	181.8	90.0	179.2	264.0

The prices for camel meat and beef (with bone) are nearly the same in each market, although there is a great deal of variation between markets. In addition, the spread in price between meat with and without bones is about the same in each market. Boneless camel meat is higher than boneless beef in Jilib only. In Kismaayo, there is an abundance of camel and beef offered for slaughter daily. This helps explain the low price for these meats in this town. Goats are scarce in the south and the demand for goat meat in Kismaayo is steep.

Meat prices more closely reflect the official price in Kismaayo and Baardheere. Jilib is also fairly close, at least for the cheapest cuts of meat. The divergence of prices in Buurdhuubo—almost twice that of other areas—cannot be explained except, perhaps, because of its isolation from other urban areas. However, given the high number of animals in the Buurdhuubo area, the high meat prices there are puzzling.

In the JESS consumption study, it was rare to find a family in any sector that did not eat some meat at least once a week.

There are four principal kinds of milk sold in Jubba Valley: fresh cow's milk, fresh camel's milk, sour cow's milk, and sour camel's milk. Goat's milk is rarely sold.

The milk marketing study done by Evans, Cullen, and Little for the Kismaayo area reveals that camels furnish a more regular supply of milk during the year than cattle and consequently, camel's milk is the only milk type that is consistently sold in the urban markets of the southern valley (Evans, Cullen, and Little 1988). For Kismaayo, in particular, urban-based traders collect slightly soured camel's milk from the countryside within a radius of approximately 50 km. They send empty milk containers on regular transport vehicles and their trading partners in the countryside fill the containers and send them back (Evans, Cullen, and Little 1988).

Fresh camel's milk is supplied to towns by pastoral women whose family herds happen to be in the area. In Kismaayo and the larger towns of the valley, the supply of fresh camel's milk is continued almost year-long. However, as the Evans, Cullen, and Little study showed, this type of milk can also disappear from the market. Because of severe drought in the Kismaayo area during the study period, cattle and camel herders were forced to move their herds across the river, toward the Lower Shabeelle swamps. As herds moved away from the eastern Jubba Region, the number of milk sellers in the Jamaame market fell in one week from 100 to only 25.

Cow's milk tends to be produced by urban residents, either for their own use or for sale in town. In Kismaayo, fresh cow's milk is supplied primarily by producers living on the fringes of town (peri-urban areas). However, despite their proximity to markets, fresh cow's milk often disappears from the market toward the end of any dry period because of the lack of sufficient graze for the animals. The large seasonal fodder market in Kismaayo attests to the large number of animals kept in or near that town, although most milk producers cannot afford to purchase fodder for more than one or two milk animals over an extended dry season. Nevertheless,

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peri-urban producers supply urban markets with fresh milk longer than pastoral suppliers. The latter either must move further away from the urban areas to get sufficient graze for their animals during the dry season, or must retain the small amount of milk produced by their animals during the dry season for their own consumption.

The three categories of sellers: urban-based, pastoral, and peri-urban are almost exclusively composed of women (Evans, Cullen, and Little 1988). Urban-based and peri-urban traders tend to be divorced or widowed heads of households.

Table 32 is a summary of the primary sources of milk supply for each district town covered by the JESS Marketing Survey. Supplies from the market town itself are from urban-based and peri-urban producers. In general, most of the milk supplied to these four towns comes from a radius of between 10 and 50 km. However, if milk is walked into market, it generally does not come from further than 15 km away.

Table 32. MAIN SOURCE OF MILK SUPPLY FOR FOUR JUBBA VALLEY MARKETS

BUURDHUUBO	BAARDHEERE	JILIB	KISMAAYO
Buurdhuubo	Baardheere	Jilib	Kismaayo
Countryside	Hureena	Hombooy	Biroole
Refugee camps	Jamballey	Sh/Ax. Yare	Buulo Xaaji
	Daar	Biliksa	Canjeel
	Caanoole	Geesguud	
	Aaminey	deex	
	Gantama	Burgaan	
	Darjaani	Hiloshiid	
	Siidaamo		

Although large urban areas are generally assured of some kind of milk supply throughout the year, supplies to smaller towns and villages are less consistent. Veterinary supplies of *trypanosomiasis* prophylactics are harder to procure in many of the more isolated areas of the valley, making peri-urban or peri-village milk production more difficult. Further, as mentioned earlier, herders tend increasingly to take their milk for sale to the larger towns, reducing the supply available for purchase in the smaller agglomerations. For sedentary village dwellers to procure milk, it is sometimes necessary to go to the district town. However, herders exchange milk with villagers in the dry season when they come to gather or buy crop residues for their animals.

Milk is generally sold by the *galas* or *shood*. JESS measured an official *galas* at 450 milliliters, but there is undoubtedly variation in the measures that are used traditionally; pastoral women tend to use carved wooden cups for this purpose. Evans, Cullen, and Little found galas or shood measures to be the equivalent of 0.33 liters (Peter Little, personal communication).

Table 33. AVERAGE PRICE OF MILK IN FOUR MARKETS OF JUBBA VALLEY, 1987 (in SSh/shood)

TOWN	FRESH MILK	SOUR COW'S MILK	SOUR CAMEL'S MILK
JESS DATA			
Buurdhuubo	28.0	12.5	19.5
Baardheere	35.8	23.6	31.7
Jilib	27.3	12.0	24.5
Kismaayo*	28.6	15.6	23.0
EVANS,CULLEN, AND LITTLE DATA			
Kismaayo**	25.7	13.8	20.1
Jamaame	23.2	9.0	18.0

**Average of bi-monthly prices from 4 Kismaayo markets*
***Average of wet and dry season prices from 2 markets in Kismaayo*

Results of both surveys show a consistent gap between the prices of each of the three kinds of milk although the level varies from market to market. The price of fresh milk centered around 27 SSh/shood, cow's milk was around 15 SSh/shood, and that of sour camel's milk was nearly 23 SSh/shood. Although cow's milk commands a higher price when fresh, camel's milk is preferred to cow's milk when they are sour.

Live Animals

All four towns in the JESS survey had active markets for live animals. Livestock owners generally sell their animals because of cash needs, but they also sell if an animal is sick, or if they want to alter their herd composition by selling certain kinds of animals in order to buy other types. Buyers purchase animals for slaughter, in order to increase the size of their herd, or to alter the mix of their herd by adding a fertile female or a breeding male.

In Kismaayo, the livestock market can be divided into two parts: the market for sale of animals to local butchers and herd owners, and the sale of animals to traders for transport elsewhere in Somalia or for export.

Table 34 records the high and low range for prices for several animal species in Baardheere. In general, the gender, condition, and special characteristics determine approximate price in each species. However, supply considerations, such as the difficulty of the season and presence of animals in the market area, also influence the price.

Table 34. PRICE RANGE FOR DIFFERENT SPECIES AND CONDITIONS OF LIVESTOCK IN BAARDHEERE, 1986-88
(high and low prices)

SPECIES	SEX	TYPE	CONDITION	PRICE (SSh)
Cattle	M	Bull	Excellent	14,500
Cattle	M	Steer	Poor	2,225
Cattle	F	Lactat	Excellent	15,000
Cattle	F	Nonlact.	Sick	500
Goat	M	Mature	Good	7,800
Goat	M	Mature	Fair	1,600
Goat	F	Lactat.	Good	3,500
Goat	F	Nonlact.	Fair	1,120
Camel	M	Bull	Excellent	28,000
Camel	M	Bull	Poor	9,000
Camel	F	Lactat.	Excellent	33,455
Camel	F	Nonlact.	Fair	7,010
Camel	F	Immature	Fair	6,700
Donkey	M	Mature	Excellent	7,500
Donkey	M	Mature	Fair	5,020

In Jilib, prices for nonlactating cows ranged from 5,100 SSh for one in fair condition to 8,900 SSH for one in excellent condition. In that same town, the price range for bull camels was between 5,000 SSh and 23,500 SSh depending on the age and condition of the animal.

Table 35 gives the local livestock market price summary for the Kismaayo, Baardheere, and Jilib districts in 1987, while Table 36 shows the average price for each animal species and gender from the end of 1986 through the first quarter of 1988 for the four markets in the SEBS marketing study (see note below table).

Average livestock prices could be higher in Kismaayo than in other markets because of the condition of animals sold in the smaller markets and the lower demand at those points. To some extent, the active export market for livestock that is centered in Kismaayo could be contributing to higher prices.

Table 37 indicates some of the more important sources for live animals in each of the four JESS survey markets.

Table 35. LOCAL LIVESTOCK MARKET PRICE SUMMARY, 1987
(Somali Shillings)

	KISMAAYO		BAARDHEERE		JILIB	
TYPE	AVG	MAX	AVG	MAX	AVG	MAX
CAMELS						
Bull	30,694	46,900	20,340	28,000	13,083	23,500
Castrated	27,009	46,973	19,526	24,290	10,790	12,500
Lactating	20,656	32,565	25,485	33,455	19,900	21,000
Non-lact	18,137	35,500	12,400	20,000	12,607	16,060
Non-bred	25,612	46,800	10,185	14,000	7,959	7,959
CATTLE						
Bull/steer	13,348	22,600	7,326	14,500	7,438	10,350
Lactating	14,259	25,380	11,190	15,000	10,640	14,185
Non-lact	8,167	14,208	7,027	14,000	6,640	10,091
Calf (F)	6,120	7,405	4,264	6,000	3,883	5,000
Calf (M)	5,690	7,570	-	-	3,824	4,005
GOATS						
Male	2,578	[illegible]	2,990	4,700	2,041	4,650
Female	3,059	[illegible]	2,352	3,500	2,419	4,238
SHEEP						
Male	2,595	[illegible]	2,436	3,500	3,431	4,368
Female	1,601	[illegible]	1,900	1,900	1,963	5,500

Tabl[illegible] AVERAGE PRICES FOR LIVE[illegible]ALS IN JUBBA VALLEY, 1986-88

	BUURD[illegible]	BAARDHEERE	JILIB	KISMAAYO
CAMEL				
male	no[illegible]	18,278	12,529	26,810
female	no[illegible]	13,004	12,607	21,367
CATTLE				
male	8.[illegible]	7,076	7,342	11,645
female	16.0	14,024	6,591	8,330
GOAT				
male	2.[illegible]	2,257	2,152	2,775
female	2.[illegible]	2,323	2,478	3,011
SHEEP				
male	3,076	2,392	5,122**	2,595
female	2,876	1,900	2,539	1,601
DONKEY				
male	none	5,010	6,100	4,000
female	none	7,500	12,359	none

**Buurdhuubo[illegible] data start only in May 1987; data for Jilib and Baardheere [illegible]t in November 1986 and run until March 1988.; Kismaayo d[illegible] as gathered for the period December 1986 through Fe[illegible] 1988.*

***Average [illegible]315 SSh before the addition of a large ram priced at the [illegible]usual price of 10,350 SSh.*

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Table 37. SOURCES OF LIVE ANIMALS SOLD IN JUBBA VALLEY MARKETS

	BUURDHUUBO	BAARDHEERE	JILIB	KISMAAYO
CATTLE	Buurdhuubo	Shangolow	Jilib	Kismaayo
	Garbahaarey	Baardheere	Biliqsa	Afmadow
	Luuq	Dhakaje	Balley	Muqdisho
	Hilo Mareer	Siidaamo	Hombooy	Yaaq Bishaaro
	Qansaxdheere	Daar	Biliqmarrow	Merka
		Ilbeeto	Haranka	Badhaadhe
CAMELS	none	Faafxadhuun	Balley	Kismaayo
		Daar	Hiloshiid	Warsingow
		Gantama	Jilib	C.Biroole*
		Siidaamo	Bu'aale	Beerxaani
		Ceel Cilaan	Kamsuuma	Libooye
		Dhakaje	Arbay Cabdi	Baydhabo
GOATS	Buurdhuubo/ Bush	Ceel Cilaan	Saakow	Kismaayo
	Garbahaarey	Markabley	Haranka	Haranka
	Qansaxdheere	Hiloshiid	Baardheere	Jamaame
	Luuq	Dhakaje	Kamsuuma	Jilib
	Hilo Mareer	Baardheere	Jilib	Canjeel
	Refugee camps	Shangolow	Deg Cadey	Kafarka
SHEEP	Buurdhuubo/ Bush	Baardheere	Jilib	Kismaayo
	Garbahaarey	Daar	B/Haxma	Afmadow
	Qansaxdheere	Dhakaje	Afmadow	Jamaame
	Luuq	Ilbeeto	Baardheere	Haranka
	Refugee camps	Dhoobley	Hiloshiid	Libooye
	Baardheere	Kormare	Haranka	Kudhaa

**According to Evans, Cullen, and Little, Cabdulle Biroole is the same place as Yaaq Bishaaro.*

Generally, the area immediately around the market town is the main source of animals for sale. However, because of the nature of transhumant pastoralism animals coming from more distant areas show up for sale in these markets. Buurdhuubo and Baardheere markets draw mainly on their immediate districts for live animals, although animals also come from Ceel Waaq (Faafxadhuun) and Luuq districts, as well as the Bay Region. Jilib draws animals from the rangelands on both the east and west banks of the Jubba River, particularly from the Shabeelle swamps area immediately east of the town. Camels from Middle Jubba Region and small ruminants originating in Baardheere are also offered for sale in the Jilib market. Kismaayo draws in animals from the widest range of all. Cattle and camels come from the Bay Region, the Kenya border area, and as far east as Muqdisho and Merka.

However, the most important source area for these animals is between Kismaayo and the Afmadow. Small ruminants come from Jamaame and Jilib districts, particularly from the area between the Shabeelle swamps and the coastal Deex.

Grains and Oilseeds

The most important traditional agricultural crops grown in Jubba Valley are maize, sorghum, and sesame. Maize production is centered on the Lower and Middle Jubba regions while sorghum production is concentrated in the zone north of Saakow. However, with the advent of small-group pumping, maize production has expanded along the river into areas with irrigation. Sesame is grown throughout the vailey.

There is little bulking and wholesaling in Jubba Valley for the main cereal grains. Occasionally, traders from the larger towns will go to the main producing areas to purchase large quantities for transport back to the urban areas, but this appears to be done on an *ad hoc* basis, with little or no formal organization or operation. Maize shortages in Muqdisho have consequently been filled by purchases in Jilib market.

Table 38 below shows the average prices for cereal grains in the JESS survey markets from 1986 to 1988. The average price of rice in those markets is included for comparison.

Table 38. AVERAGE PRICES FOR FOUR STAPLE GRAINS IN JUBBA VALLEY MARKETS (1986-88) (in SSh/kg)

	MAIZE	SORGHUM	SESAME	RICE
Buurdhuubo	26.5	31.2	49.6	63.1*
Baardheere	25.8	20.3	61.5	57.6*
Jilib	20.7	26.8	55.3	54.1**
Kismaayo	23.9	36.4	61.5	48.2**

**Imported rice only*
***Average price of imported and local*

During the study period, prices for sorghum were generally above that of maize, except in the main sorghum-producing area of Baardheere. Both cereal prices were far below that of rice. However, rice is a popular food. In Somalia, rice and pasta entered local diets in severe drought years when locally produced cereals were unavailable, and have become preferred grains.

To provide some notion of price fluctuations and seasonal variations, Table 39 shows the range of prices attained by cereals and sesame over the study period as well as the quarterly price averages for these foods.

The spread between high and low maize prices is fairly consistent between Buurdhuubo, Baardheere, and Jilib (between 20 and 23 SSh), although the prices go much higher in Gedo Region than they do in the main producing areas around Middle Jubba Region. The low price of 12 SSh/kg in Jilib occurs at harvest time and is an indication that Jilib is more central to maize production than either Buurdhuubo or Baardheere. The range in high and low prices for maize is much narrower in Kismaayo, indicating that this large urban area can attract supplies on a more constant basis year- round than the other areas.

Table 39. HIGH/LOW PRICE RANGES AND QUARTERLY AVERAGES OF GRAIN PRICES IN JUBBA VALLEY, 1986-88 (in SSh/kg)

	High	Low	(4Q 86)	(1Q 87)	(2Q 87)	(3Q 87)	(4Q 87)	(1Q 88)
Buurdhuubo								
maize	40	20	-	-	17	16	25	26
sorghum	47	25	-	-	23	25	19	26
sesame	80	32	-	-	48	60	38	32
Baardheere								
maize	40	17	20	2[illegible]	26	18	29	34
sorghum	37	12	17	[illegible]	19	14	26	25
sesame	100	40	40	80	82	77	57	76
Jilib								
maize	33	12	15	19	20	21	21	28
sorghum	28	20	27	28	26	27	-	-
sesame	67	40	47	55	50	62	54	65
Kismaayo								
maize	30	17	17	22	24	24	24	30
sorghum	66	17	-	27	30	38	39	52
sesame	73	53	-	58	53	68	63	67

**Prices were not taken for the full three months in either 1986 or 1988 in any market. These "quarters" are indications of earlier and later prices in the 1987 series.*

However, the spread between sorghum prices in Gedo Region (between 22 and 25 SSh) compared with Kismaayo (49 SSh) indicates that Kismaayo is far from the major sorghum-producing centers of Gedo Region and cannot procure a constant supply for its markets. Demand for sorghum is relatively low in Kismaayo as well as in Jilib, where demand for this grain occurs primarily as a function of price.

The spread between high and low sesame prices is more variable. As a large urban area, Kismaayo can maintain a steadier supply of sesame than other places. Its higher prices, relative to Jilib, indicate that it can attract sesame from wherever it is available in the area. The JESS surveys indicate that both Kismaayo and Jamaame districts supply Kismaayo with sesame.

Price curves for all three commodities in Jilib and Kismaayo move together over the seasons. For maize and sesame, Jilib price lines run below but in a near mirror image of Kismaayo prices. In Gedo Region, maize price lines for Buurdhuubo and Baardheere tend to run parallel, although Baardheere's prices are consistently higher. Prices appear to fluctuate more for maize in Gedo Region than in Lower Jubba Region.

Price trends for sorghum are difficult to discern as price information [illegible] not available for the first two quarters for Jilib [illegible] the last two quarters for Buurdhuubo. In addition, Baardheere and Kismaayo appear to move in opposite directions from each other. Sesame price lines move together with slightly deeper [illegible] in Gedo Region. In general, cereal prices [illegible] the most during the third quarter of 1987 [illegible] September); sesame prices fell most during the last quarter of 1987. Highest prices occurred during the first quarter of 1988. In all cases, the general price trend was slightly upward over time.

Table 40 indicates the main sources of supply for the principal [illegible] grains (and rice) to each of the four survey markets.

For the most part, maize supplies to the Jubba Valley markets come from the immediate area, except for Kismaayo. In Gedo Region, the area immediately surrounding a market town is the exclusive source of maize. Jilib is one of the principal maize-producing centers in Jubba Valley which is indicated by the numerous neighboring villages that it supplies with this grain. Kismaayo is the only market that draws maize in from further afield. Here, maize comes in from Jilib, Jamaame, and Kismaayo districts, as well as from Lower Shabeelle [illegible] and Muqdisho when local supplies dry up. However, in normal times, the villages of Jamaame district are the principal maize suppliers to the Kismaayo markets.

The main source for sorghum throughout the valley is from the Baakow-Baardheere area, which sup-

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plies markets from Kismaayo up to Buurdhuubo (and probably Luuq). The primary supplier of the Kismaayo markets is Baardheere, Saakow is the principal supplier for the Jilib market.

Table 40. SOURCES OF GRAIN FOR JUBBA VALLEY MARKETS, 1986-88

MARKETS	MAIZE	SORGHUM	SESAME	RICE
Buurdhuubo	Refugee*	Baardheere	Refugees*	Muqdisho*
	Buurdhuubo	Buurdhuubo	Buurdhuubo	Baydhabo
	Refugees			
Baardheere	Baardheere**	Baardheere**		Saakow*
			Baardheere	
			Muqdisho	
Jilib	Beled Raxma	Saakow	Yaaqle	Muqdisho*
	Jilib	Diinsoor	Jilib	Faanoole
	Kamtanda	Hombooy	Hiloshiid	Jilib
	Adooma	Baardheere	Cusbooley	Janaale
	Moobleen	Bidi	B/Shidaad	
	Kaytooy		Mansuur	
	Cusbooley		B/Mareer	
	B/Mareerta		Jaraawe	
	Hiloshiid		Kumbareera	
	Qoryoole		B/Balley	
Kismaayo	Jamaame*	Baardheere*	Jamaame*	Muqdisho*
	Kismaayo	Jamaame	Kismaayo	Faanoole
	Jilib	Muqdisho	Mogambo	Mogambo
	Muqdisho			
	Qoryoole			
	Mareerey			
	Sangunni			
	B/Mareerta			

** 50% or more of recorded sales (by number, not volume) came from here*

*** 100% of recorded sales came from here*

Sesame, like maize, tends to come in from the area immediately adjoining the market town, as in the cases of Buurdhuubo and Jilib. However, Saakow is the principal supplier of this oil seed to the Baardheere market—possibly because so much of the agriculture in that area is devoted to irrigated commercial crops, such as onions. Jamaame villages are the main source of sesame supplied to the Kismaayo market.

Imported rice comes to Jubba Valley from Muqdisho. In all four markets, it is this type of rice that predominates in the shops and stalls. Even in Jilib and Kismaayo, which are situated on either end of the state farm rice production projects of Fanoole and Mogambo, very little of the rice from those projects appears in the market. Even though prices are lower than for imported rice, supplies of locally produced rice are quite small due to production limitations noted elsewhere.

Fruits and Vegetables

A great quantity and variety of fresh produce and fruits are marketed in the main producing areas (along the Jubba and Shabeelle rivers), but relatively few outside these areas. Muqdisho benefits from being within easy transport distance of Afgooye which is the main source of supply to the capital.

Fruits and vegetables that can endure long periods of transport and lack of refrigeration have done relatively well in the markets of Somalia. Bananas, in their green state, are widely distributed. In recent years, watermelons have also been grown on a commercial scale, marketed throughout the urban areas of southern Somalia, and, occasionally, exported. Several vegetables that normally do well in conditions where cool storage is unavailable are imported into Somalia from neighboring countries. This category includes potatoes from Kenya and garlic from Ethiopia, (Ministry of Agriculture July 1988). Other hardy vegetables, such as turnips, beets, and cabbages are almost unknown in Somalia.

Table 41 lists fruits and vegetables that are grown in Jubba Valley and appear on local markets throughout the area. With the suppression of grain marketing during the 1970s, and the more recent spread of small-group irrigation, fruit and vegetable production is flourishing throughout the valley. The Baardheere area is currently the reigning capital of onion production distributed throughout the country. The area around Luuq has recently become the second largest onion producer in the country (Jaffee 1984). Further, Kamsuuma and Jamaame serve as important bulking centers for mangos that are picked up by truckers from northern Somalia and Djibouti at regular intervals.

Despite the increase in small-group irrigation around Buurdhuubo, many of the fruits and vegetables being grown in other areas are still not grown in this area or in sufficient quantities to be marketed. The great range of fruits and vegetables available in southern markets attests to longer ex-

perience with irrigation and exposure to foreign populations that have introduced many of these crops into Lower Jubba Region.

Table 41. FRUITS AND VEGETABLES SOLD IN JUBBA VALLEY MARKETS, 1986-1988

BUURDHUUBO	BAARDHEERE	JILIB	KISMAAYO
Fruits			
bananas	bananas	bananas	bananas
—*		coconut	coconut
—	—	dates	dates
grapefruit	—	grapefruit	grapefruit
—	—	guava	guava
limes	limes	limes	limes
—	mangos	mangos	mangos
—	—	oranges	—
papaya	papaya	papaya	papaya
—	tamarind	tamarind	tamarind
—	watermelon	watermelon	watermelon
Vegetables			
beans	beans	beans	beans
—	carrots	—	carrots
garlic	garlic	garlic	garlic
—	green onions	—	green onions
—	green pepper	green pepper	green pepper
—	hot pepper	hot pepper	hot pepper
—	leafy grns	leafy grns	leafy greens
lettuce	lettuce	lettuce	lettuce
—	okra	—	okra
onions	onions	onions	onions
—	—	—	parsley
—	—	plantains	plantains
potatoes	potatoes	potatoes	potatoes
—	—	pumpkin	pumpkin
—	squash	squash	squash
—	sweet potat.	sweet potat.	sweet potat.
tomato, lrg	tomato, lrg	tomato, lrg	tomato, lrg
tomato, sml	tomato, sml	tomato, sml	tomato, sml

**A "—" indicates that the item was not noted by the market surveyor, although it may appear in the market at some times.*

In general, fruits are sold by the piece and vegetables by the pile, although pumpkin can be sold by the slice (Table 42). In markets where there are few vegetables for sale, such as Bu'aale and Saakow, vegetables such as onions are sometimes divided into halves or quarters for sale. Instead of the price changing for a measure of fruit or vegetable, the measure usually changes: a five-shilling pile of small tomatoes may contain 25 fruits at harvest time but only five or 10 in a season when they are scarce. Therefore, as a simple indication of the price range offered for fruits and vegetables in the valley, Table 42 presents the high and low prices for some of the more important items using the measures by which they were sold.

Table 42. PRICE RANGES FOR SELECTED FRUITS AND VEGETABLES IN JUBBA VALLEY, 1986-1988 (In SSh/measure)

ITEM		BUURDHUUBO	BAARDHEERE	JILIB	KISMAAYO
Tomato	High	10/pile	10/pile	10/pile	20/pile
Small	Low	8/pile	5/pile	2/pile	5/pile
Tomato	High	3/piece	20/pile	5/piece	30/pile
Large	Low	2/piece	5/pile	1/piece	10/pile
Onion	High	10/piece	180/kg	300/kg	250/kg
Low		3/piece	15/kg	40/kg	45/kg
Potato	High	100/kg	220/kg	200/kg	140/kg
Low		100/kg	100/kg	80/kg	
Beans	High	80/m[illegible] (2)	50/*shood*	380/*suus*	240/*suus(3)*
Low		*50/madaal*	120/*shood*	120/*suus*	120/*suus*
Green	High	—	5/piece	7/piece	5/piece
Peppers	Low	—	1/piece	1/piece	2/piece

(1) Only two data po[illegible] both 100 SSh/kg.
(2) Mandaal is appre[illegible]ely equal to a shood, that is, between 0.6 and 0.75 kg. A su[illegible] beans normally equals 3.2 to 3.5 kg. There are generally [illegible] in one suus.
(3) If mung beans ar[illegible]ded, high price is 400 SSh/kg

The large range in prices between high and low points indicates the volatility of the vegetable market. During peak season, vegetables flood the local markets, driving the prices very low. At other times, local demand exceeds supply.

Measures used in the markets are tending to become standardized. While onions are still being sold by the piece in the Buurdhuubo market, they are sold by the kilogram in the larger markets of Baardheere, Jilib, and Kismaayo. Although traditional volumetric measures are often used for grains, beans, milk, and oilseeds, measures are fairly comparable throughout the valley, and each one has a metric equivalent that is known and accepted.

The following table indicates the key supply areas for selected vegetables in the Jubba Valley markets.

Several vegetables including beans and tomatoes, are principally supplied to Gedo Region from the Bay Region. Muqdisho is also an important supplier of vegetables. The capital serves two functions with

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regard to food distribution: to distribute imported goods like potatoes and rice to the interior urban areas and to redistribute foods produced in Somalia from one area to another. Beans supplied to Gedo and Kismaayo from Muqdisho may be grown in either Bay Region or along the Shabeelle River. These must be bulked and brought to Muqdisho for resale to markets in the capital and to interior markets. The redistribution function is mirrored in the interior districts by distribution networks that link district towns with villages and smaller urban markets.

Table 43. SOURCES OF SELECTED VEGETABLES FOR MARKETS IN JUBBA VALLEY

ITEM	BUURDHUUBO	BAARDHEERE	JILIB	KISMAAYO
Onions	Refugee camps*	Baardheere*	uqdisho[1]	Goob Weyn
	Buurdhuubo	Kukute	ardheere	Jamaame
	Baardheere	Dhakaje	shiid	Kamsuuma
		Caanoole	Mana Moofa	Kenya
		Dhoobley	Mareerey	Mogambo
Tomatoes	Buurdhuubo	Baardheere	Kamsuuma	Jamaame*
(Lrg/sml)	Baydhabo	Baydhabo	Mansuur	Sanguuni
	Refugee camps		B/Mareer	Kamsuuma
			Mana Moofa	Koban
			Shabeelle[2]	Fagan
			Kaytooy	Mana Moofa
Beans	Baydhabo*	Baydhabo*	Hombooy	Jamaame
	Muqdisho	Mahadaay	Kaytooy	Muqdisho
		Jowhar	B/Shidaad	Kamsuuma
		Muqdisho	Jilib	Afgooye
			Muqdisho	Jilib
Potatoes	Kenya*	Kenya*	"Import"*	Kenya
	Muqdisho		Muqdisho	Muqdisho
				Jamaame[3]
Squash		Baardheere	Goomaale	Jamaame
		Saakow	Jilib	Sanguuni
			Adooma	B/Gaduud
			B/Raxma	Jilib
			Koban	
			Fagan	

[1] *Probably includes some onions from Baardheere that are wholesaled through Muqdisho*
[2] *Includes Golweyn, Shalambood, and Janaale (Genale).*
[3] *Probably imported potatoes resold through Jamaame.*
**More than 50 percent of reported sales in this market originate from this place.*

D. Jubba Valley Institutions

This section presents the institutional context of socioeconomic life in Jubba Valley. These institutions comprise sets of rules which people in Jubba Valley follow to secure the well-being of their households in a political and social environment which surpasses the scale of the residential community. The most effective of these institutions act to integrate the residential community with Somali national society.

The importance of this discussion is twofold. First, it creates an institutional backdrop to the discussion of agicultural production systems which follow in the next section. The institutions discussed here act as resources in the inventory of a household which the household takes into consideration in its decision making. Second, in effect, the discussion indicates points of entry through which development planners might set up two-way communications with communities of Jubba Valley.

Under the institutional rubric, this section examines four areas of concern to local communities: political, social, economic, and government services. Land tenure is the economic institution that has the greatest impact on the household production choices and, by extension, the level of household production. Therefore, considerable attention is given here to describing the institution of land tenure in the Jubba Valley.

1. Political

The valley is divided into three regions—Gedo, Middle Jubba, and Lower Jubba. Regions are divided into districts, and each district into subdistricts, called *beels*. Each beel has a seat or center plus a number of satellite villages. Table 44 shows the number of beels and villages by district in the study area.

Table 44. NUMBER OF BEELS AND VILLAGES IN THE STUDY AREA

DISTRICT	BEELS	VILLAGES
Luuq	3	16
Garbahaarey	-	10
Baardheere	43	128
Bu'aale	17	45
Saakow	18	89
Jilib	10	86
Jamaame	7	84
Kismaayo	4	19
Totals	102	477

Community-level political institutions in Somalia operate democratically; local leaders are chosen through a process of consensus-building in their

constituency. For example, a beel is headed by a *guddoomiye* (chairman), who is nominated from the local citizenry and approved by the national administration. Throughout the process of appointing a guddoomiye, administration representatives carry out a dialogue with residents of the beel. The guddoomiye is supported by a local council or *guddi*, typically made up of seven members chosen in the same way. Each satellite village of a beel is headed by a guddoomiye and supported by a three-member guddi.

Larger villages and towns are divided into neighborhoods or *xaafads*. The population of each is usually fairly homogeneous, but different xaafads in a village or town often have different historical origins. Often, they were created at varying times by different groups of settlers coming to a community. Each xaafad has an orientation center where residents meet weekly to discuss local affairs.

In all cases, officials are appointed from the local citizenry. Often, they are chosen by consensus from village or neighborhood elders. If they lose their local base of political support, they must leave office. Their responsibility is to give the national administration a local presence, acting as a two-way channel of communication between the administration and local citizens. They are the court of first resort for settling disputes; they manage rights to local land resources and frequently mobilize a community to support activities of local interest. Often, a representative of the national political party and/or police force is a member of the guddi.

These political institutions are most effective in the Middle and Lower Jubba regions, where people tend to live in nucleated settlements clustered around a dhesheeg. They are also more effective among sedentary villages, as opposed to pastoral communities. Community authority is most structured and respected in permanently settled villages and least among pastoral groups. Authority structures are less evident among pastoral groups who elect for qualities of greater household autonomy and individual herd management and decision making due to the mobility and seasonal fusion and fission of these residence groups.

Along the corridor lining the Jubba River in Gedo Region, settlements are more dispersed and the post-revolutionary administrative structure has been less successful in supplanting previous local institutions. Particularly in these parts of the Gedo Region, pre-revolutionary political institutions continue to parallel the guddoomiye and guddi. This is less evident elsewhere.

Pre-revolutionary village political institutions centered on an informal council, called an *aquiaarta*. For the most part, community affairs continue to be run on the basis of consensual unanimity emanating from these informal councils. Aquiaarta membership is not fixed. The aquiaarta is similar to a council of elders, but includes all mature men (not just elders) who have impressed residents with their judgment, sagacity, evenhandedness, probity, and responsibility. Women are rarely visible among this assemblage except for occasional post-menopausal women whose status in the community commonly increases with age. Generally, the guddoomiye and guddi members are also members of the aquiaarta.

Local administrative structures provide the framework within which a community governs itself and also relates it to the rest of Somalia. In principle, local administration is the same throughout the Jubba Valley. It is the local manifestation of the administrative structure that has been put in place nationally since the revolution of 1969. This new structure has taken hold successfully because it is based on the pre-revolutionary political structure and has preserved the fundamentally democratic nature of the local political process.

The *nabadoon*, which translates as peacemaker, is usually a hereditary office that is not generally recognized officially. Nabadoons influence a range of local affairs and activities and are informally responsible for facilitating the settlement of disputes. These individuals may exercise their responsibilities over a wide territory, especially in the Gedo Region. In the Middle and Lower Jubba regions, the authority of nabadoons tends to be restricted to a smaller area—often, just a few villages around their home. Nabadoons used to be responsible for managing the land resources of villages in their constituency. To some degree, this is still true in the Gedo Region.

Smaller villages and the xaafads of larger villages and towns owe their cohesion largely to the kinship relations that usually prevail among community members. Often, the family heads of a village or xaafad are nearly all descendants of a single founding ancestor, any number of generations back. In disputes with groups outside the village or xaafad, community members support each other. Frequent-

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ly, the entire community contributes to pay compensation to outside groups for the misdeeds of its members.

These political institutions provide a central framework for all institutional life in the Jubba Valley, as other institutions in the valley are built on that framework. Similarly, these are the most effective local institutions for mobilizing support and participation in efforts of community interest. The first point of contact between outsiders and a community is most advisedly the guddoomiye. For instance, the JESS team consistently found that the guddoomiye was able to mobilize constituents to participate in SEBS.

2. Social

Cassanelli (1982), Samatar (1983), and Lewis (1960, 1961a, 1961b, 1963, 1965, 1971, 1975a, 1975b, 1980) present more developed ethnographic and historical treatment of Somalia's people than is possible here. Authoritative accounts dealing specifically with the people of the valley are sparse. The results of more recent studies on the political economy of the lower Jubba Valley by Menkhaus and on the sociology of middle Jubba Valley by Besteman should be available by late 1989.

The household, based on the nuclear family, is the unit of social organization most common throughout the valley. The majority of marriages within the valley are contracted between couples living within the same village. This suggests a high degree of residence stability among the nonpastoral sector and a particular value placed on residence location in the selection of spouses. As a result of residence stability, most villages show strongly established extended kin networks that contribute to increased social cohesion.

Virtually all populations of the valley focus descent and inheritance through the male line. However, there is considerable recognition of a mother's relatives—especially among the settled population. In settled villages, cousin marriage is common, if not preferred.

The major exception to cousin pattern marriage is among the traditionally pastoral population (Lewis

Aquiaarta *(council of adult village males) pose for a group photo following a village meeting with JESS survey team.*

1961). Marrying-out among pastoralists has distinct economic and political advantages by creating allies whose grazing and watering resources are potentially accessed in times of scarcity.

Rural residence, including among pastoralists, is typically with or near the husband's family. Residence with or near the wife's parents is common in settled villages, particularly where the groom gives work service to the bride's family. Newly married couples in pastoral and most rural agricultural villages establish separate households. Although separate, there is commonly a high degree of social interaction and work exchange between extended kin households.

Although kinship forms the basis for much of community life, common residence location is equally important among settled people. Settled populations, particularly of middle Jubba Region, incorporate newcomers who, over time, become assimilated by these communities—not on the basis of historic kin ties but by identification with the larger group through common residence and a collective dependence on agriculture. When asked if outsiders could obtain land in a particular village, an informant responded, "To acquire land a stranger need only marry one of our daughters and pledge allegiance to us; then he becomes one of our people." In contrast, pastoral peoples, lacking permanent residence, rely on kinship almost solely as a source of identity and social organization.

In the urban areas of the valley as elsewhere in the world, the larger the urban aggregation, the more pluralistic its social mix of peoples and their economic base. With greater urban incomes comes an increasing dependence and focus on the nuclear family as the economic and social unit with a correspondingly diminished emphasis on the extended family.

Villagers have a diverse group of social institutions, many of which (like the political institutions) signify the integration of villages into a larger structure, often one operating on a national scale. In fact, social institutions that integrate villages with national structures are present mainly in the Jubba Valley's district centers. They include secular school and health care facilities and SWDO chapters. Most villagers have to travel to a town to participate in or benefit from any of these organizations.

However, virtually every village has one or several Koranic schools headed by a religious leader or *macalin*. The macalin is paid in-kind by the parents of pupils and is generally a member of the aquiaarta.

In general, when valley inhabitants receive treatment for diseases, it is from pharmacists or traditional healers. Most villages have healers who practice homeopathic medicine using locally available plant and animal products. Their cures are often buttressed by recitations from the Koran. Different healers have special skills, and people choose a healer based on reputation, although convenience also plays a role in this choice.

Islam is the religious institution in the Jubba Valley. Religious leaders, or *sheikhs*, represent Islam's most potent organizing force. Communities under the leadership of charismatic sheikhs have been established in the valley for several generations. As a moral force, a sheikh often holds sway over a wide area. For example, the JESS team found that 80 villages in the area around Jawari in the Saakow District look to the leadership of one particular sheikh. The most charismatic sheikhs have been elevated to a status equivalent to sainthood. Their grave sites have become shrines which attract pilgrims from a wide area.

3. Economic

Jubba Valley residents have several institutions of economic importance. In general, these focus on different aspects of agricultural production. The framework behind the organization of these local economic institutions is each community's sociopolitical structure, which is based on relationships of kinship, affinity, and common residence, as described above.

The most important economic institution is land tenure. Each village has a delimited territory attached to it. Newly created villages are assigned land by district and regional administrations.

Land Tenure

Villages in the Jubba Valley may have a mix of different types of land under cultivation (*i.e.*, riverbank, dhesheeg, nondhesheeg floodplain, and bush), depending on their location. In principle, it is the responsibility of the guddoomiye and guddi to manage village lands, but in many areas, the nabadoon and aquiaarta still play a role in managing land resources. However, none of these officials is responsible for managing lands sequestered under various provisions of the 1975 Agricultural Land

Law. Rights to such lands are sanctioned directly by the Ministry of Agriculture, which is represented at the local level by district authorities.

Government Land Policy

Following the socialist revolution of October 1969, the new government announced a series of agrarian reforms aimed at stimulating growth and economic development. Policy makers believed the solution to Somalia's agricultural problems to be corporate structures which would transform agriculture. In 1984, government farms controlled nearly 25,000 hectares in the Jubba (Fadal, Shego, and Ali 1986). By 1979, 233 group cooperatives controlled an area of nearly 35,000 hectares, and 48 multipurpose cooperatives encompassed over 32,000 hectares (Fadal, Shego, and Ali 1986).

1975 Agricultural Land Law

Formal land-tenure relations in Somalia today are governed by the 1975 Agricultural Land Law and subsequent decrees. According to this law, all land resources are owned by the state. The responsibility for managing these resources and authority to allocate land are under the direct jurisdiction and control of the Minister of Agriculture. The minister may issue concessions (leaseholds) for agricultural purposes to cooperative societies, state farms, autonomous agencies, local government bodies, private individuals, and companies. Since all land is owned by the government, individuals with registered leaseholds are tenants of the state with certain rights and restrictions.

Land registration became compulsory when the 1975 Land Law was enacted. Any person who did not register land within six months theoretically lost all state-recognized rights to that land. All landholders, excluding cooperatives and state farms, must apply for 50-year, renewable, variable-term leases. An individual or family may obtain only one lease per household. Total landholdings are restricted to 30 hectares of irrigable land and 60 hectares of nonirrigable land. The ceiling for banana plantations, raised to 100 hectares, is waived entirely for cooperatives, state farms, private companies, and autonomous agencies. Registered leaseholds cannot be bought, sold, leased, rented, or mortgaged, although rights may be transferred if the lessee is incapacitated or dies. Subsequent land laws seem to have relaxed provisions banning the exchange, buying, and selling of leases, though it remains unclear what kind of exchanges are allowed or now effective these are.[1] The government may repossess land that is in excess of size restrictions, used for nonagricultural purposes, not used productively, unnecessarily fragmented, or not farmed for two successive years.

An individual or cooperative wishing to register a parcel must write an application letter to the MOA's District Agricultural Officer (DAO). The DAO then posts a notice of the application at the District Party Secretary's office, District Commissioner's office, police station, MOA, and village center.

After 30 days, a committee—composed of the district officer of the Department of Land and Water Resources (DLWR), a district police officer, the applicant, a draftsman, and the guddoomiye of the village where the land is located—is responsible for adjudicating the claim, marking boundaries, and drafting a map. The DLWR officer and police officer each write a report to their superiors giving the farm's location, area, soil type, and present use, and confirming that the parcel is free of dispute. The DAO sends a report to the Party Secretary for approval.

Next, a district registration number is assigned, and all previous reports, the map, and original application are forwarded to the Regional Agricultural Officer (RAO) for approval and issuance of a regional registration number. The RAO is responsible for taking these documents to the director of DLWR at the MOA, in Muqdisho. The director

[1] Point 16 in *Guidelines for the Giving of Farmland* (MOA 1987) states that, "The changing of hands of farmland and changing of certificate will be executed by the ministry after the two parties reach an agreement between themselves and bring a notorized agreement," (English Translation). It is unclear what "agreements" are allowed under this circular.

checks the application for conflicting claims before sending the file to the Minister of Agriculture for signing to approve the leasehold. Once signed, the registration procedure is complete, and copies are returned to the landholder and various DLWR offices. The registration process may also be started at the national level. In this case, a letter is written to the DAO or RAO, directing them to find unregistered land.

In recent years, strong demand for registered titles has come from private landholders, large and small, as shown by the dramatic rise in the issuance of titles in regional offices. In some cases, title gives outsiders the means to gain access to untitled land; in others, the present landholders seek title out of concern that the government may expropriate untitled land for outsiders.[2] However, land registration is biased toward wealthier or more politically astute farmers by virtue of the costs of acquiring state leaseholds.

In 1986, 11 years after passage of the Agricultural Land Law, government registries showed that over 75 percent of all registered land is irrigable (see Table 45), though not necessarily irrigated.[3] In Lower Jubba Region in 1986, 0.3 percent of all land was registered, including 501 farms that averaged 33.8 hectares each. Further upstream, in Middle Jubba Region, 1.1 percent of the total area was registered, including 375 farms averaging 52.6 hectares.

The averages are deceiving since registered farms vary from a few hectares for smallholders to banana plantations in excess of 200 hectares. In comparison, holdings on untitled land average only several hectares each, which indicates a considerable degree of land concentration on state leaseholds. Even though state-leasehold tenure is expanding rapidly, customary tenure still predominates.

Conflicts are emerging between the state-leasehold and customary tenure systems that are causing economic losses for present landholders. While both systems coexist in the Jubba Valley, customary land tenure differs radically in form and substance from the state-leasehold system and land statutes. Traditional tenure systems prevail, even though usufructuary rights were negated with the passage of the 1975 Agricultural Land Law. Multiple holdings are common under traditional tenure arrangements, yet formal law provides for only one leasehold acquisition. Tenure rights to land in bush are recognized by residents, although the land law disclaims these rights. Land transactions are common practice—especially giving and borrowing of parcels—despite provisions in the formal statutes banning these transfers.

Customary Tenure

Besteman and Roth recently carried out a study of land tenure in a village in Middle Jubba Region for JESS. Their report (Besteman and Roth 1988) notes a number of ways that land can be acquired under customary tenure arrangements, inheritance being foremost. Fifty-one percent of cultivated parcels in the sample were acquired through inheritance, 25 percent from the village council, 12 percent purchased, nine percent received as a gift or long-term loan, and three percent "just cleared" by the owner. Slightly less than half of the inherited parcels (44 percent) were subdivided at inheritance, while boundary changes for farms acquired through other means were rare.

Methods of acquiring land have changed over time. Original settlers in the area cleared land wherever they wanted. As the population grew, village nabadoons took on more responsibility for provid-

[2] The term "outsiders" is sometimes used by local landholders to describe foreigners or non-residents (usually traders, businesspeople, or government officials from Muqdisho or regional capitals) seeking to acquire land through the state leasehold process.

[3] Area statistics for registered farms should be viewed with moderate skepticism. At the time of registration, the applicant is asked for an estimate of the area being registered. There may be some pacing of boundaries, but rarely (if ever) are accurate measurements taken or areas calculated. Similarly, land listed as irrigable does not necessarily mean that it is irrigated. An area may be listed as irrigable for a variety of reasons—doing so increases the likelihood of getting the application approved (provisions in the land law have the intent of fostering capital development and use); irrigation was planned at the time of registration, but a lack of capital, technology, or labor constrained development; or the parcel is situated close to a river.

Table 45. SOMALIA'S LAND CHARACTERISTICS IN 1986

	Total Land Area	Cultivated[a] Area Under Rainfed Ag.	Cultivated[a] Area Under Irrigation	P[illegible] Land That Is Titled	Irrigable[b] Land That Is Titled	Number of Registered Farms	Area (ha) Per Farm	
	'000 ha	'000 ha	'000 ha	'000 ha	'000 ha	Farms	Reg.	Unreg.[c]
North West Regions[d]	4,480	90.3	-	24.3	8.5	2,927	11.2	6.4
Central and N.E. Regions[e]	32,260	32.5	-	22.3	2.2	2,651	9.2	1.0
Hiraan	3,400	15.3	13.0	0.5	15.8	355	45.8	2.5
Middle Shabeelle	2,080	86.8	26.9	-	56.1	1,474	38.0	5.0
Benadir	80	-	-	-	-	-	-	-
Lower Shabeelle	2,770	167.2	29.8	16.4	120.6	3,361	43.5	3.0
Lower Jubba	4,900	10.3	16.2	4.4	12.6	501	33.8	1.3
Middle Jubba	1,870	49.7	4.9	3.9	15.9	375	52.6	4.0
Gedo	4,470	37.8	1.6	-	10.5	540	19.4	2.2
Bay	4,120	244.4	-	12.3	5.4	377	46.7	4.3
Bakool	2,630	38.9	-	-	-	-	-	7.7
Total	63,060	773.2	92.4	84.1	256.4	12,561	27.1	3.3

a. Cultivated land is distinguished from cropped land in that it includes arable land, perennial crops, and fallow land.
b. Includes land irrigated by pump irrigation, and controlled and uncontrolled gravity irrigation.
c. Cultivated area divided by total number of farms (MOA 1987:5), registered and unregistered.
d. Includes the districts of Awdal, West Galbeed.
e. Includes the districts of Togdheer, Sanaag, Sool, Bari, Nugaal, Muduug, Galgaduud.

Source: Government of Somali Democratic Republic, Ministry of Agriculture, Department of Planning and Statistics, "Yearbook of Agricultural Statistics 1986/86", Mogadishu, 1987.

ing newcomers with land. However, since 1977, anyone who wants land must make a request through the guddi who has replaced the nabadoon.

The guddi is responsible for delineating the boundaries of new parcels and mediating all land disputes. Disputes are generally of three types—boundary disputes, inheritance disputes, and disputes with herders whose animals have damaged a crop.

Until recently, customary tenure appears to have provided a high degree of security of access to land and water resources. This security lay in communal recognition of land ownership. Settlement was relatively dispersed, so population pressure on land resources was not critical. New land could easily be obtained, and land transfers by sale, gift, and especially borrowing allowed people to meet long-term and seasonal needs through the farming of multiple parcels. Threats of land usurpation were practically nonexistent, as the area was of little interest to investors, land speculators, or developers. Almost all respondents in the random sample said the scarcity of land and disputes are more significant now than in the past, largely due to the influx of outsiders interested in acquiring land. Using the formal land-registration process, outsiders are able to acquire previously untitled land, thereby circumventing the customary land-allocation process.

Women and Land Tenure

Ten percent of households in Besteman and Roth's study village are headed by women—widows or those who have husbands living elsewhere. (All divorced women live with a brother or their father.) When a man dies, his land passes to his children, despite the fact that the Koran says the widow is to inherit her own portion. If the children are too young to take over their father's farm, the widow may farm it "in trust" or the man's family (his brothers or older sons by another wife) may keep the entire farm until the children are older. In the latter case (there were two in the study village), the widow is nearly destitute and completely dependent on her family or other relatives for support until she remarries or her children come of age, inherit the land, and can support her.

There tend to be very strong relationships between women who head households and their grown sons.

The land is ostensibly owned by the sons, but in all cases, mothers and sons stressed their equality in managing the farm.

All women are entitled to a *meher* (wedding payment) from their husbands, which may be money or land. Men may make this payment at any time, but are obligated to give it at divorce if the husband wants the divorce and the wife does not. If the wife initiates the divorce, she forfeits her right to a meher. There were no divorced women in the village who received land as their meher.

In the Besteman and Roth sample, 25 percent of the wives had their own parcels. All had inherited farms from their fathers, and one had bought two parcels in addition to those she inherited.

The vast majority of women with their own farms manage and maintain them separately from their husband's farms. The men cannot and do not interfere with their wives' land. The husband does not control the production or profits from his wife's farm.

Depending on the family, a woman's farm can be inherited by her children or a brother and, consequently, his children.

Most women will never have their own farms. A woman may be assigned a plot on one of her husband's farms, but has no independent control over its production and makes no management decisions of her own.

To gain some independent control over land, women frequently borrow a portion of a friend's or relative's farm for a season, a year, or longer. Women say they borrow land with regularity to "get something of their own."

State-Leasehold Tenure and Land Registration

In Besteman and Roth's study village, only two of the approximately 400 farms (including those in bush) owned by villagers were registered. Most titled land in the village is registered by outsiders, town dwellers from the regional capital, or Muqdisho. Village farmers are aware of the land registration law.

In January 1986, the RAO had a smallholder registration drive and collected 217 applications. Many villagers made this initial application. However, these applications have gone no further.

Still, land registration is becoming more widespread in the district and region. The records are unclear, but approximately 300 titles have been issued in the Bu'aale District since the first was issued in 1978, and 798 have been issued in the Middle Jubba Region (see Table 46). A disproportionate number of these are being issued to newcomers, not farmers resident in the community. In the small sample of registered farmers surveyed in the Bu'aale area, 75 percent were newcomers to the area. Indeed, the biggest fear of local farmers is that their land will be "stolen" by an outsider who registers their farms. All the registered farmers interviewed were government officials or had been when they registered land.

Table 46. FARMS REGISTERED IN THE MIDDLE JUBBA BY YEAR

YEAR	NO. OF FARMS REGISTERED*
1978	43
1979	12
1980	23
1981	43
1982	17
1983	31
1984	81
1985	247
1986	156
1987	126
1988 (through March)	19
Cumulative total	798

**Compiled from registry records at the RAO in Bu'aale. There are discrepancies between the number of registered farms listed in the registry book at Bu'aale and the National Office in Muqdisho.*

There are several points at which agricultural practices in the Middle Jubba Region conflict with the provisions of the 1975 Agricultural Land Law.

First, ownership of multiple parcels is an important risk- aversion strategy for smallholders. Limiting a household's registration to a single parcel forces a farmer to choose a parcel in only one land type.

Second, villages maintain a reserve of bushland. This land is critical to a village's future, for inheritance, to accommodate population growth, and to offset potential losses of soil fertility on cultivated land. By allowing no one to claim rights to land left in bush, the land law is constraining families and villages in their planning for present and future land needs.

Third, the 1975 Agricultural Land Law is encouraging deforestation by requiring that all registered land be cleared, developed, and used, or risk expropriation by the government. Unregistered farmers say they are working hard to clear all their bushland in an attempt to prevent others from registering it. Increasing rates of deforestation in the Middle Jubba Region have already been noted by researchers and local residents (JESS 1987; Riddell 1988).

Fourth, farms in the Middle Jubba Region tend to be small, usually a few hectares. Under the state-leasehold system, families can register more than 100 hectares by calling themselves private companies. This has resulted in a vast difference between the landholdings of a majority of farmers in the region and those of newcomers.

Fifth, local farmers have always utilized a strategy of land transfers in the form of gifts, purchases, and borrowing. Such transfers are not allowed under the land law.

Although smallholders recognize the need to register their land to avoid losing it, they perceive the costs of land registration as too great. Time and a lack of knowledge and money are the major constraints on registering land. Being unfamiliar with the workings of the government, farmers do not know how to pursue the complicated registration procedure. Costs involved in registration are beyond the means of many smallholders.

Tenure Security

Security of tenure under customary arrangements is weakening as formal laws usurp traditional authorities' rights of land governance. In addition, the role of customary tenure in governing land access and use is facing unprecedented economic, social, and environmental pressures which are shifting demand for Somalia's land resources toward sedentary agriculture.

Until recently, the Middle and Upper Jubba Valley remained largely unaffected by these factors due to the region's geographical isolation.

Public expenditures are now increasing investors' expectations of promising economic opportunities in the Middle and Upper Jubba Valley. Already, land grabbing and speculation, the environmental degradation of forest reserves, conservation, and efficiency versus equity considerations have become central issues in development of the Jubba Valley.

Farmers who thought they had relatively secure rights to village land have begun to find that these "rights" are irrelevant under the state-leasehold system. Primarily, land that is currently in bush has been lost to outsiders since, according to the 1975 Agricultural Land Law, no one can hold claims to bushland.

Instead of encouraging investment by offering a greater degree of tenure security, the land-registration program has made smallholders less secure. Land grabbing and speculation are emerging as primary concerns among smallholders. Since the Middle Jubba Region is slated for economic development, this might have been inevitable, but the formal land-registration system has facilitated the process by providing speculators with an official means to obtain large areas of land. As a result, title insecurity for local farmers has increased. Almost all farmers in the Besteman and Roth sample said they feel there is a serious threat of outsiders coming and taking their land.

Performance on State Leasehold Farms

Planners frequently assume that land-titling programs will encourage capital investment and higher productivity by providing more tenure security than customary arrangements. For the most part, registered farmers do not exhibit greater productivity than smallholders.

Many farmers in the Besteman and Roth study have registered large tracts, up to 100 hectares, and some have more than one registered farm, but are only farming one to 33 percent of their land. Smallholders farm a much higher percentage of their household land.

Owners of one-third of the registered farms in the Besteman and Roth study have since been transferred to new locations, so their farms are being managed by friends or relatives. Many registered farms in the area are completely in bush because the owner has been transferred and has no one to continue farming the land. Seventy percent of the registered farmers have never had their own farm before, and many are not farming the land themselves. They depend on hired labor to perform all agricultural tasks. Their production levels are low because of the difficulty in locating hired laborers.

Because of their high cash expenses and low returns, most registered farmers are just breaking even or operating at a deficit to keep their farms cultivated. Their farming practices are not sig-

nificantly different from those of smallholders in the village. Preliminary analyses suggest that smallholders are more productive than registered farmers, obtaining a higher return per unit of land.

Farming may not be financially profitable for most registered farmers, but the area offers few other economic opportunities and there is widespread belief that with an all-weather road and future development projects, the Middle Jubba Region is going to prosper and land values will soar.

So far, the formal leasehold system appears to have had little impact on encouraging capital investment in the Jubba Valley. Registered farmers are investing more capital in the form of hired labor, but productivity per unit of land is low. A majority of the registered farmers interviewed are inefficient producers, holding large tracts that they cannot farm effectively.

One reason for this low productivity is that, for many people, land acquisition is motivated by speculation that land values in the Middle Jubba Region will increase dramatically rather than by production objectives. Another reason for low productivity is the lack of support for expanding production. Communications and transportation infrastructure are practically nonexistent. There is no effective agricultural extension program, few available inputs, little access to improved seed varieties, no credit facilities, only six tractors to serve the entire district, and frequent diesel shortages. Before capital investment can proceed, the availability of resources to farmers must be improved.

Other Local Institutions of Economic Importance

Other local institutions of economic importance play varying roles in agricultural production. Many villages have community work groups (*goob*) to support subsistence crop production. A goob operates as an *ad hoc* labor group. It comes together at the request of a farmer who needs help carrying out a specific task. The goob usually works for only one day. The beneficiary compensates members with a good meal. The farmer is not required to reciprocate with participation in a goob on a benefactor's farm.

However, benefits from a *daab wareeg* do require reciprocation. This is a cooperative labor group that works members' fields in rotation. Some daab wareeg work only in the morning, but more often, they work only in the afternoon after members have completed their routine responsibilities for the day. Daab wareeg that work in the afternoon are called *galabta*, which means afternoon.

The majority of members of a *barbaar*, which literally means youth, are unmarried men between the ages of 15 and 30. It may also include unmarried women, married men, and/or older people. The barbaar is as much a social club and service group as a work group. It is particularly known for its dancing and, hence, is prohibited in strict religious communities. The barbaar is a corporate group in that it has an existence beyond any specific activity its members may be pursuing. It is led by a slate of officers elected by members. These officials have the right to fine or exclude members who do not participate in group activities.

Away from the river, people get water for themselves and their livestock from small reservoirs called *wars*. The creation and maintenance of such a reservoir is a community activity. Its management is under the control of a local committee called a *sagaale*, which is led by an *aaw*. The sagaale controls access rights to the reservoir. Its members also organize and oversee the annual task of digging out accumulated sediment. The *fatiir* (all members contributing to a war) have privileged access to the reservoir during the dry season when the competition for water becomes intense.

Different forms of local economic institutions have been evolving in the Jubba Valley in response to changing economic conditions. Expansion of the market for agricultural products has been the major force behind the emergence of several new institutions. In recent years, several types of sharecropping have become common on dhesheegs and riverbanks in the valley. From the farm laborer's perspective, the objective of sharecropping is to benefit from access to a pump for irrigation.

There is a small number of local cooperatives in the Jubba Valley. The JESS team found a case where 25 people have formed a group to maintain a stretch of road above the Baardheere Dam site. Similarly, a group in Golweyn bought a pump together. The team also encountered several cooperatives of fishermen in the Kismaayo District.

Finally, particularly in the Lower Jubba Region, villagers have begun revolving credit associations called *aiuto*. These are not yet widespread further up the river. The aiuto requires regular contributions from all its members and periodically pays out accumulated funds. In turn, each contributing mem-

ber, receives a payout from the association. Participation in it is one way for villagers to accumulate significant sums of cash to meet special needs.

4. Government Services

Government services include construction and maintenance of roads, schools, public-health posts, and hospitals, market structures, and research and extension agencies for the agriculture and livestock sectors, including machinery services.

The first paved road to be built in the valley was from Jilib to Kismaayo, constructed in 1972. At the time, it was known as "Banana Road" because its main function was to expedite bananas grown in the Lower Jubba Region to the port at Kismaayo. Portions of this road are now severely broken, and the surface has begun to deteriorate rapidly under the traffic associated with the construction of large projects in the area (Sauermilch 1984).

A bridge was constructed to extend the road at Kamsuuma over the Jubba River. Another was built near Jamaame to link the main thoroughfare on the east side of the river with the new, paved road on the west side.

The main link between Jilib and Muqdisho was paved in 1984. The road surface was pitted with potholes and breaking apart within one year of completion. The road linking Baardheere with Muqdisho was paved up to Baydhabo in 1984. The rest of the distance remains graded gravel that is generally in good condition. The Muqdisho-Luuq link diverges from the Baydhabo-Baardheere road. It is graded gravel that has deteriorated in the area near Luuq under heavy traffic carrying food supplies to refugee camps.

The main roads up the river valley through the Middle Jubba Region are dirt tracks that become seasonally impassable. On the west side, there is no road at all between Baardheere and Saakow. Further north, between Baardheere and Garbahaarey, the road is extremely rough and rocky.

Transportation links between valley towns are clearly difficult. The Middle Jubba town of Bu'aale can be entirely cut off from the outside for as much as five months each year because of poor road conditions.

Table 47 shows the number of certain types of facilities enumerated in the SEBS sample of villages. Some are private, like tea shops, Koranic schools, and traditional healers. For the public sector, out of 26 villages, only six said they have a functioning school, although there are 52 Koranic schools in those same villages. This corroborates JESS findings on education and literacy levels. (see Section II.B).

Only six functioning health posts were found in the 26 villages. Of those, most are located in the Middle Jubba Region where Swedish Church Relief runs the health outreach program, while a few were found in the Lower Jubba Region. However, there are 257 traditional healers in these villages, a majority of whom are Koranic healers who often also serve as village Koranic teachers.

Many of the SEBS villages have old structures that formerly served as schools, but are now defunct. A major part of the problem is that teachers' salaries are too low to sustain an individual, so teachers must find other means of livelihood.

Government-supported health facilities suffer from some of the same problems. A number of villages have old structures that served as health posts in former years, but there is now no trained staff or medicine. The best model for public-health outreach is provided by the Swedish Church Relief health project in the Middle Jubba Region. This group has provided capped wells with hand pumps, training for village health workers, medicine, and instructions for building and maintaining village health posts.

There are still a few hospitals in the Jubba Valley, but all are in various states of disrepair and some are almost nonfunctional. The former hospital in Jamaame, set up by the Mennonites in the mid-1950s, had an advanced staff that could perform major operations. Today, it rarely has the most basic supplies of aspirin or chloroquine.

The MOH in Muqdisho has no information for Somalia's countryside on the number of patients treated or seeking treatment, what they were treated for, and level of treatment given. The only statistics maintained by the ministry concern the personnel assigned to the various regions (Sauermilch 1984).

AHT's 1984 report on valley infrastructure shows that the Jubba Valley has a total of seven doctors and three assistant doctors. Three of the doctors and two of the assistant doctors were located in Kismaayo, where there are also six Chinese doctors. One specialized health center that functions well is

Table 47. SERVICE FACILITIES IN 26 SEBS VILLAGES

DISTRICT	VILLAGE	TOTAL # SHOPS	# TEA SHOPS	#SCHOOLS	# KORANIC SCHOOLS	# HEALTH POSTS	# PHAR-MACIES	# TRADI-TIONAL HEALERS	DIS-TANCE TO NEAREST CLINIC	VET. AGENT EVER VISIT	AG. AGENT EVER VISIT
Luuq	Goleyle	0	0	0	2	0	0	35	28 km	N	N
	Garboolow	1	3	0	4	0	0	25	20 km	1974	N
	Dhaysiyow	0	0	0	7	0	0	35	22 km	N	Register Land Only
Garbahaarey	Golweyn	2	4	0	1	0	0	10	12 Hours Walk to Luuq	N	N
	Maykoreebey	7-8	0	0	0	0	0	11	2 Hours Walk to Garba-haarey	N	Twice a Year
	Hufey	0	4	0	3	0	0	7	1 Hour Walk to Refuge Hosp.	N	MCC*
	Ceel Gaduur	8	13	3 But Not Functional 6 Years	3	0	0		50 km	Y	N
Baardheere	Jaffey	0	3	0	2	0	0	5	10 km	Y Once/ Year	N
	Kudug	0	0	0	4	0	0	Many	15 km	15 km	N
	Mardha	0	3	0	1	0	0	10-14	11 km	N	3-4 Times
	Dugsiilow	0	3	0	2	0	0	9	25 km	1985	Register Land Only
	Xagarbuulo	0	1	0	1	0	0	2	15 km	N	N
Saakow	Labi buul	0	3	0	2	0	0	3	24 km	N	N
	Buur Fuley	0	2	1 School 1st up to 5th Grade	2	2	0	4	16 km to Saakow	N	N
	Kusdumiya	0	0	1	1	1	0	Many	6 km	N	N
	Kulmis	3	1	1 School 1st up to 5th Grade	0	0	0	3	1 Hour Walk	N	Once Every 3-4 Years
Bu'aale	Hiloshiid	1	1	0	1	0	0	6	18 km	N	N
	Bakta	6	6	1	2	1	0	2	12 km	N	N
	Gallaheiay	0	0	0	1	0	0	5	8 km	N	N
	Qoraxey	0	1	0	1	0	0	3	2 km	N	N
	Buul xgalool	0	0	0	0	0	0	3	4 Hour Walk	N	Y
Jilib	Kasiib Bukdo	0	0	0	1	0	0	13	21 km	N	N
Jamaame	Janaale Jay	0	3	0	2	0	0	11	14 km	Y	Y
Kismaayo	Goob Weyn	4	15	1 School up to 8th Grade	5	1	0	7	14 km to Kismaayo	Y	Y
	Mokomane	0	3	0	1	0	0	7	22 km to Kismaayo	N	N

** Mennonite Central Committee, Private Volunteer Organization Group.*

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the Leprosy Hospital near Jilib, which is part of a project financed by World Concern. It receives its primary financial aid from the government.

The last area of government services to be discussed here is extension in the agricultural and livestock domains. There are at least two agricultural extension centers in the Jubba Valley—one at Yontooy and the other at Iskandariya, next to the Leprosy Center. In Yontooy, the center dates from the colonial era when it was set up to do research on bananas and other commercial crops destined for export. The research station at Iskandariya is practically nonfunctional. Although there is an extension service in the Lower Jubba Region, its agents have been plagued by lack of vehicles and fuel necessary to meet with area farmers.

From the SEBS data, only four villages out of 14 in Lower and Middle Jubba Region have apparently ever been contacted by an agricultural agent. Some were only visited because of land registration taking place. Only three out of 14 had ever seen a veterinary agent, although these civil servants might be more likely to visit with pastoralists and agro-pastoralists than settled farmers.

Out of 12 villages in Gedo Region, five had received a visit from a veterinary agent, although several of these occurred some time ago. Only four were ever contacted by an agriculture agent, though one was assisted by a PVO worker from the Mennonite Central Committee (MCC).

E. Production Systems

The rural household economy of Jubba Valley is dominated by its focus on agriculture and, secondarily, on livestock production. Not only is the valley agriculturally oriented, but the nature of that orientation is toward basic subsistence. Inhabitants of Jubba Valley practice three different agricultural production systems:

- riverine agriculture;
- pastoralism; and
- nonriverine agro-pastoralism.

In each of these three production systems, households juggle resources in land, labor, and capital to meet their strategic objectives. These objectives have recently been evolving toward increasing levels of commercial production in addition to meeting family subsistence needs.

The economy of the urban households of Jubba Valley is also based on agricultural production, but has consistently been more commercially oriented than households practicing rural production systems.

These three rural production systems and the urban production system coexist and compete with state-run irrigation systems, particularly in Lower Jubba Region.

The object of this section is to describe each of the four household production systems—rural and urban—common in Jubba Valley, and then to describe several different types of commercially oriented irrigation that coexist with the subsistence agricultural systems practiced by the majority of Jubba Valley residents. This section ends with an overview of the economic role women play in agricultural production in Jubba Valley.

1. Riverine Agricultural Systems

Physical Setting

Riverine agriculture is the production system most immediately affected by fluctuations in annual river flow (see Map #4). Generally, the flood regime coincides with the long (gu') and short (deyr) rains occurring April to June and October to December, respectively. However, 90 to 97 percent of the Jubba's waters come from the Ethiopian highlands. Therefore, the degree of flooding and rainfall within the Jubba Valley does not necessarily coincide.

Four types of land are used for farming:

- *jiimo*—the riverbank and readily cultivable stretch of soil immediately inland from the river;
- *dhesheegs*—natural depressions in the soil where water collects following a flood or rain; varying in size from a few hundred square meters to several square kilometers (Dhesheeg Waamo, 60 km^2 is the largest); some permanently wet and others, small, shallow, and drying out quickly;
- all other types of floodplain soils; and
- rainfed—higher ground inland from the river and floodplain known as *doonk* in portions of Middle Jubba Region and *adable* in Gedo Region and most areas of agro-pastoral settlement.

Gedo Region is physically distinguished by a slightly steeper gradient and relatively high banks of the

SEBS MAP #4
AGRICULTURAL ZONES IN JUBBA VALLEY

0 5 10 20 30 40 50
SCALE IN KILOMETERS
R.F. = 1:1,000,000

LEGEND

- Surfaced Roads (Tarmac)
- Maintained Dirt Roads
- Bush Tracks (Alignment Approximate)
- Wetlands
- Inundation Area of Dam
- District Boundary
- Regional Boundary

Area of Large Scale Projects

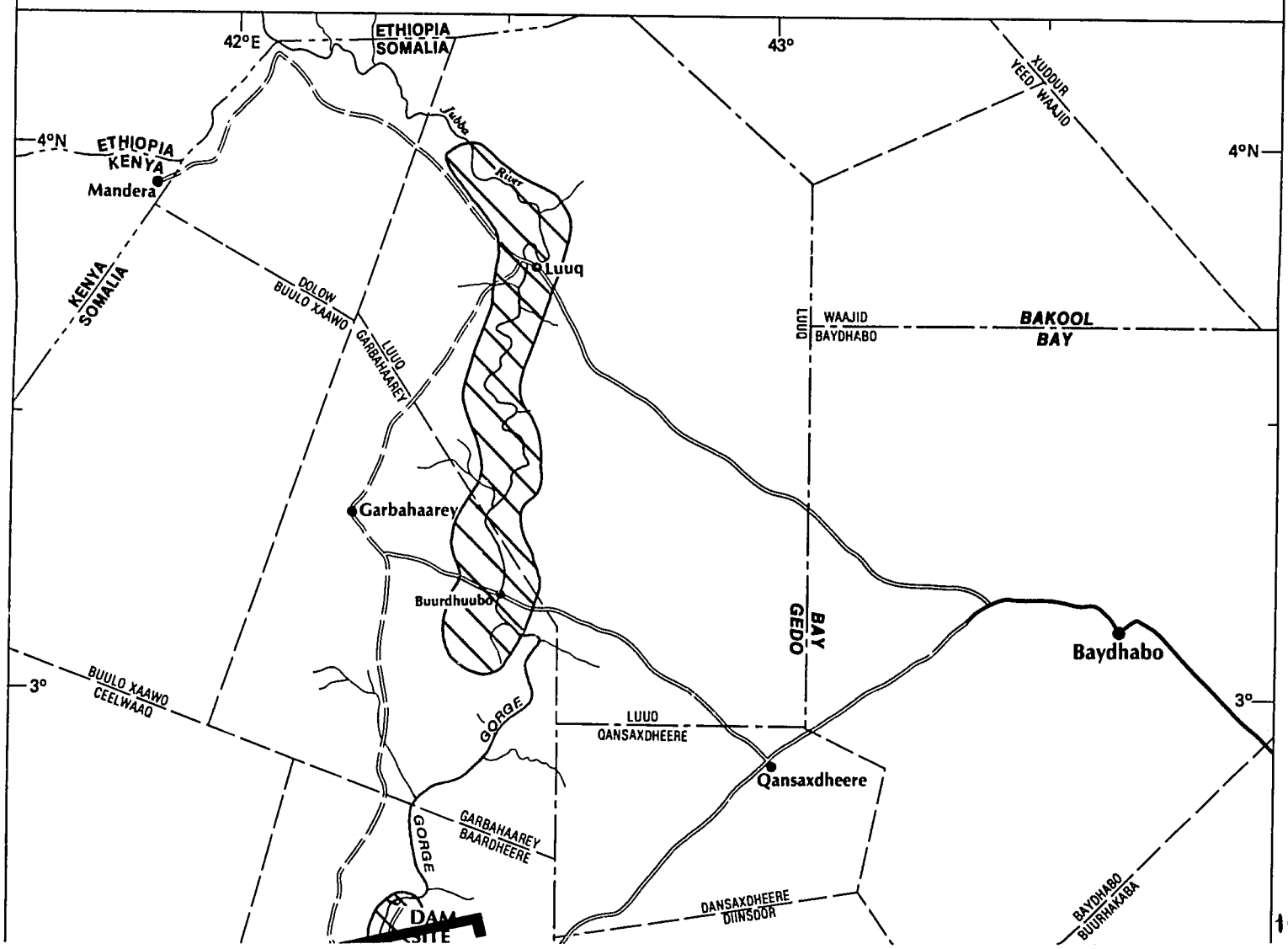
Maize Zone

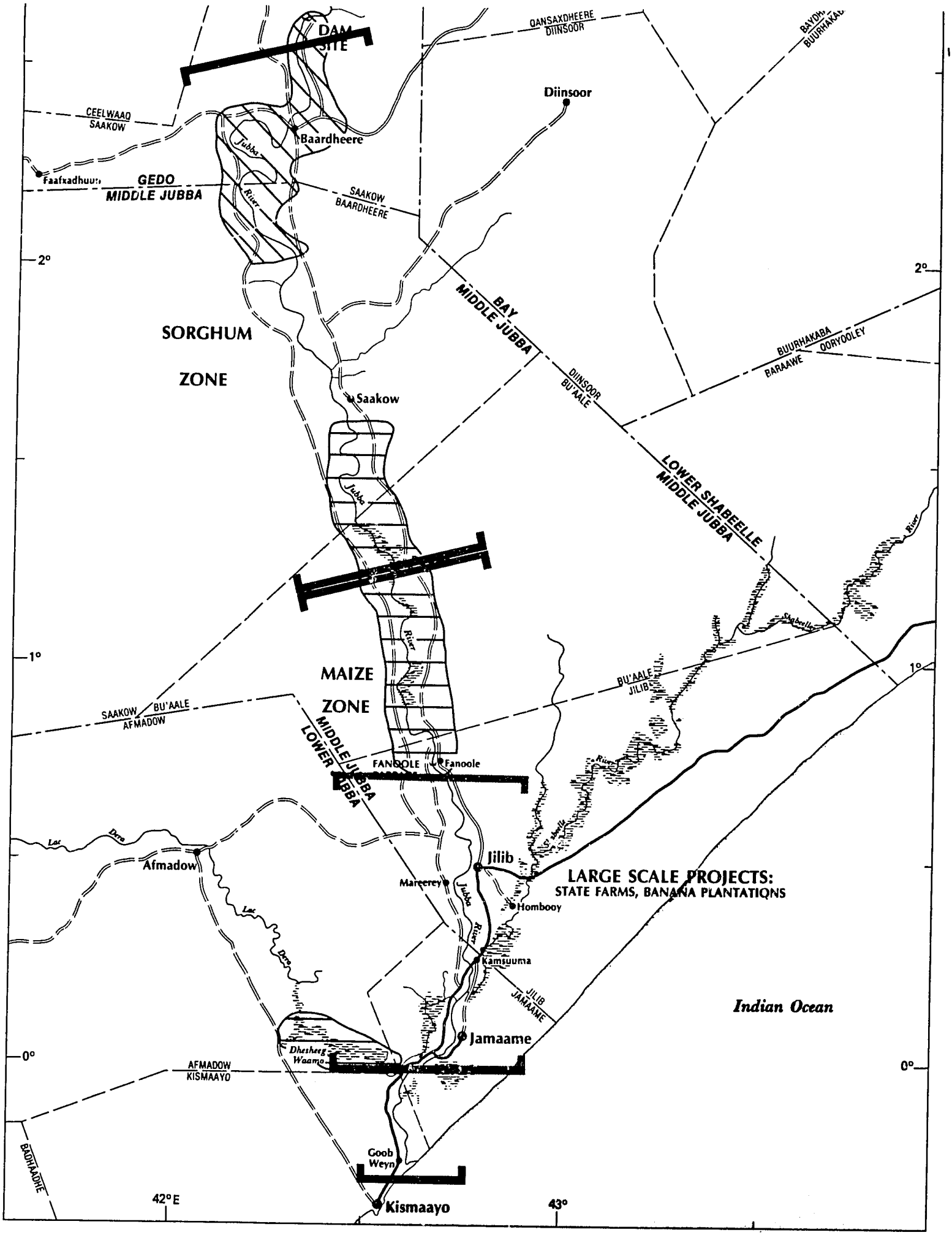
Sorghum Zone

Areas of Dhesheeg Agriculture

Areas of Small Scale, Private Pumping

Sorghum and Maize Zones depict areas of greatest concentration: Sorghum is grown up to the Ethiopian border but concentrated from the general area of the Baardheere Dam site to Bu'aale District. Maize is grown throughout the Valley under irrigation; the zone of greatest production is from Bu'aale District, south.




DAM SITE
QANSAXDHEERE
DIINSOOR
BAYDHABO
BUURHAKABA
Diinsoor
CEELWAAQ
SAAKOW
Baardheere
Jubba
River
Faafxadhuun
GEDO
MIDDLE JUBBA
SAAKOW
BAARDHEERE
2°
BAY
MIDDLE JUBBA
SORGHUM
ZONE
BUURHAKABA
BARAAWE
QORYOOLEY
DIINSOOR
BU'AALE
Saakow
LOWER SHABEELLE
MIDDLE JUBBA
Shabelle
River
1°
MAIZE
ZONE
BU'AALE
JILIB
SAAKOW
BU'AALE
AFMADOW
MIDDLE JUBBA
LOWER JUBBA
FANOOLE
Fanoole
Lac
Dera
Afmadow
Jilib
Mareerey
LARGE SCALE PROJECTS:
STATE FARMS, BANANA PLANTATIONS
Hombooy
Kamsuuma
JILIB
JAMAAME
Indian Ocean
Jamaame
Dhesheeg
Waamo
0°
AFMADOW
KISMAAYO
BADHAADHE
Goob
Weyn
42° E
Kismaayo
43°

river. There are essentially no dhesheegs, and the floodplain, except for north of Luuq, is narrow or nonexistent. Recession agriculture is practiced on or near banks of the river and some irrigation on scattered plots on thin alluvial strips. Some villages have additional dryland plots at distances of up to 10 to 15 km inland from the river.

In Middle Jubba Region, the floodplain broadens, the river banks are less steep, and the area is typified by dhesheegs. Here recession agriculture practiced in the dhesheegs is a particularly important aspect of the agricultural economy in addition to cultivation on the river's banks. Cultivation of inland rainfed plots is also an important feature of the total economic strategy.

The river's gradient is lowest and the floodplain broadest in Lower Jubba Region. There are dhesheegs in the south, but due to man-made alterations in the physical setting, dhesheeg agriculture is no longer as important to the economy as it was in the past. Fanoole Barrage has changed the seasonal flow of the river. A system of dikes or bunds protecting the Juba Sugar Project from severe flooding diverts excess waters to the east bank causing significant flooding on small farms. Land-leveling as well as the construction of dikes, flood gates, and canals that protect the rice and banana farms have also significantly altered the flood regime.

Jiimo, dhesheegs, and other floodplain lands were originally forested or covered by other floodplain vegetation. Over time, many of these areas have been cleared for cultivation to the point that few patches of natural vegetation remain intact. The trend toward loss of natural cover has accelerated dramatically over the past two decades.

Household Resources

Households commonly have plot rights on one or more soil/location types to minimize production risks since each type produces better under different climatic conditions. During droughts, dhesheeg land is critical as the soils retain water better. During and immediately after floods, doonk is preferred because floodwater drains more quickly from higher ground, thereby allowing earlier cultivation. However, doonk produces poorly, if at all, during droughts. Riverbank land is valued for its *siimow* or underground water that percolates up through the soil. While this land does not produce as well as dhesheeg land during drought, it is the best land for fruit trees because of the siimow.

Families in Besteman and Roth's village sample from Middle Jubba Region (Besteman and Roth 1988) reported an average of three plots. The number depends on a family's position in its "life cycle"—a young single man or married couple may have just one plot, whereas an older man with two wives and a married son living in the household may have five or six. Many families have plots that are currently in bush (*i.e.*, left uncultivated for a year or more), in addition to those under cultivation. The fallowing of land to maintain fertility is not generally practiced. Usually, land is left idle due to drought or a lack of labor.

Riverine populations in the SEBS survey, as a whole, reported that 73 percent of households averaged only one plot of land under production at the time of the survey (Table 48).

Table 48. NUMBER OF FARM PLOTS PER HOUSEHOLD BY MEAN OF PLOT AND PERCENTAGE OF HOUSEHOLDS HAVING PLOTS

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE		
NO FARM PLOTS	MEAN HA	N	%	MEAN HA	N	%	MEAN HA	N	%	MEAN HA	N	%
1	4.3	715	76.4	5.2	128	87.4	4.9	321	73.1	2.7	170	73.2
2	3.7	174	18.6	4.9	15	10.4	3.8	91	20.6	2.9	55	22.8
3	2.7	30	3.2	3.8	4	2.2	2.9	6	3.9	1.4	8	3.1
4	3.8	7	0.7	—	—	—	4.2	6	1.2	0.5	1	0.4
5	3.2	4	0.4	—	—	—	4.0	2	0.5	0.8	1	0.4
6	3.2	3	0.3	—	—	—	3.2	2	0.5	—	—	—
7	4.0	2	0.2	—	—	—	5	1	0.2	—	—	—
8	2.5	1	0.1	—	—	—	—	—	—	—	—	—
	PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
1	3.7	91	78.4	2.9	193	83.9	3.2	273	74.0	6.6	249	74.0
2	4.4	19	14.4	1.0	32	13.9	2.4	80	22.0	6.8	62	18.0
3	3.6	4	27.0	1.2	5	2.2	1.5	13	3.5	4.5	12	4.0
4	5.0	1	0.9				0.8	3	0.8	6.0	4	1.2
5	3.8	1	0.9				0.8	1	0.3	4.0	3	0.9
6	3.1	1	0.9				—	—	—	3.2	3	0.9
7	3.0	1	0.9				—	—	—	4.0	2	0.6
8	2.5	1	0.9				—	—	—	2.5	1	0.3

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An example of riverbank-recession agriculture in the Gorge between Buurdhuubo and the dam site.

A father and son plant a dhesheeg *plot in the Middle Jubba.*

Like their Middle Jubba Region counterparts, riverine farmers elsewhere in the valley commonly have access to additional bushlands available for cultivation during flood years, *i.e.*, when riverbank and dhesheegs are flooded. However, these additional lands not regularly under cultivation were not enumerated as part of farmers' holdings. Although farmers' value for multiple plot types is apparent, cultivation of multiple plots concurrently is less common than expected.

In Middle Jubba Region, dhesheeg land is considered the most important. For example, 41 percent of cultivated plots in the Besteman and Roth sample from this region are on dhesheeg land (Besteman and Roth 1988). Doonk comprises 31 percent of plots in the sample, and riverbank, 24 percent. The remaining four percent consist of some combination of these types. In the SEBS sample, drawn from the entire Jubba Valley, 61 percent of the plots of riverine agriculturalists are riverbank or dhesheeg plots.

Because the number of dhesheeg plots is limited and every household wants at least one as a hedge against drought, they tend to be smaller than doonk or jiimo plots. There has been an increase in the clearing of jiimo and doonk plots by villagers, which is apparently related to four factors:

- improved prices for agricultural produce (caused by the lifting of state controls);
- increase in population;
- fear of losing riverbank land to outsiders if it is not cleared; and
- recent village relocations.

Farms of riverine agricultural families average 5.9 hectares. With a median farm size of 1.5 ha, Lower Jubba Region farmers have the smallest farms in the valley (one-half that of Gedo Region) and the smallest percentage of cultivated land devoted to riverine plots (14 percent in contrast to 41 percent for Middle Jubba Region and 54 percent for Gedo Region) (Table 49).

Traditional agricultural production systems in Jubba Valley operate at a low technological level. The majority of farmers use only hand implements—a small hand hoe, the *yambo*, is ubiquitous as well as a long machete (*banga*) and hand ax for clearing bush from fields. Tractor rental is desired by a majority of farmers for field preparation because of the heaviness of soils and a shortage of family labor. However, relatively few farmers have access to tractors due to cost and the general unavailability of tractors in most agricultural areas.

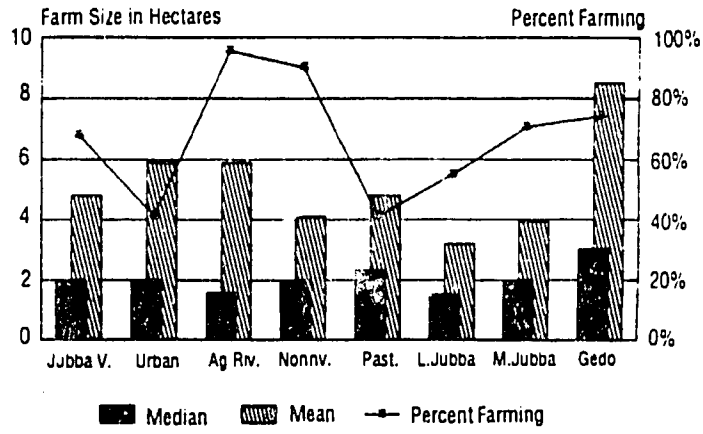

Figure 3. Farm size and percent of each production sector having farms.

The greatest degree of smallholder irrigation in Jubba Valley occurs among riverine agricultural households (Table 50). Irrigation has introduced profound changes into agriculture in the Jubba Valley by expanding its traditional subsistence orientation to include cash-crop production. Among political regions, irrigated plots are most common in Gedo Region (42 percent) and least common (four percent) in Middle Jubba Region which has not developed a market-oriented economy due to its isolation. It is no coincidence that Gedo Region, with the highest proportion of irrigated plots, also has the valley's highest agricultural income (Tables 50 and 51).

Accumulating the capital to purchase a pump is a fundamental obstacle to more rapid development of smallholder irrigation. A sharecropping arrangement with an outsider providing a pump is the most common type of system smallholder irrigators are involved in. Sharecropping arrangements involving irrigation were followed most commonly by farmers owning their own pumps (Table 52).

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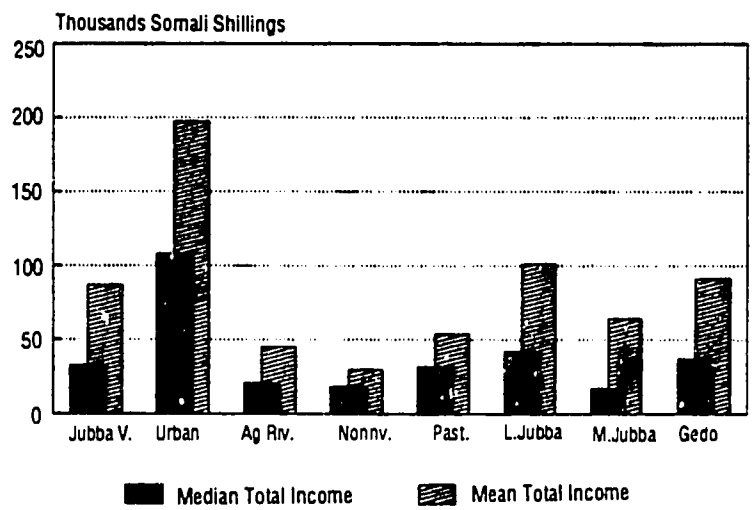
Table 49. FARM SIZE AND PERCENT OF EACH PRODUCTION SECTOR HAVING FARMS

JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE		
MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS
4.8	2.0	68.0	5.9	2.0	41.4	5.9	1.6	95.8	4.1	2.0	90.1
PASTORAL			**LOWER JUBBA**			**MIDDLE JUBBA**			**GEDO**		
MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS	MEAN HA	MED HA	% WITH FARMS
4.8	2.3	41.0	3.2	1.5	55.0	3.9	2.0	70.4	8.5	3.0	74.0

Table 50. IRRIGATED VS NON-IRRIGATED PLOTS AND PERCENT OF HOUSEHOLDS HAVING EACH TYPE

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE		
	MEAN HA	N	%	MEAN HA	N	%	MEAN HA	N	%	MEAN HA	N	%
Irrigated	9.4	173	18.5	11.0	22	16.3	8.9	128	26.8	7.1	21	9.4
Non irrigated	2.9	760	81.5	4.0	112	83.0	2.6	350	73.2	2.2	2.2	90.2
	PASTORAL			**LOWER JUBBA**			**MIDDLE JUBBA**			**GEDO**		
Irrigated	40.0	2	1.8	15.5	16	7.0	8.6	16	4.3	8.8	141	42.0
Non irrigated	3.1	110	98.2	1.7	213	92.6	2.6	354	95.7	4.8	193	57.0



for cases with no missing data (n=1018)

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Table 51. HOUSEHOLD INCOME, INCLUDING PERCENT MEDIAN AND MEAN OF EACH POPULATION HAVING INCOME TYPE

INCOME TYPE	JUBBA VALLEY N=1028 % WITH INCOME	MEAN INCOME	MEDIAN INCOME	URBAN N=282 % WITH INCOME	MEAN INCOME	MEDIAN INCOME	AG RIVERINE N=360 % WITH INCOME	MEAN INCOME	MEDIAN INCOME	AG NONRIVERINE N=176 % WITH INCOME	MEAN INCOME	MEDIAN INCOME
Agriculture	41	30,584	10,000	25	68,241	21,500	53	27,435	8,800	52	16,912	10,900
Livestock	49	30,648	15,700	17	42,345	15,000	54	23,069	7,000	46	16,658	10,280
Hunt & Gather	14	24,022	5,000	4	53,346	20,000	26	18,554	4,650	9	9,800	5,000
Craft	11	61,118	8,000	10	186,059	96,000	14	15,804	4,180	9	10,362	2,100
Business	23	161,512	66,100	42	263,792	170,000	14	32,304	10,200	19	32,883	10,000
Wages	28	42,650	18,000	49	65,342	28,200	20	23,333	8,000	24	14,381	12,000
Property sale	1	146,400	7,500	1	430,000	430,000	—	—	—	—	—	—
Rent	41	23,374	5,700	11	26,249	7,200	2	3,680	3,600	2	35,233	4,800
Remittance	14	52,649	13,500	25	87,493	36,000	9	12,826	5,250	10	14,279	10,000
Bridewealth	5	12,348	5,000	5	18,933	15,000	5	8,738	3,300	4	6,957	5,000
Inheritance	7	82,950	24,000	2	222,142	100,000	2	28,100	21,000	3	18,000	20,000
	PASTORAL N=210			LOWER JUBBA N=345			MIDDLE JUBBA N=307			GEDO N=376		
Agriculture	23	22,982	11,000	36	22,040	11,000	47	15,065	7,600	34	56,507	17,400
Livestock	80	43,112	24,900	36	27,990	15,000	36	16,758	8,000	62	38,740	21,700
Hunt & Gather	8	29,171	9,000	8	40,956	7,200	21	9,109	3,000	11	35,492	1,000
Craft	4	13,300	5,600	7	139,760	36,000	21	41,221	4,000	4	31,378	19,000
Business	11	83,822	26,150	23	161,511	66,100	22	115,638	48,000	19	108,312	36,000
Wages	6	18,558	18,000	38	49,212	24,000	24	30,058	10,200	17	43,693	15,600
Property sale	1	7,200	7,200	0	60,000	60,000	1	4,600	2,700	—	—	—
Rent	1	11,700	11,700	7	12,840	6,600	3	16,580	5,100	2	76,833	11,400
Remittance	6	17,550	11,000	16	56,500	13,500	8	48,644	12,500	15	50,600	13,500
Bridewealth	5	16,155	2,500	4	7,076	5,000	5	12,700	3,000	7	14,892	10,000
Inheritance	2	30,250	8,000	1	20,000	18,666	2	60,000	57,160	4	103,052	21,000
Gifts	11	9,139	2,000	6	16,816	5,000	5	8,027	2,000	9	12,925	4,000
Other income	19	18,817	4,000	30	136,859	12,000	20	248,927	5,250	26	48,302	15,000
Total Income	**99**	**54,017**	**31,900**	**99**	**100,914**	**42,035**	**97**	**64,228**	**17,370**	**97**	**91,251**	**37,370**

Table 52. FREQUENCY DISTRIBUTION OF PUMP OWNERSHIP

OWNER	JUBBA VALLEY N=1242		URBAN N=300		AG RIVERINE N=442		AG NONRIVERINE N=235		PASTORAL N=193		LOWER JUBBA N=382		MIDDLE JUBBA N=403		GEDO N=463	
Interviewee	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Neighbor	36	2.9	16	5.3	16	4.0	2	0.9	2	1.0	2	0.5	2	0.5	32	7.0
Merchant	28	2.2	3	1.0	22	5.0	3	1.3	—	—	5	1.3	4	1.0	19	4.1
Outsider	48	3.8	—	—	38	9.0	10	4.3	—	—	2	0.5	5	1.2	41	8.9
Relative	8	0.6	—	—	8	2.0	—	—	—	—	—	—	2	0.5	6	1.3
Other	21	1.7	3	1.0	18	4.1	—	—	—	—	—	—	—	—	21	4.5
Not irrigated	32	2.6	—	—	21	5.0	6	3.0	—	—	8	2.1	2	0.5	20	4.3
	1075	86.1	276	92.0	317	317.0	214	91.1	191	99.0	365	95.5	387	96.0	323	70.0

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There are basically two sharecropping arrangements in the valley:

- laborers work the land of a pump owner in exchange for half the harvests; and
- farmers with land but no pump supply labor and share the harvest with a pump owner, often a local merchant, who furnishes fuel and maintenance for the pump as well as transporting harvests to market.

As listed in Table 52, the most common form of sharecropping is the second model. Sharecropper agreements with those from outside the village are less desirable than contractual agreements with a pump owner from within the village. Sharecropping relationships are not always harmonious. However, sharecropping has not yet posed a serious threat to land security or economic well-being of valley farm households.

Irrigation also has an effect on the value of labor. On nonirrigated farms, the household supplies its own labor. However, irrigation and cash-crop production are accompanied by the cash value of labor and sharecropping. Irrigation also increases competition for land and challenges traditional local resource management systems. Pump owners are in an increasingly advantageous economic and technical position to acquire land.

Deployment of Resources in the Farming Enterprise

Traditional cultivation of jiimo and dhesheeg is a function of the yearly cycle of available soil moisture. The flood cycle is highly variable. Although flooding is most anticipated in the deyr, it occurs twice in some years and not at all in others.

Farm plots are generally cleared for cultivation prior to the anticipated flood and/or rains. All soils except dhesheeg are usually planted shortly after rains begin, with maize during gu' and sesame in deyr. Dhesheeg land is planted whenever the soil is dry enough and farmers are reasonably confident that crops can be harvested before the next flood. Because dhesheegs frequently dry little-by-little after a flood or heavy rain, planting follows the receding water. Therefore, planting, weeding, and harvesting may occur continuously for three months on a dhesheeg plot, with one end of the plot being planted while the other is being harvested.

Farmers usually plant on jiimo and nonfloodplain farms first (unless there is a serious drought) and wait to plant dhesheeg plots. Consequently, planting, weeding, and harvesting are staggered, although major labor bottlenecks occur on doonk and jiimo plots.

Dhesheegs, like jiimo, are dependent on several sources of moisture including floods, rainfall, inland tributaries, inland surface water runoff, and underground sources of moisture. Floodwater flow to the dhesheegs is augmented in some instances by hand-dug canals leading from the riverbank.[4]

Risk-aversion in the riverine zone is further enhanced by cultivation of inland rainfed soils beyond the floodplain. These rainfed soils are most susceptible to drought but are not affected by flood. As such, the inland rainfed soils add another dimension to the overall riverine agricultural production system.

North of Bu'aale, sesame planting declines and sorghum is planted with greater frequency. Most farmers also plant some pumpkin, squash, and beans, and a few plant a small amount of tobacco. Maize is grown for home consumption and sesame primarily for sale (after household needs for sesame oil have been met). In the southern part of the valley, tobacco and cotton are also sometimes grown in the xagaa. These crops, among others, may be grown continuously in some dhesheegs as waters evaporate and recede toward the center.

Households in villages depend on subsistence farming. The majority of farmers cultivate primarily to provide for family consumption needs while livestock provide an important source of income for meeting household cash needs. A few have additional sources of income, such as carpentry or shopkeeping, but these activities are secondary to agriculture in terms of time and income.

Riverine households, the sector most agriculturally dependent, reported that only one-half of all households earn agricultural income (Table 51). Not only did relatively few households earn cash

[4] For a more extensive discussion of dhesheeg agriculture, see *Impact of the Bardheere Dam on the Development of the Traditional Agricultural System (Desheks) in Juba Valley*, Agrar-und Hydrotechnik: Essen, October 1986.

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incomes from farming, but the median yearly agricultural income for riverine households (8,800 SSh) was the lowest of any sector, and approximately one-half the median agricultural income derived by urban farmers (Table 51). Highest regional median agricultural incomes, in excess of 17,000 SSh, are earned by farmers in Gedo Region, site of the valley's most robust smallholder economy.

Even among riverine agricultural households, livestock play an important part in household economic strategies. In spite of tsetse in much of the riverine areas below Baardheere, 72 percent of riverine households have some livestock (Table 53). Although animal traction is not used for agricultural work, animal-drawn carts are fairly common. Among rural agricultural sectors, camels are kept by 11 to 19 percent of households where they are used primarily as burden animals for carrying water and other household supplies.

Cattle herds average 10 head among the 50 per cent of riverine households that keep cattle. Cattle herds held by agricultural riverine households are the smallest of Jubba Valley production systems. Regardless of the size of cattle herds, households annually sold an average of seven percent of their herds and consumed only two per cent of their total herds (Table 54). Camel herds kept by riverine agriculturalists are, likewise, the smallest among valley production systems. Herds average eight camels among the 20 percent of riverine households with camels.

Regarding disposition of agricultural products among subsistence farmers, home consumption far outstrips sales as a percentage of total production. When income from sale of milk products is added to income from sale of live animals, the commercial importance of livestock appreciates even more. Cereal grains compose the bulk of farmers' diets, but cereals are expensive to produce in terms of high labor inputs. Considering the faster rates of livestock herd growth in comparison to hand cultivation and the greater labor efficiency of livestock herding over traditonal, nonirrigated agriculture, the investment return is higher on livestock as a source of cash.

The point of this discussion is to underscore the integration of livestock in all sectors of the valley and to emphasize the extreme importance of livestock to all aspects of the valley economy—not just to pastoralists alone.

A family's farming strategy for any given year is very fluid and depends on a variety of factors, including the availability of labor, climatic conditions, prices, types of land held, and how many plots have returned to bush and would require extensive preparation before planting.

Seeds used are all traditional varieties except for some varieties of improved sorghum that appear to have been introduced about 20 years ago ("merikan" sorghum). Farmers have little or no access to fertilizers, chemical pesticides or herbicides.

In each season, yields in the traditional agricultural riverine sector range from 0.5 t/ha to just over one t/ha for maize and sorghum, and 0.3 t/ha to 0.5 t/ ha for sesame. In riverine environments, livestock and agricultural incomes are nearly equal.

2. Pastoral Systems

Pastoralism is adjusted to harsh environments often too severe to allow agriculture. These constraints include conditions which are too dry, cold, rocky, high, or steep for cultivation. As such, pastoral production is suited to the climate of Somalia and the Horn of Africa.

Nationally, following a steady trend of urbanization and rural settlement over the past two decades, the remaining portion of pastoral population in Somalia is probably in the realm of 40 to 50 percent. Moreover, the structure of the pastoral economy is changing in response to a number of forces which have resulted in greater economic diversification.

Physical Setting

Rainfall records from the past 60 years collected from Muqdisho and northeastern Kenya adjacent to southern Somalia indicate no pattern in recent history of increased frequency of drought and gradual drying-out (see Figure 6) (J. Merryman 1987). Drought, defined as sustained below-mean rainfall levels, was more extreme and sustained in the 1940s and 1950s in northeastern Kenya.

The reason for an increasing impact of drought in recent decades lies more in sociological and political forces that occurred mainly in the twentieth century. For pastoralists, traditional adaptive strategies are decreasingly effective in the face of nationally imposed land-use changes, limitations on mobility, restrictions on use of force, and greater exposure and susceptibility to international conflict. These forces have placed pressure on pastoral systems rendering them less responsive to drought

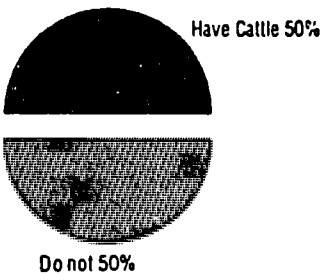
Table 53. PERCENT OF HOUSEHOLDS HAVING LIVESTOCK

JUBBA VALLEY	URBAN	AG RIVERINE	AG NONRIVERINE	PASTORAL	LOWER JUBBA	MIDDLE JUBBA	GEDO
N=1028	N=282	N=360	N=176	N=210	N=345	N=307	N=376
69 9	41.8	71.8	79.5	100	61.4	56	88.2

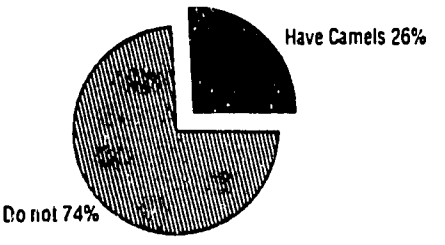
Table 54. ANNUAL CHANGES WITHIN CATTLE HERD COMPOSITION FOR HOUSEHOLDS HAVING CATTLE

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD
OFF-TAKE																
SALES	1.3	7.0	1.2	7 6	0.7	7.4	1.1	7.1	2.0	6.0	0.8	5.1	1.5	6.9	1.4	8.1
DOMESTIC CONSUMP	0.3	2.0	0.1	0.6	0.2	2.1	0.4	2.6	0.5	2.0	0.3	2.0	0.4	1.8	0.3	1.8
DIED	4.0	20.0	4.2	26.8	2.4	25 3	3.1	20.1	6.7	20.0	2.9	18.8	3.7	17.1	5.1	29.8
GIVEN	0.2	1.0	0.1	0.6	0.1	1.0	0.1	0.6	0.5	2.0	0.1		0.3	5.4	0.1	
TOTAL OFF-TAKE	5.8	30.0	5.6	35.6	3.4	35.8	4.7	30.4	9.7	30.0	4.1	25.9	5.9	31.2	6.9	39.7
HERD GAINS																
BIRTHS	3.5	18.0	2.8	17.8	2.2	23.1	2.9	18.8	6.0	18.0	3.0	19.5	4.1	19.0	3.5	20.5
PURCHASED	0.1	1.0	—	—	0.2	2.1	0.3	2.0	—	—	0.1	0.6	0.3	1.4	0.1	0.6
RECEIVED	—	—	—	—	—	—	0.1	0.7	—	—	—	—	—	—	—	—
TOTAL GAIN	3.6	19.0	2.8	17.8	2.4	25.2	3.3	21.5	6.0	18.0	3.1	20.1	4.4	20.4	3.6	21.1
NET LOSS	2.2	11.0	2.8	17.8	1.0	10.6	1.4	8.9	3.7	12.0	1.0	5.8	1.5	10.8	3.3	18.6
CALVING RATE		29.6								31.0		29.4		28.2		30.7

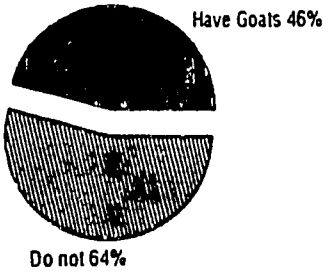
Households with Cattle
Jubba Valley



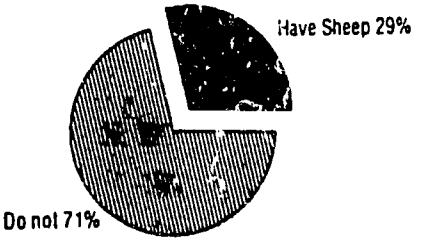
Households with Camels
Jubba Valley



Households with Goats
Jubba Valley



Households with Sheep
Jubba Valley



which, in turn, has hastened sedentarization. In particular, increasing human and livestock numbers have placed limitations on the land's carrying capacity, particularly in times of drought. This has developed as a problem in the twentieth century because previous rapid rates of human and livestock population growth were offset by Somali territorial expansion (J. Merryman 1986).

Household Resources

By definition, all pastoral households keep livestock (Table 53). In addition in the pastoral sector, 41 percent of households sampled have agricultural holdings. The pastoral sector is the only group to have a significant portion of three or more plots per household undoubtedly related to a greater dispersion of plots corresponding to seasonal pastoral migrations. The highest percentage of dryland plots are found among pastoralists (88 percent) who primarily cultivate patches of drought-resistant crops such as sorghum (Table 48). Pastoralists have the lowest percentage of irrigated plots of any of the groups in the study (Table 50).

Regionally, livestock are least commonly kept among households of Middle Jubba Region (56 percent) and most commonly kept among Gedo Region households (88 percent). Gedo Region is well-known for its pastoral orientation and arid environment. Lower Jubba Region livestock are represented, particularly by the pastoral centers of Afmadow and Dhesheeg Waamo in Afmadow District, as well as pastoralists of the Deex grazing area located on the sandy soils between the east bank farms of Jamaame and the coast.

Among pastoralists, cattle are the single most common species and are kept by 79 percent of households (Table 55). However, in terms of species combinations, cattle, camels, sheep, and goats are the most common pattern found in 26 percent of households (Table 56). Cattle herds average 30 head among the 74 percent of pastoral households with cattle (Table 57). Average camel herd size closely parallels average cattle herd size. The mean camel herd size is 25 among pastoralists (Table 58).

Of the four socio-ecological sectors, pastoralists have the largest goat herds in Jubba Valley with a mean of 39 per household. Sheep are represented in only 29 percent of valley households.

The four primary livestock species of the valley are very different in their size and weight characteristics making it difficult to compare overall livestock holdings within and across sectors of the valley. In an effort to facilitate comparability, livestock species have been combined into Tropical Livestock Units (TLUs).

The mean number of TLUs is 55 for pastoral households (Table 58). Information in Pratt and Gwynne (1977) suggests that average current live-

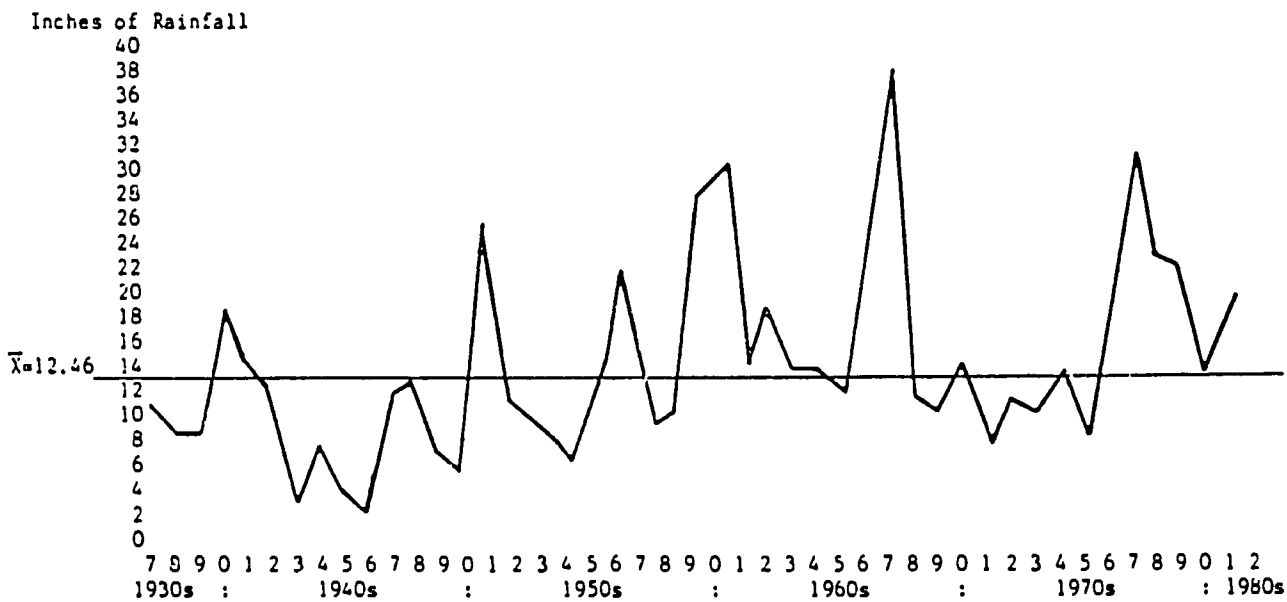


Figure 6. Rainfall pattern, 1937 to 1982. Garissa District, Northern Kenya.

Table 55. AVERAGE NUMBER OF LIVESTOCK PER HOUSEHOLD FOR % OF HOUSEHOLDS HAVING LIVESTOCK

LIVESTOCK TYPE	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
	TYPE	%	TYPE	%	TYPE	%	TYPE	%	TYPE	%	TYPE		TYPE	%	TYPE	%
CATTLE	50.0	17.7	24.0	15.7	52.0	9.5	63.0	15.4	79.0	29.5	46.0	15.4	40.0	21.6	61.0	17.1
CAMELS	26.0	17.6	7.0	25.5	20.0	7.9	11.0	9.9	72.0	25.2	18.0	28.3	9.0	16.0	46.0	21.5
GOATS	46.0	26.0	25.0	24.0	51.0	25.0	38.0	15.0	73.0	39.0	35.0	15.0	27.0	15.0	78.0	35.0
SHEEP	29.0	16.0	12.0	29.0	46.0	14.0	22.0	13.0	49.0	16.0	16.0	7.0	12.0	7.0	55.0	20.0

Table 56. HOUSEHOLD LIVESTOCK HERD COMBINATIONS

HERD COMBINATION	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
No livestock	308	30.1	164	58.2	92	28.2	108	30.4	22	11.6	133	38.6	133	44	42	11.2
Cattle	155	15.1	38	13.5	28	8.6	34	9.6	55	25.4	65	18.8	66	21.9	24	6.5
Camels,Cattle,Sheep,Goats	105	10.3	8	2.8	36	11.0	36	10.1	12	6.8	8	2.3	7	2.3	90	23.9
Cattle,Goats,Sheep	84	8.2	6	2.1	52	16.0	52	14.6	12	2.9	23	6.7	15	5.0	46	12.2
Goats	79	7.7	31	11.0	25	7.7	29	8.2	4	3.8	24	7.0	30	9.9	25	6.6
Cattle,Goats	64	6.3	7	2.5	30	9.2	31	8.7	8	14.4	24	7.0	14	4.6	26	6.9
Camels,Cattle,Goats	45	4.4	4	1.4	8	2.5	8	2.3	30	1.0	21	6.1	5	1.7	19	5.1
Goats,Sheep	44	4.3	10	3.5	23	7.1	25	7.0	2	11.1	4	1.2	8	2.6	32	8.5
Camels,Cattle	40	3.9	4	1.4	9	2.8	9	2.5	23	10.5	9	2.6	11	3.6	20	5.3
Camels,Goats,Sheep	39	3.8	2	0.7	9	2.8	9	2.5	24	10.7	6	1.7	1	0.3	32	8.5
Cattle,Sheep	18	1.8	2	0.7	7	2.1	1	2.0	—	—	10	2.9	3	1.0	2	0.5
Camels	10	1.0	1	0.4	1	0.3	1	0.3	6	2.9	4	1.2	4	1.3	5	1.3
Sheep	6	0.6	4	1.4	2	0.6	2	0.6	—	—	1	0.3	3	1.0	2	0.5
Camels,Cattle,Sheep	3	0.3	—	—	1	0.3	1	0.3	2	1.0	1	0.3	—	—	2	0.5
Camels,Sheep	1	0.1	—	—			—	—	1	0.5	1	0.3	—	—	—	—
Camels,Goats	—	—	1	0.4	2	0.6	2	0.6	17	8.2	11	3.2	—	—	9	2.4

Table 57. AVERAGE HOUSEHOLD CATTLE HERD COMPOSITION

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD
LACTATING	3.7	20.9	3.5	22.4	1.9	20.1	3.3	21.4	6.2	21.1	3.2	20.9	4.8	22.1	3.4	20.0
NON-LACTATING	8.1	45.8	7.6	48.4	4.2	44.1	7.0	45.5	13.2	44.7	7.0	45.5	9.7	45.0	8.0	46.8
BULLS	1.2	6.8	1.1	7.0	0.6	6.3	1.1	7.1	1.8	6.1	1.1	7.1	1.4	6.5	1.1	6.4
CASTRATES	0.3	1.7	0.1	0.6	0.2	2.1	0.2	1.3	0.6	2.0	0.3	1.9	0.3	1.4	0.3	1.7
IMMATURE FEMALES	2.7	15.2	2.0	12.7	1.5	15.8	2.1	13.6	5.0	17.0	2.3	14.9	3.5	16.2	2.6	15.2
IMMATURE MALES	1.7	9.6	1.4	8.9	1.1	11.6	1.7	11.1	2.7	9.1	1.5	9.7	1.9	8.8	1.7	9.9
TOTAL	17.7	100.0	15.7	100.0	9.5	100.0	15.4	100.0	29.5	100.0	15.4	100.0	21.6	100.0	17.1	100.0

Table 58. AVERAGE HOUSEHOLD CAMEL HERD COMPOSITION FOR HOUSEHOLDS HAVING CAMELS

	JUBBA VALLEY N=267		URBAN N=20		AG RIVERINE N=72		AG NONRIVERINE N=20		PASTORAL N=151		LOWER JUBBA N=62		MIDDLE JUBBA N=28		GEDO N=173	
	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD	NO OF CATTLE	% OF HERD
LACTATING	4.5	20.0	5.9	23.0	1.0	12.6	1.5	15.2	4.9	19.4	6.4	22.6	3.6	22.5	3.9	18.0
NON-LACTATING	10.1	44.9	11.4	44.7	3.5	44.3	4.4	44.4	10.9	43.2	13.6	48.2	5.3	33.2	9.8	45.6
BULLS	2.3	10.2	3.0	11.8	1.2	15.1	1.7	17.2	2.5	10.0	2.5	8.8	1.6	10.0	2.3	10.7
CASTRATES	0.8	3.6	0.7	2.7	0.7	9.0	0.2	2.1	1.0	4.0	0.6	2.2	0.5	3.1	0.9	4.2
IMMATURE FEMALES	2.9	12.9	3.0	11.8	0.8	10.0	1.3	13.1	3.5	13.9	3.2	11.2	2.8	17.5	2.8	13.1
IIMMATURE MALES	1.9	8.4	1.5	6.0	0.7	9.0	0.8	8.0	2.4	9.5	2.0	7.0	2.2	13.7	1.8	8.4
TOTAL	22.5	100.0	25.5	100.0	7.9	100.0	9.9	100.0	25.2	100.0	28.3	100.0	16.0	100.0	21.5	100.0

stock holdings in the study area are approximately twice the amount needed for subsistence. However, the mean suggests a pastoral well-being that is not altogether warranted because averages are heavily skewed by a few large herd owners.

Choosing the median as a more appropriate reflection of central tendency, the pastoral sector median number of TLUs is slightly more than half the mean number of pastoral TLUs. Based roughly on the formula in Pratt and Gwynne, it is reasonable to assume that most of the pastoral sector is currently able to live at no more than subsistence level in terms of nutritional dependence on livestock alone (Table 59).

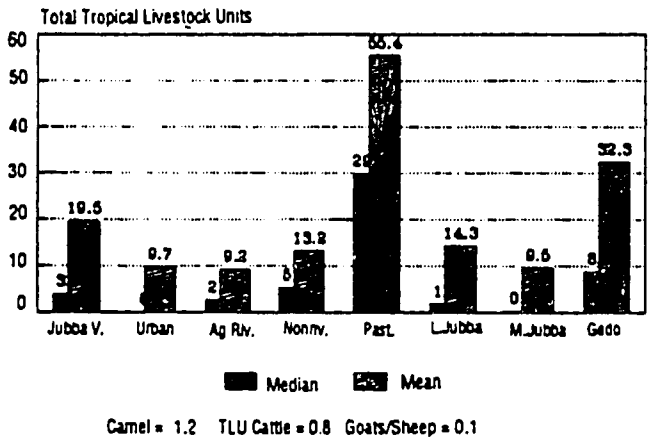


Figure 7. Tropical Livestock Units. Average holdings per household.

Herd management is organized on a household and extended kin basis with family members supplying the bulk of labor, herding livestock in extensive area, open-range contexts.

Purchase of live animals is not particularly common. Valley households are primarily producers, not buyers of livestock.

Deployment of Pastoral Resources in the Farming Enterprise

Multi-species livestock-keeping continues to be important among pastoralists. Herd mixes of both browsers (camels and goats) and grazers (sheep and cattle) make efficient use of Somalia's range and increases carrying capacity (Pratt and Gwynne 1977). Multi-species herding can be credited for much of Somali pastoralism's success. Pastoralism is a specialized economic mode vulnerable to a variety of social and natural variables. However, that vulnerability is reduced by spreading that risk over a number of species of varying reproductive rates, disease resistance, and drought tolerance.

Among pastoral households, there was a net cattle herd loss of 12.0 percent in the year (1986 to 1987) prior to the JESS household interview (Table 54). Cattle herd reductions are mainly attributed to deaths (20 percent of herd size) related primarily to drought in much of the valley in 1987. Cattle losses in pastoral herds were somewhat compensated by an 18 percent herd gain from births. A 31 percent calving rate reported for breeding females is low, a fertility rate possibly related to the year's drought and subsequent decline in range conditions.

For the same period, the more drought-resistant pastoral camel herds showed no change in herd size. Domestic consumption of camels by households accounts for only one percent of herds among pastoralists; consumption of household camels is almost nonexistent among urban and riverine agricultural households (Table 60).

The off-take pattern for goats and sheep for 1987 suggests a different pattern than cattle and camels. A greater off-take of goat herds (8.5 percent) went toward sales than was found among cattle and camel herds. Secondly, a greater proportion of sheep and goat herds (four to five percent) are consumed by the household than camel and cattle herds (one to two percent) (Tables 61 and 62).

Livestock production continues to be primarily for household consumption and not for market sale of live animals. Secondly, household livestock production is geared toward milk and milk products—primarily *ghee*.

The dairy orientation of Jubba Valley livestock producers is reflected in low off-take for market sales, and further illustrated by low meat consumption by livestock producers. Other than livestock on the verge of death that are slaughtered, especially in times of drought, few cattle and camels are consumed domestically except for weddings, funerals, and religious holidays. In contrast, sheep and goats are not an important source of milk but form more common sources of meat consumed.

Gifts of live animals among pastoralists amount to one percent of total camel and goat herds and two percent of cattle herds (Tables 53, 60, 61, and 62).

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Table 59. NUMBER OF TROPICAL LIVESTOCK UNITS PER HOUSEHOLD

JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE		
RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN
0/705	19.5	3.9	0/645	9.7	0	0/208	9.2	2.6	0/609	13.2	5.3

PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN
0/705	55.4	29.8	0/404	14.3	1.8	0/375	9.5	0.3	0/705	32.3	8.8

Table 60. CHANGES WITHIN AVERAGE CAMEL HERD FOR HOUSEHOLDS HAVING CAMELS

	JUBBA VALLEY N=267		URBAN N=20		AG RIVERINE N=72		AG NONRIVERINE N=20		PASTORAL N=151		LOWER JUBBA N=62		MIDDLE JUBBA N=28		GEDO N=171	
OFFTAKE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE	NO OF CAMEL	% OF HERD CHANGE
SALES	1.0	5.7	1.3	5.1	0.4	5.1	0.7	7.1	1.3	5.0	1.0	3.5	1.2	7.5	1.0	4.7
DOMESTIC CONSUMP	0.2	1.1	0.0	0.0	0.0	0.0	0.1	1.0	0.3	1.0	0.1	0.4	0.2	1.3	0.2	0.9
DIED	2.5	14.0	4.0	15.7	2.5	31.6	1.0	10.1	2.9	12.0	0.9	3.0	0.9	5.6	3.3	15.3
GIVEN	0.2	1.1	—	—	—	—	—	—	0.3	1.0	0.1	0.4	0.3	1.9	0.2	0.9
TOTAL OFF-TAKE	3.9	21.9	5.3	20.8	2.9	36.7	1.8	18.2	4.8	19.0	2.1	7.3	2.6	16.3	4.7	21.8
HERD GAINS																
BIRTHS	3.9	22.0	4.5	17.6	1.0	12.6	1.7	17.2	5.1	20.0	3.7	13.0	4.9	30.6	3.8	17.7
PURCHASED	—	—	—	—	0.1	1.3	—	—	—	—	—	—	0.2	1.3	0.1	0.5
RECEIVED	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL GAIN	3.9	22.0	4.5	17.6	1.1	13.9	1.7	17.2	5.1	20.0	3.7	13.0	5.1	31.9	3.9	18.2
NET LOSS	0.0		0.8	3.2	1.8	22.8	0.1	1.0							0.8	3.6
NET INCREASE		0.1							0.3	1.0	1.6	5.7	2.5	15.6		

Table 61. ANNUAL CHANGES WITHIN SHEEP HERD COMPOSITION FOR HOUSEHOLDS HAVING SHEEP

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
OFF TAKE	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD	NO OF SHEEP	% OF HERD
SALES	1.0	6.3	0.9	3.1	1.2	8.6	0.3	2.3	0.9	5.6	0.3	4.3	0.2	2.9	1.3	6.5
DOMESTIC CONSUMP	0.7	4.4	1.3	4.5	0.6	4.3	0.9	6.9	0.5	3.1	0.4	5.7	0.6	8.6	0.9	4.5
DIED	5.0	31.3	15.0	51.7	3.8	27.1	3.6	27.7	2.9	18.1	1.6	22.8	0.4	5.7	6.7	33.5
GIVEN	—	—	—	—	—	—	—	—	0.1	0.6	—	—	—	—	0.1	0.5
TOTAL OFF-TAKE	6.7	42.0	17.2	59.3	5.6	40.0	4.8	36.9	4.4	27.4	2.3	32.8	1.2	17.2	9.0	45.0
HERD GAINS																
BIRTH	3.1	19.4	1.9	6.6	2.7	19.3	3.2	24.6	3.6	22.5	2.0	28.6	1.8	25.7	3.6	18.0
PURCHASED	0.1	0.6	0.1	0.3	0.1	0.7	0.1	0.8	0.1	0.6	0.1	1.4	0.1	1.4	0.1	0.5
RECEIVED	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL GAIN	3.2	20.0	2.0	6.9	2.8	20.0	3.3	25.4	3.7	23.1	2.1	30.0	1.9	27.1	3.7	18.5
NET LOSS	3.5	22.0	15.2	52.4	2.8	20.0	1.5	11.5	0.7	4.3	0.2	2.8			5.3	26.5
NET INCREASE													0.7	9.9		

Table 62. ANNUAL CHANGES WITHIN AVERAGE GOAT HERD COMPOSITION FOR HOUSEHOLDS HAVING GOATS

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
OFF-TAKE	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD	NO OF GOAT	% OF HERD
SALES	2.2	8.5	0.6	2.5	2.6	10.4	1.4	9.3	3.4	8.7	0.9	6.0	0.4	2.7	3.2	9.1
DOMESTIC CONSUMP	1.2	4.6	0.9	3.8	1.2	4.8	1.0	6.7	1.6	4.1	0.5	3.3	0.8	5.3	1.6	4.6
DIED	6.8	26.2	8.1	33.8	7.6	30.4	4.6	30.7	8.0	20.5	2.2	14.7	1.9	12.7	9.9	28.3
GIVEN	0.2	0.8	0.1	0.4	0.2	0.8	0.1	0.7	0.4	1.0	0.1	0.7	0.1	0.7	0.3	0.9
TOTAL OFF-TAKE	10.4	40.1	9.7	40.5	11.6	46.4	7.1	47.4	13.4	34.3	3.7	24.7	3.2	21.4	15.0	42.9
HERD GAINS																
BIRTHS	5.3	20.4	3.6	15.0	5.4	21.6	3.5	23.3	7.7	19.7	3.3	2.2	2.1	14.0	6.9	19.7
PURCHASED	0.4	1.5	—	—	0.5	2.0	0.4	2.7	0.5	1.3	—	—	0.4	2.7	0.5	1.4
RECEIVED	—	—	—	—	—	—	—	—	6.0		—	—	—	—	—	—
TOTAL GAIN	5.7	21.9	3.6	15.0	5.9	23.6	3.9	26.0	14.2	21.0	3.3	2.2	2.5	16.7	7.4	21.1
NET HERD LOSS	4.7	18.2	6.1	25.5	5.7	22.8	3.2	21.4	-0.8	13.3	0.4	22.5	0.7	4.7	7.6	21.8

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Livestock gifts are most commonly given in the form of bridewealth or *Zakat* (the Islamic practice of annual alms giving). Zakat has recently been functioning adaptively among pastoralists as a means for impoverished herders to restock their herds (J. Merryman 1984).

Loans of milk cows (*irmaan*) are also of adaptive significance. Wealthy livestock owners with lactating herds in excess of their consumption needs lend lactating cows to relatives whose cows have insufficient milk to meet their needs. The owner of the lactating animals retains ownership of the animals and can call in the loan whenever needed. Meanwhile, he is benefitted by reducing his own herd labor, gaining status through his assistance, and accruing an obligation debt.

However, most cash from livestock sales goes toward grain purchases to substitute for diminishing pastoral milk supplies during dry seasons. In general, pastoral-sedentary relations are becoming more monetized than in the past. For example, they are changing from free foraging of livestock on farmers' agricultural residues to one of increasing cash relationships. These relationships have changed most radically in areas of irrigated cash-cropping where nearly all agricultural products have acquired a cash value.

Livestock sold are commonly old or sick, particularly during a drought or annual dry season. Consequently, livestock are typically sold when prices are most depressed. Conversely, after the rains, livestock prices increase, livestock regain condition, and herd owners are reluctant to sell—adhering to the time-tested strategy that he who has the most livestock is most likely to survive the next drought, plague, or other devastation.

In 1983, Saudi Arabia placed a ban on imports of Somali livestock based on allegations of improper disease control. Later, the restriction was limited to Somali beef only. The Saudi ban on Somali beef imports had little impact on herd management strategies. In general, cattle keepers felt that the current state of export markets had little impact on their production strategies, and pastoralists, with mixed herds of camels and cattle, said that only nature altered their herd balance.

However, a species-specific marketing pattern is pursued—mainly at the level of livestock traders and large commercially oriented herders. For example, there is a pattern of trekking cattle from Somalia for sale in Kenya which has a significant internal market for beef. Similarly, there is a movement of camels from northern Kenya to Somalia due to lack of significant market demand for camel meat in Kenya (for further details, see Little in Evans, Cullen, and Little 1988).

Although the economics of pastoralism in Jubba Valley have not changed significantly, the dynamics of range use have altered over time. The seasonal movement patterns described in maps that illustrate annual pastoral migrations within southern Somalia (LDRC 1985; Janzen 1988; Watson and Nimmo 1985) are toward greater dispersion of livestock into hinterland areas lacking permanent water supplies during the two rainy seasons and toward greater concentration of herds in grazing areas near permanent wells, wars, and the Jubba River during dry seasons.

However, over the past few decades, large-scale banana, rice, and sugar projects in lower Jubba Region, have eliminated some riverine and floodplain areas from pastoral use, creating greater pressure on remaining range resources of the valley. They have also deprived livestock of use of by-products of agricultural production.[5]

Since the Somali Revolution of 1969, greater attention has been given to development of new water sources. Wells have been dug near Afmadow. Large *wars*, hand-dug water catchment basins that provide most of the water for human and livestock during long, dry intervals between rainy seasons, have been dug in southern Bay Region in the heart of Dooy grazing area not far from the Jubba. Simultaneous with increased water development was the government's ban on tribalism and tribal-based activities. The Land Law of 1975 made range areas the property of the state and therefore available to

[5] Mogambo Irrigation Project now allows some cattle in to graze on rice stubble after the harvest for a fee. This is a change in position by management which formerly would allow no livestock near the periphery of the project. (JESS Field Notes, Mogambo area, 1986 to 1988).

everyone, which resulted in greater fluidity in pastoral movement.

Preservation of range quality is largely a function of maintaining reserve grazing. Prior to the revolution, access to specific range area was based on claims of extended kin groups and their ability to control that claim in the presence of competing kin-groups.

However, freer movement of pastoralists and the expanded number of wells and wars available to livestock-keepers means there is little incentive for anyone to protect reserve areas and considerable potential for short-term gain by maximizing use of these resources. For example, Afmadow was traditionally cattle country. However, in recent years, the area has been increasingly influenced in dry seasons by camels from Gedo and Hiran regions. Afmadow cattle-keepers, in an effort to stay clear of Jubba's tsetse belt, have developed hundreds of hand-dug wars in what used to be dry-season reserve. Of concern is the pattern of increased range degradation resulting from more livestock coming south from Gedo Region and the development of wars.

3. Nonriverine Agro-pastoral Systems

In southern Somalia, population increase in the past 100 years has been exacerbated by the waves of pastoral migrations out of Ogaden. These migrations were, partially, a response to Abyssinian territorial expansion at the advent of the colonial period (see map, Figure 8). The southwestward Somali pastoral expansion at the turn of the century into northern Kenya was effectively halted by British Colonial policy of Somali containment within what today, is Kenya's Northeastern Province. With Somali expansion into northern Kenya curtailed by the 1930s, a population buildup resulted in southern Somalia. By the time of the *Juumco Baasto* (Friday year of pasta) in the mid-1960s and *Abaar Dabadheer* (long-tailed drought), in the mid-1970s, pastoralists who lost major herds had little alternative but to settle and broaden risk-aversion strategies through agriculture.

Combining livestock with agriculture significantly increases drought tolerance. Cultivation of cereal crops, specifically drought-resistant sorghum, provides a valuable source of dry-season livestock fodder. Crop residues can be grazed in the field, cut and stored for later feeding, or sold to other livestock-keepers. In 1987, sorghum stalks in the Baardheere area sold for three shillings a piece.

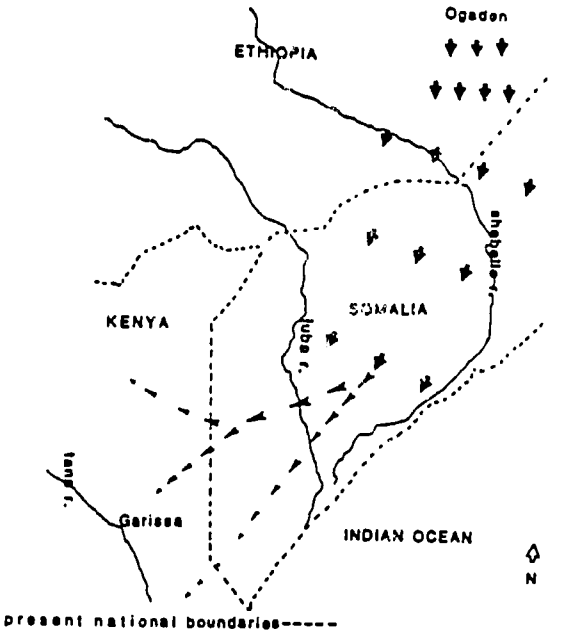

Figure 8. Somali Migration Pattern (Ogaden ca. 1900)

Agro-pastoral Physical Setting

In areas beyond the floodplain, primarily in Baardheere and Saakow districts, rainfed agriculture is practiced along with livestock-keeping. A few villagers in this agro-pastoral zone formerly lived near the river but had to move due to flooding or government consolidation of villages. Some still retain riverine farms there.

Agro-pastoralism is based on a particular combination of soils and water. Soils used most extensively for cultivation are referred to locally as *adable* (vertisols). The adable soils are dark, heavy clays with high water retention properties vital to agriculture. More widespread are the soils called *harqaan* that are well-drained and appropriate for grazing animals near cultivated fields. Typically, villages are sited on the well-drained harqaan soils near arable pockets of adable. The juxtaposition of soil types is an essential feature of the agro-pastoral production system. In additon to cultivation, the heavy adable soils provide sites for wars. A third soil type, known as *dooy*, refers to the laterites—sandy soils suitable for grazing.

From a local perspective of available production strategies and levels of technology, riverine resources alone do not necessarily confer the greatest economic advantage. For example, many nonriverine agro-pastoralists of the Saakow area were

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purely cultivators a generation ago. However, pressure on riverine lands, recurrent flooding, and endemic tsetse encouraged some farmers to take up dryland farming and livestock-rearing beyond the floodplain where rainfed soils are generally abundant.

The nonriverine area of Jubba Valley is undergoing change primarily in the form of increased settlement by agro-pastoralists. Agro-pastoralism in the Jubba Valley context is a subsistence mode combining fixed settlement and seasonal cultivation of rainfed crops—mainly drought-resistant varieties of sorghum—with open-range livestock herding. Most of today's agro-pastoral settlers in the valley are former pastoralists who have settled in response to a range of ecological stresses, particularly drought.

Precedents for agro-pastoralism is well-established in Bay Region where it has flourished and expanded (Massey, *et al.* 1984; Massey 1987). In many cases, east bank agro-pastoral settlement between Bu'aale and Luuq is an extension of Bay Region agro-pastoralism. Recently, many settled agro-pastoral communities of the valley have moved south out of Bay Region from areas of population pressure and exhausted soils. West bank agro-pastoral settlement dates mainly from the past 25 years and is less entrenched and formalized than its east bank counterpart. West bank agro-pastoralists have emerged from strong transhumant pastoral traditions and tend to operate on the periphery of settlement. Although west bank agro-pastoralists have laid claim to land, few have fixed dwellings in the form of munduls and tend to cultivate opportunistically—returning to their agricultural sites in years where rainfall appears sufficient to guarantee a harvest or when high livestock losses compel them to settle and cultivate.

Household Resources

Agricultural and pastoral production systems have contrasting labor demands. When the two systems are combined to form agro-pastoralism, high demands are placed on household labor requiring both careful planning and flexibility.

Conflicting demands of agro-pastoral labor require management flexibility and compromise. The size and species diversity of a household's herds and size of its landholdings are a function of available labor.

Gathering maize stalks for livestock fodder near Jilib.

In large, polygynous households, it is common for a wife and several sons to accompany livestock to grazing for extended periods while additional household labor remain in the fields. Smaller households, or those at an earlier stage of family cycle, must limit size and variety of holdings to meet labor constraints. Herds must be kept near the fields or else aggregated with herds from other households.

Livestock labor demands increase with multi-species herding. The differing feed and water requirements of each species dictate the need for their separate herding or herding in various combinations. Consequently, multi-species herding is dependent on sufficient labor to provide for the contrasting (if not conflicting) needs of each species. Where labor is limited in agro-pastoral settings, camels are the first to be eliminated from the herd mix because of their labor needs for herding over more extensive areas.

The second area of agro-pastoral labor constraint comes between herding and cultivation demands. Following the start of the rains, the high labor requirements of planting fields, followed by three weedings, compete directly with the need to remove livestock from the water-saturated clay soils and take them to fresh pastures in the hinterland. At harvest time, labor is needed in the fields at a time when dry-season grazing and watering needs for livestock place stress on agro-pastoral labor.

Nonriverine agro-pastoralists average the smallest farms in Jubba Valley (4.1 hectares). Sixty per cent of the plots of the agro-pastoralists are rainfed lands (Table 48).

Deployment of Resources in the Farming Enterprise

Cultivation among agro-pastoralists utilizes the most rudimentary hand-tilling technology. There is very little use of draft animals to increase cultivation efficiency. Use of other agricultural inputs such as improved seed, fertilizer, and insecticide is equally rare.

Agro-pastoralism is a generalized production strategy. Diversified production is constrained by labor to the point that surplus production is limited and cannot be anticipated from one year to the next. Therefore, households are typically geared toward subsistence rather than cash-crop production. For example, lowest mean irrigated agricultural incomes were recorded among the nonriverine sample (32,000 SSh). Agro-pastoralists tend to be marginal agriculturalists and livestock-keepers. Fixed residence and labor demands of a mixed economy act as constraints to maximizing investment in either sector.

An advantage of agro-pastoral systems is the ability to shift labor from one sector to another to benefit from changing terms of trade. For example, in the early 1980s, when the official ADC-controlled price of sorghum was 150 SSh per 100 kg (well below its free-market value), agro-pastoralists typically responded by cutting back grain production to meet household consumption needs. Simultaneously, livestock prices were relatively high prior to the Saudi Arabian ban on Somali beef. During this period, agro-pastoralists channelled labor into livestock herding and away from cultivation. When grain markets were liberalized in 1983, free market values for grain sky-rocketed by as much as 2,000 percent, and many agro-pastoralists shifted labor back to grain production (J. Merryman 1986).

4. Urban Households

Livestock are commonly held even in urban areas where 42 percent of households keep livestock. Median livestock income in these areas is equal to 70 percent of median agricultural income. Camels are least common among urban households, while keeping cattle alone was the most common pattern. One quarter of the households sampled not only have cattle but have a mean household holding of 16 head—more than half the number kept by pastoral households.

Although camels are least commonly held among urban households, the average urban camel herd is as large as the average agro-pastoral camel herd (26 animals) (Table 55). This indicates that, for a minority segment of the urban population, camels are an important investment. Urban centers are a common terminus for the poorest and wealthiest segments of the pastoral population. The poor settle in town, at least temporarily, looking for wage employment. Wealthy pastoral leaders commonly relinquish the rigors of the bush for a comfortable life in town where they continue directing their livestock interests from a sedentary setting.

Forty-one percent of urban households have agricultural holdings that average 6.0 hectares, which equals those of riverine agriculturalists as largest in the valley. With the exception of Kismaayo (the only urban area in the valley reflecting a more diversified economy), most of the other

Livestock watering at Dhesheeg Radiile in Middle Jubba, near Bu'aale. Note women leading pack bulls in foreground.

A young goatherd driving his flock to site of hand-dug wells east of Bu'aale.

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Pastoralist trekking cattle to water in Middle Jubba.

Transporting water by pack camel for dry-season domestic use from Jubba River to inland Middle Jubba agro-pastoral villages.

district capitals are large villages where agriculture remains of primary importance, or exists as a secondary investment.

Highest mean irrigated agricultural incomes in Jubba Valley were recorded among the urban sample (146,000 SSh). Higher incomes among urban irrigated farmers are attributed to greater access to cash markets and more reliable access to diesel and other irrigation inputs. On average, the largest irrigated plots in Jubba Valley are among urban farmers (11 ha) who are most involved in the cash economy (Table 50).

5. Commercial Agricultural Ventures

Farmers, pastoralists, and agro-pastoralists in Jubba Valley share the area with several types of commercially oriented agricultural ventures. These recent innovations include cooperative farms, commercial banana plantations (both large and small), private irrigation projects, state farms, and livestock feedlot projects.

Private Irrigation

A dynamic type of irrigation, organized individually or on the basis of small pumping groups, has grown dramatically over the past six or seven years, particularly around Baardheere and Luuq towns and in the area of Saakow. Watson estimates that the number of small pumps added on the river between his aerial count in 1983 and 1984 (and a similar count in 1986 and 1987), to be about 230 (Watson and Nimmo 1985, 1988). About 10 pumps a month were added to production around Luuq alone in 1987 (AHT 1988).

This sector is centered around onion production. Onions are particularly well-suited to tropical agriculture because they are not as perishable as most vegetables. They travel well, and enjoy a relatively steady, high demand. Another advantage is that onions have not been subject to ADC price controls. Many people are imitating the success of the Baardheere onion farmers. The model of small-scale pumping, with additional mechanical and hired manual labor, is being replicated up and down the valley—sometimes with other crops as a base. The off-take from Jubba River waters from the proliferation of small pumps in this sector may eventually compete with the needs of larger-scale projects downstream.

In addition to small-group vegetable production, there are approximately 54 private and joint-venture banana plantations, all in Lower Jubba. In 1986, the total area in bananas was estimated at 2,276 ha with an additional 800 ha in annual crops or fallow. Combining banana plantings and fallow area results in an average of 57 ha for each farm. Bananas occupy prime riverine land of the Jubba Valley and, as such, their impact on local food production has been negative, despite any contribution they may make to foreign exchange earnings. Wages offered by banana plantations are higher than those offered by the state farms.

State Farms

State agricultural operations can be divided into three separate rubrics: irrigation projects, "crash" program farms, and resettlement farms.[6] The "Crash" Program, or *Kraash* as it is known in Somali, was an attempt to give unemployed young people training in agricultural skills so that they would not join the ranks of the urban unemployed and to help the government expand the area under cereals cultivation. Most of the land used for this program was in the Shabeelle River Valley.

Resettlement farms that were part of the government's Settlement Projects were designed to help the drought-affected pastoral populations of the northern and central parts of the country who suffered catastrophic losses of livestock in the 1974 to 1975 drought.

Table 63 shows the number of hectares assigned to each of these state farm categories in Jubba Valley in 1979.

Although located in the fairly restricted area between Fanoole Barrage and the southern border of Jamaame District, the impact of government irrigation projects (referred to as state farms) on the traditional agricultural and herding systems has been far-reaching.

One of the most important effects has been a great loss of agricultural land. This loss must be analyzed on at least five levels:

[6] Evans, Cullen, and Little 1988; AHT, *Deshek and Small- and Medium-Scale Irrigated Agriculture in the Juba Valley*, 1986; and MMP 1987, Somalia Agricultural Sector Survey, TaskForce 1, Table 6.

- the loss of land taken out of smallholder food production but used for import substitution crops;
- the land lost by the smallholder farmer but not used by the state farm (land held idle);
- the loss of land that was unused by the traditional farming sector but served as a future reserve of farmland and pasture for their animals;
- the loss of land to the transhumant pastoralists who used the area for browse and graze and for access routes to drinking points on the river; and
- the loss of land that supported wild flora and fauna.

Table 63. STATE-FARM LANDHOLDINGS IN THE JUBBA VALLEY IN 1980

FARM TYPE	LAND SIZE (HECTARES)
Irrigation Projects	
Fanoole Irrigation Project	8,200
Juba Sugar Project[1]	7,700
Mogambo Irrigation Project	6,400
Saakow Experimental Farm[2]	60
Other Government Agencies' Holdings	3,000
"Crash" Program Farms	
Jilib[3]	300
Settlement Farms	
Dujuuma[4]	15,000
Total	40,260

Source: Somalia Agricultural Sector Survey, "Land Resources..." volume, Tables 3, 4, and 15.

1 The source notes that these land areas are the total size of the land lease, and not the cultivated area. In the case of Juba [sic] Sugar, the project actually controls a much larger area through its peripheral dike system. This area is estimated to be between 16,000 and 20,000 ha.

2 6,100 hectares were identified as a priority area out of a total estimated project area of 25,000 ha. Full implementation has to await the development of Baardheere Dam.

3 Topographic maps from the mid-1970s show another area near Kismaayo as being under the "Kraash" Program. Notes in the source table say these lands were redistributed to smallholders.

4 The Settlement Farm at Dujuuma was disbanded in about 1981 because of its inability to be self-supporting. For the most part, this land has remained idle since.

Any benefit flowing from such projects must be weighed against the real economic and social losses suffered in the five areas enumerated above.

Table 64 gives details of the amount of land under the control of the three main state projects in lower Jubba Region and compares these to the amount of land actually used for cultivation.

Table 64. LAND LEASED TO AND CULTIVATED BY LARGE-SCALE AGRICULTURAL PROJECTS IN 1986 AND 1987

PROJECT	TOTAL LAND LEASED	LAND PREPARED	LAND CULTIVATED
Fanoole Rice	8,200 ha	1,600 ha	625 ha*
Juba Sugar	13,000 ha	7,365 ha	6,800 ha**
Mogambo Irrig.	6,000 ha	2,260 ha	550 ha***
Total	27,200 ha	11,225 ha	7,975 ha

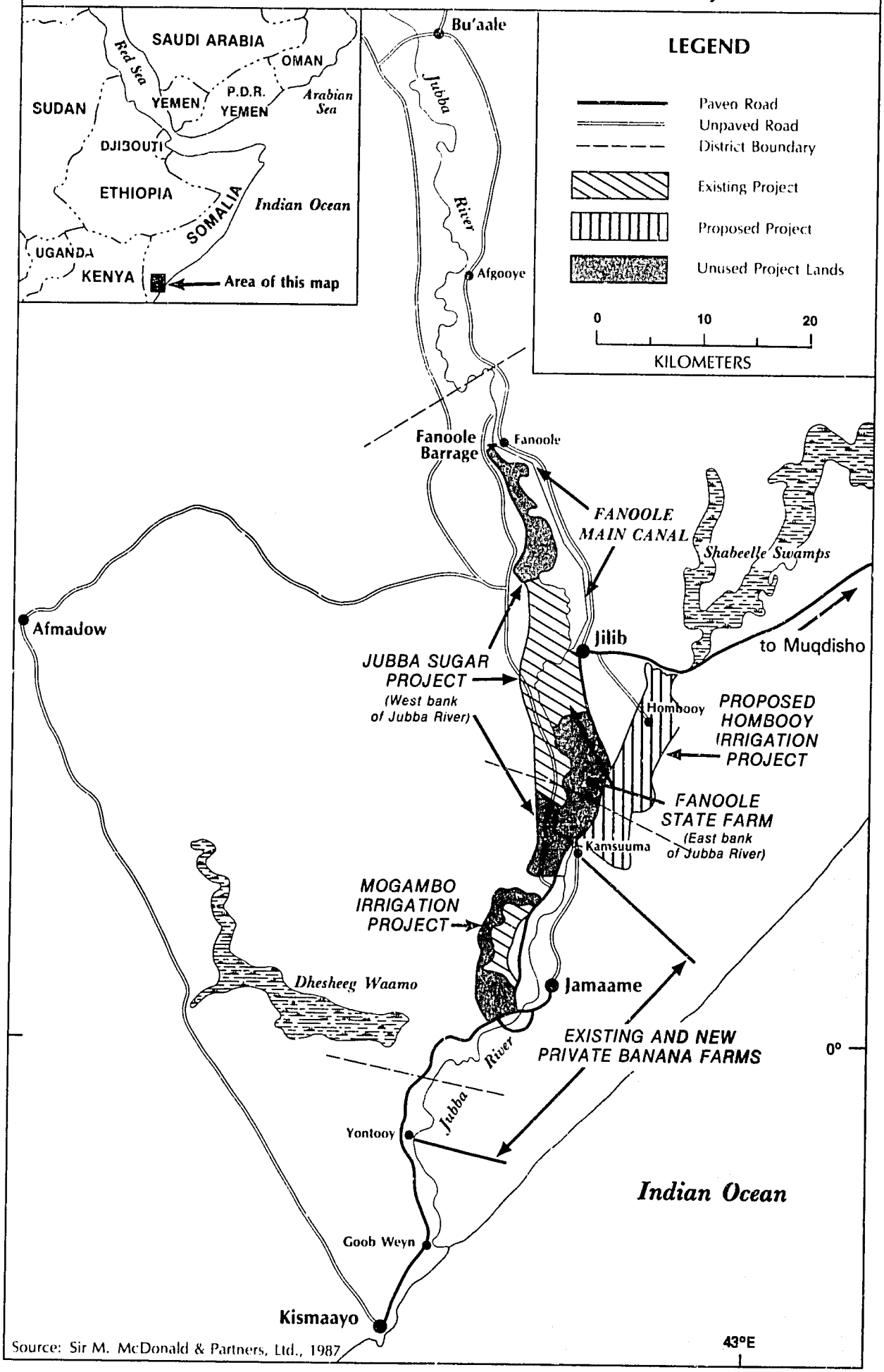
**Between 1981 and 1985, no more than 100 ha. were planted per season. Since gu' of 1985, this average has grown to 600 ha and 650 ha, in the two rainy seasons, respectively. Since it is reported that a different 600-650 ha. are used each season, only the amount for single season is presented. Source: Homboy Study, 1986; UNDP/MNP Memorandum "Field Visit to Fanaole [sic] Irrigation Project", November 1, 1986. Technital, 1976, p.23 reports a target reclamation of 20,000 ha. for Fanoole.*

***The block of land (all of Labadaad Island) reportedly controlled by Juba Sugar Project is estimated at between 16,000 and 20,000 ha. The first phase of sugar production only targeted 7,365 ha for development, out of 8,000 total for earth works, factory site and living areas. The proposed second phase is for an additional 5,000 ha of cane. Source: JSP Publications 1986, 1987; MMP 1987, Section C-2.*

****Mogambo managed to cultivate 506 ha in gu' of 1986 and 500 ha in deyr of that year; in 1987, 500 ha in gu' and 600 ha in deyr. The mid-point of these last two was taken for the table. Source: Ministry of Agriculture report on national rice production.*

More than two-thirds of the total land leased to these three projects was unused in each growing season of 1987. As a result, 19,225 ha of some of the best Jubba Valley farmland was held out of production in that year. Hundreds of families have lost their farms to these projects over the years, and generally, farmers have not been compensated for this loss—either in money or in-kind (by the project clearing a new plot for them). The burden of clearing new farmland has fallen on the dispossessed Jubba Valley farmers. Riverine inhabitants have estimated that it takes nearly one month (24 days) for an individual to clear one hectare of dense bushland by hand. At the current daily wage rate paid by private farmers for agricultural work (150 SSh), this is a

FIGURE 9
MEDIUM AND LARGE SCALE IRRIGATION PROJECTS



Source: Sir M. McDonald & Partners, Ltd., 1987

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loss of 3,600 SSh per hectare that should otherwise have been paid to the farmers by the projects as minimal compensation for land taken.

Juba Sugar Project has allowed some of its unused land to be used by local farmers while it slowly works toward achieving its goals for Phases I and II. However, by all indications, Phase II will not be feasible without the stored water of Baardheere Dam. Projected to be at least eight to 10 years from accomplishment, the 5,000 ha to be developed during Phase II will be idle a great deal longer. Neither of the other two projects allows local farmers to farm unused portions of the project area despite delays in implementation.

By early 1986, the first phases of all three projects were to have been completed. The goal for Juba Sugar Project was only achieved for area under cane in 1987; Mogambo had reached only 27 percent of its cropping goal by 1987; and Fanoole Rice Project, which was to have 8,199 ha under irrigation by 1980, had only achieved eight percent of this by 1987, (Samatar 1986).

Impacts of the three state farms on the riverine community have not been uniform. In fact, there are significant differences between them.

Fanoole State Farm

The Fanoole project was first conceived as early as 1964, as part of a Soviet aid program. However, it was not until 1972 that work got underway (Abuukar 1978). In 1977, the management of the project was turned over to the People's Republic of China, which continues to manage Fanoole Rice Project almost totally independent of the Somali government. Financial figures on Fanoole are unavailable.

Fanoole is a multipurpose project, consisting of three major parts. First, the hydroelectric barrage was built at Fanoole, 40 kilometers north of Jilib town, and was completed in the early 1980s. The power station supplies electricity to the state farm as well as to Jilib town, Kamsuuma, and several villages in the area. The river is too low to run the turbine during three months or more of the year. When power is needed during these periods, diesel generators must be used. It is expected that operation of Baardheere Dam will maintain the level of the Jubba River high enough to operate the turbines at Fanoole year-round.

A second part of the project involves the 52-kilometer canal which runs from the dam site to the rice farm, located several kilometers south of Jilib town on the east bank. It was completed in 1984.

The third part of the project is the Fanoole state farm and rice mill, where, as of 1988, about 850 hectares of rice are being planted. The project was designed to irrigate an area of 7,500 hectares (Brunken and Haupt 1986). Although originally planned as a farm for cotton and oil crops, rice production is almost the exclusive focus today. The state farm employs the majority of the 400 Chinese staff, 268 Somali staff, and estimated 1,000 casual laborers who work on the Fanoole project (SDR/GTZ 1987).

The capital costs at Fanoole have amounted to approximately U.S. $94 million with only 850 hectares in production, representing an investment of U.S. $110,600 per cultivated hectare.

Of the three state farms in the Lower Jubba Region, Fanoole has experienced the greatest difficulties in achieving projected levels of production and has been a serious financial liability for the Somali government.

With the poorest production record, it also has had the least impact on the local community. The bulk of the 2,000 hectares cleared by the project was uncultivated land. Though heavily populated a century ago, the region between Jilib and Nassiib Buundo now has only a handful of villages, as a number of communities left 24 years ago following bad flooding. The remaining villages lost their dhesheeg land to the project without compensation. Today, local inhabitants continue to farm along portions of the riverbank that the project cannot use and on land across the river belonging to the Juba Sugar Project, but which local farmers are allowed to farm. Area farmers are not permitted to cultivate on unused project land.

Villagers work as casual laborers on the project, doing such tasks as weeding, irrigation work, bird-scaring, and harvesting. Unlike wage laborers on the banana plantations and other state projects, Fanoole wage laborers are predominantly men. Wages for casual labor are between 40 and 75 SSh per day. Villagers prefer to work their own plots, and come to the project for work only when not occupied with farm chores. As a result, Fanoole, like other projects and banana plantations, has faced a chronic shortage of labor.

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This problem was partially resolved when, in 1980, several thousand former tranhumant pastoralists, who had been resettled at Dujuuma in the Middle Jubba Region following the drought of 1973 to 1974, were relocated a second time to Fanoole Rice and Juba Sugar projects. There, they were to work as wage laborers on the sugar and rice fields. Unable to subsist on project wages or find sufficient farmland in a region now intensively cultivated, a substantial portion of the resettled Dujuumans at Fanoole left to find work in urban centers. A few have returned to pastoralism in the north.

In the case of Fanoole, which began operation sometime around 1979, a cumulative total of approximately 3,000 ha have been planted. If this is compared to the total area under the project's control, a total of over 144,600 ha has been lost from agricultural production since 1979.[7]

Much of the original project area was in bush and was therefore uncultivated. Had local farmers used even one-quarter of the potential area for maize production (36,900 ha) over the development period of the project, at a very modest yield assumption of 575 kg/ha[8] (compared to four tons of paddy per hectare by the project), they would still have produced over 14,000 tons more food than was actually produced by the project during this period.[9] Had the total project area been under smallholder agriculture during this time, (again, assuming the modest yield of 575 kg/ha), 7,600 tons more food would have been produced than actually were by Fanoole Project.

Further, had any of the very large capital expenditures spent on the project been directed into supporting small-scale pumping, input supply, and maintenance of tractor services, smallholders might have reached yields as high as two t/ha, or added 300,000 tons to the nation's food supply, at an average rate of about 34,000 tons a year. Given average grain imports of 323,000 tons per year over this period, Fanoole project, under smallholders receiving input support from the state, could have reduced the import deficit by as much as 10 percent.[10]

In 1986, Fanoole received 72.7 million SSh (U.S. $800,000 at then prevailing official exchange rates) for its farming operation. As only 600 hectares were cultivated in each of two seasons, production costs amounted to approximately 60,617 SSh/ha (U.S. $700 at then prevailing official exchange rates). This does not include expenses made on either building operations or on the dam and power plant. Were these latter costs to be attributed to the costs of producing rice, they would amount to 134.4 million SSh, or 112,000 SSh/ha (U.S. $1,250 at then prevailing official exchange rates)(UNDP/MNP Joint Mission 1986).

Mogambo Irrigation Project

Mogambo Irrigation Project (MIP) is located on 2,721 hectares on the west bank of the river in Jamaame District, between the villages of Bulo Yaaq to the north and Kobon to the south. It lies adjacent to the banana plantations which line the riverbank itself. MIP was first conceived in the 1970s. The first harvest occurred in 1985.

The German aid funding organization, *Kreditanstalt fur Wiederaufbau (KfW)*, has provided two grants for the project—71.5 million deutschmarks for capital investments and agricultural inputs for the farm, and 14 million

[7] 8,200 ha each season x 2 seasons x 9 years = 147,600 potential ha - 3,000 ha actually under production during that whole period = 144,600 ha unused.

[8] The Ministry of Agriculture shows an average maize yield of 885 kg/ha from 1979 through 1986, MOA, *Yearbook of Agricultural Statistics 1986 and 1987*, p. 18.

[9] Fanoole Project is given the benefit of the doubt in assuming that it has consistently produced at four t/ha of paddy which, when converted at a generous milling ration of 60 percent, is equivalent to 2.4 t of rice. Smallholder maize yields cited in JESS interviews (two to five quintals/darab), were assumed to be in terms of "on the ear" and thus halved. If three quintals/darab were taken as the norm, this gives us 1.5 quintals x 4 darabs = 6 quintals/ha or 6 quintals x 96 kgs/quintals = 576 kgs/ha, or 0.576 t/ha. The calculations show a total potential loose maize production of 21,217 tons against only 7, 200 tons of milled rice for the whole period.

[10] AHT reports yields of 2.3 t/ha under medium-scale irrigation projects, see *Deshek and Small- and Medium-Scale Irrigated Agriculture in the Juba Valley*, p. iv.

deutschmarks for construction of the rice mill. The project relies on the state for its annual budget and foreign aid as its source of foreign exchange for the purchase of agricultural inputs.

MIP has changed its goals since its inception. It was originally established to produce irrigated rice and cotton. Problems with insufficient water and an irregular supply of manual labor caused it to incorporate some smallholder settlers onto project lands for production of rice and maize. The state farm now involves about 1,400 hectares. As of the 1988 gu' season, 586 hectares were planted in rice and another 212 in alternative crops. Rice has yielded approximately two tons paddy/ha, partially because of severe bird attacks. Settler farms comprise two-hectare plots on which farmers cultivate a variety of crops, including rice, with the assistance of project inputs. The settler project involves approximately 600 hectares. During the 1988 gu', only 214 hectares of settler land were actually cultivated. Yield information for the settler's portion of the project is unavailable.

Initial capital expenditures have reached U.S. $28.7 million since its inception in 1985, but procurement of equipment is far behind schedule. Mogambo had about 600 ha developed by 1986 at a capital cost of $47,800/ha. The development costs at Mogambo will be around $14,000/ha once the full area under Phase I is developed (Evans, Cullen, and Little 1988; MMP 1987; UNDP/MNP Joint Mission 1986).

Of the remaining 2,721 hectares, 722 ha are considered unsuitable for rice cultivation or irrigation. Another 987 ha have not been planted due to project difficulties or because settlers have chosen not to cultivate or have abandoned their plots. Local villagers who have not been incorporated into the settler portion of the project are not permitted to farm on the 1,709 ha that lie idle within the project's boundaries.

Village farmers lost an estimated 1,140 hectares of farmland to the project without compensation (Menkhaus 1989). Further land was lost due to the flooding of dhesheegs by project runoff water. Villages had farmed project land for nearly 30 years, first clearing it after having lost their riverbank land to the banana plantations around 1960.

Because of the presence of the banana sector as well as the project, arable land in the Mogambo area has become particularly scarce, and village agriculture has suffered severe setbacks. Except for the minority of the population that retained access to pockets of riverbank land, villagers in the MIP area were rendered landless. For several years, from 1984 to 1987, they were almost totally dependent on wage labor from the plantations or the project. Farming was only possible by sharecropping on plantation land. Out-migration in this area has become especially high as a result of this stress; for example, Mana Moofa's population, has declined by one-third in the past five years (Menkhaus 1989).

For the present, the villagers in the MIP area remain largely dependent on wage labor. They strongly prefer work on the banana plantations to work on the project—at least in part, because they are then entitled to take home unexportable bananas to eat. Wages at the project vary according to task, with canal cleaners making up to 80 SSh per day (approximately U.S. $0.80), and bird-scarers making 50 SSh per day. Most casual labor required by the project involves weeding and bird-scaring, and is done by women and children. As at JSP, work is contracted out to labor gang leaders, who are responsible for recruiting labor and paying their wages (Menkhaus 1989).

Another form of wage labor available to villagers is work on the section of MIP devoted to settlers' farms. Most of the settler farmers prefer to hire weeders rather than do the work themselves. In fact, many settlers are absent and rely on local laborers to tend to their plots. Only a few local villagers were awarded plots on the settler farm, which, in recent harvests, has produced sizable profits for a minimal amount of work. Relations between local villagers and settlers is poor, as the locals resent having had their land taken and given to outsiders with no farming experience.

Mogambo Irrigation Project is an example of heavy capital input with little return. Development costs are estimated to be over U.S. $14,000 per hectare (MMP 1987). The hidden costs at Mogambo include the loss of subsistence and income by many families who formerly farmed this land and have been left landless.

Juba Sugar Project

In the early 1970s, the Somali government began to explore possibilities for the establishment of a second sugar complex in Somalia in addition to the one at Jowhar. The project was given control of over 25,000 hectares of land and was expected to grow

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cane on about 8,000 hectares in its first phase. Today, 7,385 hectares of cane are under cultivation, making JSP the most successful project in the region in terms of target area actually under production.

To date, more than $210 million has been spent on the development of Juba Sugar Project including construction of a sugar refinery. This amounts to a capital cost of $31,800/ha. All three state farm projects were supposed to have completed their first phase by 1986. Only Juba Sugar Project has come close to meeting its land development targets.

The project includes a sugar-processing factory, the plantation, and a township of over 1,000 housing units for Somali and expatriate staff (SDR/Booker McConnell 1976). In the early 1980s, up to 60 expatriates worked at the project, although this number is considerably lower today. In 1987, there were also 2,000 permanent staff and 2,400 to 2,800 casual laborers.

JSP encompasses two distinct areas, each of which has been affected differently by its presence. The southern half of the project area, from Mareerey to the village of Baardheere (not the town near the dam site), was thinly populated and inaccessible at the time of project implementation. Officials present at the project site in 1978 estimate that only 10 percent of the 4,000 ha cleared in the southern zone were under cultivation by villagers—much of that around Mareerey. The northern half, Labadaad Island, was heavily populated and intensively cultivated. Officials estimate that at least 50 percent of the 3,000 hectares converted to sugarcane had been smallholder plots (SDR/Booker McConnell 1976).

Portions of village land lost to the project vary according to the location of the estimated 36 directly affected villages. Some of the villages lost nearly all their land; others, located in isolated bends of the river where land is unusable for the plantation, were able to retain most of their holdings. Villagers continue to treat unused project land as they did before the project claimed it. Buying, selling, renting, and sharecropping of land technically belonging to the project commonly occurs.

The project has made farming the remaining land in the area more difficult. In some areas, flooding occurs more severely as a result of irrigation drainage or because the bunds protecting the project aggravate flooding in unprotected areas. In farm areas within the bunds, no flooding from the river can occur, depriving the land of periodic fertilization from river silt. Because land is much more scarce, fallowing cannot be practiced. As a result, villagers on Labadaad Island complained of a marked reduction in production per hectare on their remaining land (Menkhaus 1989).

After the arrival of the project, committees from each of the local villages met and agreed upon project boundaries within which each village could farm unused land. This allocation process was apparently uneven. Though all villages reported having much less land to farm than in the past, some seem to enjoy access to larger plots than other villages.

Villages that have retained access to sufficient quantities of land do not contribute much casual labor to the project. However, villages which have lost most or all of their land have become dependent on wage labor from the project as their primary source of income. Again, casual project labor is done predominantly by women and children.

Wage labor tasks on the project—cutting, weeding, fertilizing, irrigating, and planting—are subcontracted out by field managers to leaders of labor gangs. Each village has several such gangs, usually led by an older man, though occasionally by women. The gang leader is paid by the project per task, and is responsible for allocating wages to his or her workers, taking a commission from their wages.

Wages at JSP were recently doubled. Weeders, who formerly received 37 SSh per day, now receive 74 SSh. Cane cutters' wages are up from 75 to 155 SSh per day. Still, JSP has long had difficulty attracting labor. As at Fanoole, this problem was partially resolved with the arrival of the Dujuuma refugees in 1980.

Plans exist for the expansion of JSP production in the future, but current difficulties financing and maintaining the existing project make it unlikely that such an expansion will take place soon.

Of all three state farms in Lower Jubba Region, Juba Sugar Project has done the best job of meeting its land-under-production targets, although it is still far behind in meeting its sugar production goals. Table 65 shows the area cleared, the area planted, and the tons of sugar produced in each year since its inception. In 1987, sugar production was 40,784 tons, only 58 percent of the 1985 goal of 70,000 tons of sugar (Summary Sheet on Production, MSJ 1986;

MMP 1987). Meanwhile, the sugar factory which has a rated capacity of 2,300 tons of cane a day is operating well below its annual capacity of producing 67,000 tons of white sugar.

Reasons for this shortfall include seasonal lack of river water for sufficient irrigation, diesel fuel for pumping (both of which have caused a decline in yields), and sufficient foreign exchange for spare parts and replacement equipment (MMP 1987; Juba Sugar Project finance Department Report 1987).

Juba Sugar Project receives 5.5 million liters of diesel fuel for irrigation pumping alone each year. It will require 10 million liters in the future in order to operate on target. Juba Sugar Project has recently been allowed to do its own contracting for fuel overseas. Consequently, it has an advantage over Fanoole and Mogambo which receive their fuel allotments from the government. For the projects dependent on government fuel allotments, there have been recurring problems with delays—some due to foreign exchange shortage problems and some to contractual arrangements between the government and overseas suppliers.

A high proportion of operating costs require foreign exchange (notably diesel fuel). Juba Sugar Project has had serious problems with obtaining the amount of foreign exchange it needs to operate properly. In particular, it has had to continue to use machinery in the field and at the refining plant without being able to maintain it through the replacement of essential spare parts. Upkeep and repair for foreign vehicles and the costs of expatriate management also place a heavy drain on Somali foreign currency reserves. The foreign exchange component of each kilogram of sugar produced cannot be calculated, but it is certain that these costs are very high, particularly if the full capital investment is included (MMP 1987).

Cane yields have fallen from 70 t/ha to 60 t/ha during 1987 alone. This production level compares poorly with the 128 tons of cane per hectare obtained on the project's demonstration area. Instead of the project's planned 23 irrigations per year, the project has been able to achieve a maximum of only 18. In 1984, it managed only 8.7 irrigations. In jiilaal, cane needs three irrigations per month, but with the low river flow and equipment problems, two to three irrigations have been missed in a typical jiilaal. JSP staff estimate that approximately 300 kg/ha of sugar are lost for each irrigation missed, which amounts to a loss of 4,000 to 6,000 tons of sugar a year at full cropping (MMP 1987).

Since 1980, Juba Sugar Project has been producing at a cost greater than that reflected in the official financial price per kilogram of 34.9 SSh because the value of lost cereals and oilseed production that would have been grown by traditional farmers has not been subtracted.

Molasses, produced as a by-product of sugar refining, makes an excellent cattle feed supplement. The positioning of the Trans-Juba Feedlot Project (now defunct) between the Juba Sugar Project and Fanoole Rice Project was not an accident. In the original project feasibility study for JSP, it was intended that the molasses be sold as animal feed. However, JSP has found itself so short of foreign exchange that it has been forced to sell the molasses on the international market. Piles of ash around Fanoole rice mill suggest that the bran is simply burned rather than sold to local livestock-raisers—perhaps, because herders are kept at such a distance from project areas so the dikes won't be damaged.[11]

*Table 65. AREA AND SUGAR PRODUCTION AT JUBA SUGAR PROJECT, 1978 TO 1985**
*(in hectares and metric tons)***

	1978...	1979	1980	1981	1982	1983	1984	1985	Total
Cleared	648	1,531	1,368	699	246	927	1,159	7,70	7,678
Planted	1,37	2,074	1,317	512	216	1,065	1,050	6,95	7,066
Sugar			7,927	14,764	22,213	28,113	26,954	37,600	137,571

**Sugar production was 27,450 tons in 1986 and 40,784 in 1987.*

[11] Mogambo Irrigation Project started allowing livestock in to graze rice stubble for a fee in 1987. (JESS Field Notes, 1986 to 1988).

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In sum, for Juba Sugar Project, almost none of the requirements assumed in project feasiblity studies were in place:

- sufficient water from the Jubba River for full operation;
- the requisite numbers of equipment and machinery requiring a constant supply of spare parts and the foreign exchange with which to purchase it, with a sufficient number of skilled personnel to operate and maintain it;
- adequate fuel delivered on time; and
- a management context that was unconstrained by difficult exogenous budgetary constraints.

These state farm projects are often socially disruptive: local people have become state workers on projects that produce less food than the small farms that have been supplanted by the state farms, have drifted into towns joining the urban unemployed, or have left the country.

6. Women's Subsistence Production

The WBS sample is composed of 86 percent married, seven percent divorced, and seven percent widowed women. Among this sample, only 14 percent of women own their own farm. The primary ways these women acquired their farms were:

- inherited it from parents;
- cleared it herself;
- inherited it from husband;
- bought it; and
- received it as *meher* or divorce settlement (Table 66).

Of those women with farms, 24 percent have owned them longer than 10 years, and 38 percent have registered them. Only 16 percent say their husbands manage farms owned by the women (Table 67). Farms owned by women are largely managed by the women themselves.

On 27 percent of women's farms, the woman is the only laborer; children help on another 27 percent of the farms. On 33 percent of farms, the entire family (including the husband), works on the woman's farm (Table 68).

Table 66. FOR WBS SAMPLE OF FARM OWNERS WAYS THEY ACQUIRED FARMS (N = 37)

HOW ACQUIRED	PERCENT OF FARM OWNERS
Cleared it herself	24
Inherited from parents	24
Inherited from husbands	22
Bought it	8
Received as divorce settlement	8
Given by someone	8
Missing	
TOTAL	100

Table 67. DECISION MAKING ON FARMS OWNED BY WOMEN OF THE WBS SAMPLE

	WOMEN WITH FARMS (N = 37)	WOMEN WHO SELL (N = 26)
DECISION MAKER	PERCENT DECIDES WHAT TO GROW	PERCENT DECIDES WHAT TO SELL
Woman	65	54
Husband	16	15
Woman and husband	8	12
Woman and children	3	8
Woman, husband, children	3	8
Older children	-	3
Missing	5	-
TOTAL	100	100

Table 68. WORKERS ON FARMS OWNED BY WOMEN OF THE WBS SAMPLE (N = 37)

TYPE OF WORKERS	PERCENT OF FARMS
Woman, husband, children	33
Woman only	27
Woman and children	27
Family with hired labor	6
Hired labor	3

The major crops grown by women are maize and sesame, with 38 percent selling maize and 41 percent selling sesame (Table 69).

Table 69. MAJOR CROPS GROWN AND SOLD BY FEMALE FARMERS OF THE WBS SAMPLE (N = 37)

CROP	PERCENT OF FEMALE FARMERS WHO GROW IT*	PERCENT OF FEMALE FARMERS WHO SELL IT*
Maize	92	38
Sesame	57	41
Cowpeas	35	5
Sorghum	19	14
Pumpkins	14	8
Tomatoes	14	8
Cotton	11	11
Papayas	5	3
Mangoes	5	5
Onions	3	3
Peanuts	3	—
Bananas	3	3
Potatoes	3	3

** Columns equal more than 100 percent because each woman grows and sells more than one crop.*

Of women from the WBS sample with farms, 54 percent have dryland farms, 28 percent have jiimo (riverbank) land, 15 percent have dhesheeg land, and only one woman has an irrigated farm (Table 70). It is significant that over half of the farms owned by women are dryland—the most rainfall-dependent and least certain farming resource.

Table 70. FARM OWNERSHIP BY LAND TYPE FOR WBS AND SEBS FEMALE RESPONDENTS

	SEBS (N = 45)	WBS (N = 272)
Percent owning farms	51	14
Percent of each land type for women owning farms:		
Dryland	57	54
Riverbank	30	28
Dhesheeg	13	15
Irrigated	-	3

In the livestock sector, among the WBS respondents, 28 percent own their own livestock. The primary ways women acquired livestock were:

- purchased it;
- inherited from parents; and
- inherited from husband (Table 71).

The dominant species are goats and cattle (Table 72). Fourteen percent of the WBS sample own goats; 11 percent own cattle. Twice as many women as own farms own livestock. Thirty-nine percent of the women saw livestock as a significant investment and purchased it for themselves.

Table 71. FOR WBS SAMPLE OF LIVESTOCK OWNERS WAYS THEY ACQUIRED LIVESTOCK (N = 75)

HOW ACQUIRED	PERCENT OF LIVESTOCK OWNERS
Bought it	39
Inherited from parents	33
Inherited from husband	11
Received as divorce settlement	7
Given by others	7
Given by children	1
Missing	2
TOTAL	100

Table 72. LIVESTOCK HOLDINGS OF WBS RESPONDENTS:

Percent of Households With Each Livestock Type and Mean holdings of Those Households WBS (N = 272)

LIVESTOCK TYPE	PERCENT OF WOMEN OWNING	MEAN HOLDINGS
Goats	14	8
Cattle	11	7
Camels	7	5
Sheep	6	6
Chickens	10	6
Donkeys	1	1

Thirty-seven percent of the women in the WBS sample earned cash in the past year. The major cash-earning activities for women were:

- making mats and baskets ;
- selling agricultural produce;
- running a tea shop; and
- selling milk or ghee (Table 73).

All of these activities are easy for women to be involved in since they require little capital investment to start, can be carried out near home, and are compatible with simultaneous child care responsibilities.

Table 74 presents a frequency distribution of overall incomes for the female respondents of SEBS. Significantly, 47 percent of female respondents have an income in the zero to 20,000 SSh range. The 11

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wealthiest respondents were located in the urban sector.

Table 73. WOMEN'S CASH EARNING ACTIVITIES FOR WBS SAMPLE (N = 272)

ACTIVITY	PERCENT OF WBS WOMEN EARNING CASH FROM EACH ACTIVITY*
Weaving mats and baskets	18
Selling own farm produce	7
Running a teashop	7
Selling milk or ghee	5
Shopkeeper	2
Trader	2
Civil servant	1
Midwife/circumciser	1
Working on others farms	1
Selling firewood/charcoa	1
Selling livestock products	<1
Tailor	<1

**A woman may do more than one activity to earn cash.*

Table 74. FREQUENCY DISTRIBUTION OF TOTAL INCOME FOR FEMALE RESPON-

RANGE OF INCOME IN SOMALI SHILLINGS (SSh)	URBAN N	RIVERINE AGRICULTURAL N	NONRIVERINE AGRICULTURAL N
0 - 20,000	3	13	5
20,001 - 40,000	1	2	1
40,001 - 60,000	2	0	1
60,001 - 80,000	3	2	0
80,001 - 100,000	0	0	0
100,001- 200,000	7	0	0
200,001- 400,000	1	0	0
400,001- 500,000	1	0	0
OVER 500,000	1	0	0

F. The Labor Force

The questions concerning labor in Jubba Valley center around issues related to the construction of Baardheere Dam and proposed development projects that will accompany it. They also concern issues of size and resiliency of the pastoral sector and whether this group will persist into the future or become sedentarized farmers and laborers. Another important concern focuses on whether farm family members will be able to maintain their economic base or become part of a laborer class.

To provide insight on these issues, historical factors influencing the labor sector will be examined, and current economic relationships that have a bearing on these concerns will be reviewed. The historical overview concentrates on lower Jubba Region because historical information is better for that area and the impact of agricultural projects on the local labor force there might serve as an example for the impact of agricultural development in other areas in the valley.

Since independence, former colonial lands have continued to be turned over or sold to private owners. The establishment of cooperatives helped some villages to protect village lands, but other areas lost land to wealthy landowners posing as cooperative organizers. Many cooperatives became the forerunners for sharecropping systems that are continuing to develop in the valley. Also during this period, state farms took up vast tracts of land between Jilib and Jamaame districts.

The historical events that have most influenced the current dynamics of the labor force in Jubba Valley have been:

- seizure of land and labor during the colonial era that reduced a formerly productive smallholder sector to dependence on outside factors to survive; and
- a continued erosion of local control over resources with the expansion of commercial agricultural ventures and resulting under- and unemployment of labor.

The most important impact of state farms on local labor is that they have taken village lands out of food production without a concomitant increase in employment or other benefits to local farmers, thereby causing unemployment.

1. Current Aspects of the Jubba Valley Labor Force

Population Estimates for the Jubba Valley

One of the difficulties of assessing manpower availability in any area of Somalia is that there are few reliable estimates of population, (see Section III.C above for fuller discussion).

There are no published regional accounts of economic activity. A manpower survey for the nation was conducted in 1978. Reporting was done on a macroeconomic level without providing details of manpower use and demand from the different regions (Ministry of Labour and Social Affairs 1979). Further, the survey only reported on wage employment. Reports that deal with only the wage sector are incomplete since the most important economic sectors in Jubba Valley are the traditional sectors of agriculture and livestock-rearing, with relatively small amounts of commerce, civil service, and light manufacturing.

A 1981 employment study for all of Somalia estimated that 87 percent of all employment is provided by the traditional sector (Ministry of Labour and Social Affairs 1982). JESS estimates for the Jubba Valley sample indicate that 85 percent of all principal occupations there were in the traditional sector.

Average Family Size in the Jubba Valley

Table 12 indicates the average number of people who are present in the household. The average family size for the JESS sample was 6.2 people per household with a variation across regions from 5.8 to 6.9 people. Table 75 recapitulates this information and indicates the average number of able-bodied workers in the unit by region and socio-ecological sector.

Total family size does not give an adequate indication of how many people are actively working because so many family members are young children.[12] However, children do contribute to the family labor force. Therefore, the standard definition of a labor force as those people between ages 15 and 64 is inappropriate for Jubba Valley.

In Jubba Valley, many of the agricultural and herding tasks are performed by both boys and girls under the age of 15. The SEBS survey shows that 66 percent of children age eight to 14 are economically active (engaged in farming, herding, and tasks other than being a student as their primary or secondary occupations). Even children younger than age eight carry out many of the simpler household and agricultural tasks, but because children are not as effective or strong as adults doing the same work, they cannot be considered as full manpower units. To solve this problem, the JESS team gave a "manpower unit" weighting to people of different age groups.

Children age birth to seven are considered economically inactive and given a weighting of zero. Children age eight to 14 are considered capable of performing many adult-level tasks, but because their physical abilities are less than those of adults, they are given a rating of 0.5 manpower units. People age 15 to 64 receive a full weighting of 1.0.

Of those people age 65 to 74 who were interviewed by JESS, 83 percent indicated that they were still active. Nearly 77 percent of those over age 74 said that they were still occupied by farming and herding. People who live into their 60s and 70s under Somali conditions are often still fit to work. Therefore, to account for the work contribution from the older segments of the population, JESS gave a weighting of 0.5 manpower units to those age 65 to 74 and a weighting of zero to those age 75 and older.

Table 75 shows that the average number of age-weighted "manpower units" in a Jubba Valley household is 3.78. Among the three regions, Middle Jubba has the lowest level of household manpower available, (3.42 units), while the average for Gedo Region is 4.21.

Among the socio-ecological sectors, the average pastoral household has the most labor available while the average urban household has the fewest. In general, the manpower unit value represents 61 percent of the average family size, and, as such, three out of five people are contributing to sustenance and support. Accordingly, one should discount most statistics of average family size in Jubba Valley by about 40 percent to have a realistic idea of manpower.

Principal Occupations in Jubba Valley

Adult Occupations

The SEBS survey inquired about people's main and secondary occupations, if any. The main occupation was defined as the one at which people spent the most time or from which they earned the most money. Table 76 shows the breakdown for main

[12] In the SEBS sample population, 28.9 percent are under the age of eight and 46.4 percent are under the age of 15.

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occupations for the entire valley sample for men and women age 15 and older.

Table 75. AVERAGE POPULATION AND MANPOWER UNITS AVAILABLE PER HOUSEHOLD IN JESS SAMPLE BY REGION AND SES

SECTOR/ REGION	AVG # LIVING	AVG # ABSENT	AVG # PRESENT	MANPOWER UNIT
GEDO	7.66	0.74	6.91	4.21
MID JUBBA	6.75	0.98	5.76	3.43
LOW JUBBA	6.77	0.93	5.84	3.65
PASTORAL	7.00	0.59	6.41	4.01
URBAN	7.04	0.94	6.01	3.66
AGRIV	7.07	0.93	6.14	3.69
AGNON	7.25	1.02	6.22	3.78
TOTAL SAMPLE	7.08	0.88	6.20	3.78

Column 2: average number living who are attached to household.

Column 3: average number living who are absent from household

Column 4: 2 - 3 = average number living and present in household

Column 5: average number of Manpower Units in household (weighted by age)

Average is average number of people per household based on JESS sample enumeration of all the people attached to the household head by marriage, the offspring of those marriages, and any other people currently living in the houshold. With the exclusion of people within this group who have died or are absent, the JESS household reflects current residency in one compound.

Table 76. MAIN OCCUPATION FOR MEN AND WOMEN 15 YEARS AND OLDER

	MALES		FEMALES		TOTAL POPULATION
OCCUPATION	#	%	#	%	%
No work	50	3.1	73	4.4	3.8
Farming	779	48.6	369	22.3	35.2
Herding	345	21.5	126	7.6	14.4
Trade/commerce	80	5.0	20	1.2	3.1
Housework	12	0.7	1,004	60.6	31.2
Hunt/fish/crafts	18	1.1	7	0.4	0.8
Teaching/sheikh	33	2.0	4	0.2	1.1
Driver/mechanic	59	3.7	0	0.0	1.8
Civil servant	113	7.0	15	0.9	3.9
Agric. laborer	22	1.4	2	0.1	0.7
Student	93*	5.8	36**	2.2	4.0
Totals	1,604	99.9	1,656	99.9	100

**60 of 93 are state school students; of these 57 percent are from Lower Jubba*

***31 of 36 are state school students; of these, 74 percent are from Lower Jubba*

Nearly half of all males and about one-fifth of all females reported farming to be their primary occupation. Herding was the most important occupation for men after farming, followed by civil service, schooling and commerce. Agriculture was of only secondary importance for women who are principally occupied with domestic chores related to food preparation and household maintenance. The third area in which women spend their time is herding. Work in agriculture and herding is described in detail in the chapter on production systems. Because the vast majority of women's time is taken up with "housework", a fuller description of these domestic tasks follows.

Women's Domestic Occupations

Just over 60 percent of women surveyed by Jess indicated that "housework" was their primary occupation. This category was defined to include a wide range of tasks, most of which are performed daily, which include all domestic chores such as cooking, cleaning, washing, child care, and collection of firewood and water for household use. Generally, considerable amounts of time are spent on all of these family and maintenance processes by all household females (mothers and their daughters). JESS did not do a time-use study of adult occupations, but such a study on women's work times was conducted in the neighboring Bay Region in 1985 (Longstreth 1985). In this latter study of agro-pastoralists, the researcher found that women spend an average of 416 minutes per day (nearly seven hours) on household work compared to 205 minutes per day in various types of agricultural work. In this same study, males worked an average of 39 minutes a day on household task and 159 minutes per day in agriculture (Longstreth 1985:7). With the addition of the category "Other Work" which includes paid work, sewing, and manufacturing, the women in Longstreth's sample spend approximately 11 hours per day involved in all types of productive activities compared with four hours for men (1985:6-8).

Among Jubba Valley women in the WBS sample, 63 percent fetch water, and 61 percent collect firewood for their family (see Table 77). Fewer urban women collect water or firewood than among the other socio-ecological sectors. Among the urban sample of women, 71 percent do not fetch water but rely on water taps in or near their homes or the delivery of water to the door by donkey cart. However, the 25 percent urban women who do collect

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water (presumably poorer urban residents) spend an average of 1 hour 12 minutes per day in this activity.

Only 20 percent of urban residents collect firewood; the rest use charcoal or purchase firewood from local markets. Those urban residents who collect firewood spend an average of 2 hours 31 minutes per day—more than any other socio-ecological sector, presumably because the high population of urban areas has depleted firewood sources closer to town. The least time investment in firewood collecting is among the agricultural nonriverine sector which has the greatest population dispersion and adequate firewood sources near home.

The pattern of time allocation to firewood-collecting is illustrated in Table 78. Hughes, in a firewood-use survey on the Tana River in Kenya, found that the weight of bundles of firewood carried by women averaged 28 kg (1985). The average household firewood consumption per month was 272 kg or 1.8 kg per family member per day (1985). In the WBS survey, 56 percent of the women who collect firewood receive no help in this task; another 30 percent are assisted by their daughters.

The pattern of time allocation to water-fetching is illustrated in Table 79. Unlike firewood-collecting which is predominantly a chore done every other day or less, water-fetching is generally done several times a day if the distance to water is not great. On the shorter trips to water, women usually carry water on their backs in wooden containers (haan) of varying sizes. A typical container of water carried by an adult weighs 25 kg (Merryman 1984). For longer trips, four or more water containers are usually carried by a donkey or camel. As with firewood-collecting, 52 percent of women receive no help in water fetching, and another 30 percent are assisted by their daughters.

Table 77 presents the mean times involved in water-fetching for women who carry water. The greatest time spent on this task occurs in the agricultural nonriverine sector. The 31 percent of the pastoral sample who do not fetch water are settled residents whose water is delivered from the wells by donkey cart. The mean of 1 hr 56 min for water- fetching represents the pastorally dependent population sampled at watering points and not solely the mobile pastoral population living away from permanent settlements with their livestock.

A large portion of women's time is involved in providing the basic necessities of water and firewood for their families. Jubba Valley women who collect firewood and fetch water spend an average of 3 hours 9 minutes daily on these tasks with a low of 2 hours 40 minutes among the agricultural riverine sector and over four hours for the pastoral sector (see Table 77).

Occupations Outside the Traditional Sector

Beyond farming and herding, the government is the valley's single largest employer of men. Civil service employment accounts for seven percent of adult male employment, but only about one percent of adult female employment. However, in urban areas, which are all district or regional capitals, government accounts for 26 percent of the primary occupations among men. This figure falls to one percent among pastoral males.

Table 80 further breaks down the data from Table 76 to indicate occupations for men and women in Jubba Valley according to socio-ecological sector.

Civil service jobs in Jubba Valley are fairly secure positions with steady incomes as opposed to seasonal incomes derived from farming and herding. A steady income encourages small businesses and commerce in the area by helping them to operate year-round.

The commercial sector is an effective but small network which employs 5.0 percent of men and 1.2 percent of women in the SEBS sample. Naturally, in the urban areas these percentages are higher: 18 percent and two percent, respectively, but they fall nearly to zero in the rural sectors of the sample.

Table 77. MEAN WATER FETCHING AND FIREWOOD COLLECTING TIMES PER DAY FOR WOMEN INVOLVED IN EACH ACTIVITY FOR JUBBA VALLEY AND SOCIO-ECOLOGICAL SECTORS

		WATER				FIREWOOD				
	N	PERCENT DO NOT FETCH WATER	PERCENT MISSING	PERCENT FETCH WATER	MEAN WATER FETCHING TIMES	PERCENT DO NOT COLLECT FIREWOOD	PERCENT MISSING	PERCENT COLLECT FIREWOOD	MEAN FIREWOOD COLLECTING TIMES	MEAN TIME INVESTMENT PER WOMAN PER DAY FOR FIREWOOD AND WATER
JUBBA VALLEY	272	30	7	63	1 HR 40 MINS	32	7	61	1 HR 29 MINS	3 HR 9 MINS
URBAN	90	71	4	25	1 HR 12 MINS	77	3	20	2 HR 31 MINS	3 HR 43 MINS
AG RIVERINE	85	0	6	94	1 HR 20 MINS	2	8	90	1 HR 20 MINS	2 HR 40 MINS
AG NONRIVERINE	43	2	16	82	2 HR 31 MINS	0	19	81	42 MINS	3 HR 13 MINS

Table 78. FIREWOOD COLLECTING TIMES FOR JUBBA VALLEY WOMEN

FREQUENCY	AMOUNT OF TIME PER TRIP													
	0		<1/2 HR		1/2—1 HR		1-2 HRS		2-3 HRS		3-5 HRS		1/2 DAY	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
DO NOT COLLECT FIREWOOD	88	35	0	0	0	0	0	0	0	0	0	0	0	0
THREE TIMES PER DAY	0	0	1	<1	0	0	4	2	2	<1	2	<1	0	0
TWO TIMES PER DAY	0	0	3	1	7	3	4	2	2	<1	3	1	1	<1
ONCE PER DAY	0	0	2	<1	13	5	8	3	8	3	6	2	1	<1
ONCE EVERY OTHER DAY	0	0	2	<1	4	2	1	<1	0	0	1	<1	0	0
ONCE EVERY FEW DAYS	0	0	2	<1	6	2	11	4	5	2	6	2	0	0
ONCE PER WEEK	0	0	1	<1	11	4	8	3	18	7	16	6	3	1
LESS THAN ONCE A WEEK	0	0	0	0	0	0	0	0	0	0	2	<1	1	<1

Table 79. WATER FETCHING TIMES FOR JUBBA VALLEY WOMEN

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FREQUENCY	AMOUNT OF TIME PER TRIP															
	0		<1/2 HR		1/2-1 HR		1-2 HRS		2-3HRS		3-5 HRS		1/2DAY		ALL DAY	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
DO NOT FETCH	82	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THREE TIMES / DAY	0	0	32	13	24	9	7	3	1	<1	0	0	0	0	0	0
TWO TIMES / DAY	0	0	30	12	33	13	5	2	3	1	3	1	0	0	0	0
ONCE PER DAY	0	0	4	2	10	4	3	1	2	<1	3	1	2	<1	0	0
ONCE EVERY OTHER DAY	0	0	0	0	2	<1	0	0	0	0	0	0	1	<1	0	0
ONCE EVERY FEW DAYS	0	0	0	0	1	<1	0	0	0	0	2	<1	0	0	1	<1
ONCE PER WEEK	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0

Table 80. MAIN OCCUPATION FOR MEN AND WOMEN 15 YEARS AND OLDER BY SES (PERCENT OF TOTAL)

	URBAN		AG.RIVERINE		AG.NON RIVERINE		PASTORAL	
	M	F	M	F	M	F	M	F
NO WORK	8%	5%	1%	4%	3%	4%	1%	5%
FARMING	18	4	81	33	65	38	27	14
HERDING		—	8	5	17	8	66	25
H/WORK	1	76	1	56	1	47		55
MISCELL.	28	3	4		3	2	3	1
CIVL SRV	26	3	2		6	—	1	—
LABORER	4	1	1		2	—	1	—
STUDENT	14	8	1	1	4	1	1	—
SHEIKH		—	—	—	—	—		—
UNKNOWN/ N.A.		—	—	—			—	—

Note: "Miscell." includes trading, hunting/fishing, crafts, teaching, private business, and driver/mechanic. "Laborer" includes both private and gov't agricultural wage labor. "Student" includes both Koranic and government.

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For the whole valley, 3.1 percent of the males and 4.4 percent of the females indicated that they did not work. This figure includes some people who are aged or disabled, but a greater number of household members are underemployed, especially seasonally.

Adult Occupations By Sector

Numbers in Table 80 are higher in urban areas than in other sectors for those claiming to be unemployed ("No work"). Higher urban unemployment may be a reflection of the drift to urban areas of the rural un- or underemployed. The percentage of women who say they do not work is approximately the same across sectors, in contrast to men.

Eighteen per cent of urban males claim farming as their primary occupation. Most district capitals in the Jubba Valley are little more than large villages with active farming on their peripheries.

Twenty-seven percent of pastoral men claim farming as their primary occupation. It is increasingly difficult to find a pure transhumant pastoralist in southern Somalia—one without any designated place that serves as a seasonal homestead. While two-thirds remain pastoralists first in their primary occupation, the large percentage of farming reported by the rest is another indication of rapid sedentarization of this sector, if only of seasonal or partial sedentarization. Strategies that combine farming with livestock rearing often prove to be the most resilient and remunerative in the long-run. Herders with farms can produce by-products that provide animal feed (cereal stalks and other plant waste) in the dry seasons. Additional animal feed can form an important security cushion against the loss of wild forage that may result from drought and changing relationships regarding pasture maintenance and territorial jurisdiction that are faced by pure pastoralists.

Fourteen percent of urban males age 15 and over claim schooling as their principal occupation. Only eight percent urban females list school as their first occupation. Schooling among older urban children contrasts sharply with other sectors where only one group, nonriverine males, represent more than one percent of the total. Not one pastoral woman indicated schooling (either government or Koranic), as her principal occupation, and none indicated it as a secondary activity.

Children's Occupations

Children begin contributing to the household labor force long before they reach age 15. Small children carry water vessels, feed and care for small animals, run errands, scare birds, and help with other domestic and farm tasks. From age seven or eight, a child may be given care of a small herd of goats or sheep. At this same age, children begin to help adults with fieldwork on the farms. Girls are often occupied with fetching water and firewood, helping with meal preparation, and caring for younger siblings. It is rare for boys to engage in these latter activities. Table 81 shows the breakdown of main occupations for boys and girls age eight to 14, inclusive.

Table 81 shows that 46 percent of boys work principally in either agriculture or herding while 39 percent of girls do the same. Nearly 28 percent of girls spend the majority of their time on household chores. Taken together, of boys and girls age eight to 14, 58 percent work at some kind of task other than school as their first occupation. The total percentage masks some difference between the sexes: while 51 percent of boys work on some economic task as their main occupation, 67 percent of girls are so engaged. This is because a large percentage of girls (28 percent) are involved in household tasks as well as farming and herding, and few are in school. One-quarter of the total sample attends school: 33 percent of the boys, but only 15 percent of the girls.

The SEBS Survey provides some evidence that school attendance has suffered a net decline over the past two decades in Jubba Valley, particularly in the rural areas. While 51 percent of Valley males age 21 to 30 claimed to have had no formal education, 50 percent of those age 16 to 20, said the same. The percentage of those without schooling climbs to 68 percent for the 11 to 15 year old boys and 84 percent for boys 6 to 10 years old. Percentages of girls and women without schooling are much higher but they also reflect a decline in education over the past twenty years: 75 percent of women in the 21 to 25 year age bracket had no formal education. The percentage climbs to 77 percent for 16 to 20 year olds, 80 percent for 11 to 15 years, and 92 percent for girls age 6 to 10.

In the areas of large-scale agricultural projects, parents have increasingly had to keep their children from school in order to hire them out to plantations

and estates to augment family incomes. This is particularly true in areas where families have lost land to the projects and had their own economic base eroded. With wages for child labor only between 15 and 20 SSh per day, the movement of more children into this type of labor probably indicates a net decline in family economic resources. In the meantime, fewer young people are going to school or staying in school as long.

Table 81. MAIN OCCUPATION FOR BOYS AND GIRLS EIGHT TO 14 YEARS OLD

	JUBBA VALLEY		MALES		FEMALES	
OCCUPATION	#	%	#	%	#	%
NO WORK	218	14.7 %	110	13.8%	108	15.8%
FARMING	310	20.9 %	172	21.6%	138	20.1%
HERDING	318	21.5 %	191	24.0%	127	18.5%
HOUSEWORK	220	14.9 %	30	3.8%	190	27.7%
MISCELL.	12	0.9 %	10	1.3%	2	0.2%
KORANIC STUDY	183	12.4 %	141	17.7%	42	6.1%
GOV'T SCHOOL	186	12.6 %	125	15.7%	61	8.9%
N.A./UNKNOWN	33	2.2 %	6	2.0%	17	2.5%
TOTALS	1,480	00.0%	795	100.0%	685	100.0%

Estimated Jubba Valley Labor Force

JESS estimates that, in 1987, 534,000 residents of Jubba Valley were adults (51.6 percent) of full work capacity (age 15 to 64). The weighted number for children ages eight to 14 and adults ages 65 to 74 rendered an additional 98,000 manpower units. The total theoretical labor force of Jubba Valley, then, was 632,000 manpower units. There were 279,500 combined units of working children and adults in Lower Jubba Region, 215,900 in Middle Jubba Region, and 136,600 in Gedo Region. There were 278,700 manpower units in both the riverine and nonriverine agricultural sectors. Finally, there were about 193,400 manpower units in the urban work force and 159,900 in the pastoral sector.

2. Manpower Availability for Development

It is difficult to know how much of the potential labor force cited above could be made available to new economic endeavors. Better statistics are needed that would allow one to estimate supply and demand for labor.[13] The majority of job openings in the Jubba Valley are short-term jobs in traditional sectors, such as land-clearing and weeding on private farms and herding tasks in the livestock sector, and, as such, are not easily quantifiable. Further, people allocate their labor between various jobs, often in their immediate village or district. As a result, one can only draw inferences about labor demand and supply from field observations and relate these to expectations of developments that might take place in the valley. Some of these inferences can be drawn by observing how many people are staying within the valley for work, what kinds of jobs they are finding, and at what wage rates.

Out-Migration

Central to any argument of labor shortage is the idea of remuneration for current activities against possible remuneration from alternate activities. Agricultural projects like Juba Sugar Project are known to have difficulties acquiring and keeping field laborers. Farmers in the area who are not fully employed say that it is not worth working for the project because wages are so low and the work is very hard. People who do work for the project, in some cases, have few alternative places they could go to earn needed cash. If wages were doubled, more people would seek employment there, but how many more cannot be determined without further study.[14]

Some Jubba Valley farmers are experiencing difficulties in covering subsistence needs through their own production. Some people are clearly looking

[13] There are no district- or regional-level statistics in Somalia on the number or type of job openings or the number of job seekers for each position. Further, there are no studies of under- or unemployment for the valley.

[14] One student ofthe history of southern Somalia has observed that people prefer to develop and work their own farmland even when wage levels on plantations are high relative to the cost of living (Cassanelli, personal commmunication, 1989).

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for alternate ways of augmenting their incomes. The choices facing family members under economic stress are typically:

- to diversify from farming into livestock-keeping or vice versa;
- to seek employment on a neighbor's or relative's farm or with his herd;
- to seek employment on a state or private plantations;
- to go to town to look for work; or
- to seek work in other regions or overseas.

In all, the sample revealed only one percent of the estimated population was absent from the homestead, looking for work in the valley.[15] In the SEBS sample, 13 percent were absent due to work.

Table 82. NUMBER AND PERCENTAGE OF SEBS SAMPLE POPULATION ABSENT FROM HOME DUE TO WORK OR SEEKING WORK

	(PERCENT OF THOSE ABSENT)			
	WORKING*		SEEKING WORK	
DISTRICT	#	%	#	%
Kismaayo	39	3.6%	2	0.1%
Jamaame	19	1.8	2	0.1
Jilib	21	2.0	0	0
Bu'aale	10	0.9	0	0
Saakow	8	0.7	1	0.1
Baardheere	18	1.7	3	0.2
Garbahaarey	20	1.9	0	0
Luuq	4	0.4	4	0.4
Total	139	13.0%	12	~1.0%

** Includes those away due to trade and herding.*

A typical pattern followed by migrants from rural areas is to go to small towns or other nearby sources of potential employment, and then move on to larger towns. Since most Jubba Valley towns are small with little economic base, people have a tendency to go to large towns or directly to the capital. From there, once networks are established with friends and relatives, and more information is available on conditions and opportunities outside the country, a migrant may then move abroad. It is probable that the majority of migrant workers going to the Persian Gulf States and elsewhere overseas come from the larger towns like Muqdisho, Hargeisa, and Kismaayo. Kismaayo District was the source of the greatest number of migrants (10), who left Somalia.

The most common destination chosen by migrant workers was Muqdisho. Forty-two of those absent were working in the capital, while five were there looking for work. A third likely place to find Jubba Valley migrants is in a district capital, either within his or her own district or elsewhere within the valley.

The low percentage of out-migration from Jubba Valley can be explained by the high percentage of farmers who said they hired labor to do seasonal agricultural tasks, and by the fact that families with herds or farms can generally find more than enough work for their members in subsistence production. Private agricultural labor hire generally draws on local neighbors who need not migrate in order to earn extra money. The fact that migration is greater from Lower Jubba than in other parts of the valley indicates that some subsistence systems have been disrupted and forced family members to search for earnings far from the area.

Labor Hire

Additional labor was reported by farmers to be the greatest constraint to increased agricultural production. Commonly, neighboring farmers or, occasionally, local pastoralists hire themselves as day laborers when they need extra cash or when their own production activities are slow. For farmers who cannot afford to hire laborers, extended kin or neighbors are asked to participate in a work group.

Table 83 illustrates the use of different types of labor or substitutes for labor such as tractors or animal traction by region and sector in percentages of households using outside labor.

Nearly 19 percent of all valley respondents hired labor for pay at one time or another, principally for agricultural tasks. The sector that hires least is riverine agricultural farmers. The sector that

[15] The 1,060 sample households multiplied by the average manpower coefficient of 3.78 yields an active population of 4,007. This number serves as the divisor for the 251 people who were absent due to work or looking for work. However, it should be kept in mind that the low overall percentage hides some regional and sectoral differences. Lower Jubba had the largest number (62) of people away looking for work or working, while Middle Jubba had 40 and Gedo had 49.

engages the most labor is the agro-pastoral non-riverine group. Even pastoralists, as a percentage, hired farm labor more than the riverine farmers. Pastoralists and agro-pastoralists tend to have easier access to cash from the sale of animals or animal products and can better afford to hire extra labor for farm work. In relation to other forms of labor, the high percentage of urban labor hire is explained by the fact that many urban inhabitants who may have other primary occupations own farms that are run by a manager or other laborers.

Table 83. PERCENTAGE OF LABOR TYPE ENGAGED BY REGION/SES (% ALL LABOR ENGAGED)

AREA	GROUP	HIRED	RELATIVE	TRACTOR	ANIMAL*	NONE	NO.HHL**
AGRIV	6.3	15.1	7.4	8.2	0.3	62.2	365
NONRIV	1.0	25.0	3.6	10.7	-	58.7	196
PASTOR	3.8	17.2	1.6	2.2	-	75.3	186
URBAN	1.7	21.6	1.7	12.0	-	63.0	343
LOWJUB	1.8	17.7	1.6	11.9	-	66.8	379
MIDJUB	3.9	28.1	2.8	6.1	-	58.4	363
GEDO	4.5	12.0	6.6	7.8	0.2	68.9	425
WHOLE VALLEY	3.4	18.9	3.8	8.6	0.1	65.0	100%
NO.HHL USINGEACH TYPE	40	220	44	100	1	758	1,163

**Animal traction is almost nonexistent in the Jubba Valley.*
***Some households counted more than once- used several types of labor.*
****Four missing households were included in the calculation of total percentages, but were excluded from the above table, therefore, percentages shown in table do not quite add to 100 percent.*

Nonrivenne farmers also account for a large percentage of those who rent tractor-plowing services—second only to urban farm owners. The relatively low level of hired labor and tractor rental among riverine farmers is compensated by the engagement of work-sharing groups and relatives to break labor bottlenecks at peak periods.

Gedo Region has a greater dependence on group and kin labor than hired labor, especially when compared to the other two regions. Lower Jubba Region has a much lower use rate of group and kin labor, compared with hired labor and tractor rental. The wage market is well-developed in this region because of the existence of several large state farms and many private banana plantations, as well as the job opportunities available in Kismaayo, Jamaame, and Jilib. Cooperative group labor appears to be on the decline while a monetized farm labor market is on the rise.

Table 84 presents the type of tasks for which outside labor is engaged and the types of labor used most for particular tasks.

Table 84. PERCENTAGE OF LABOR TYPE ENGAGED BY TASK (Percent of Total Number of People Hired in Each Group)*

TASK	GROUP	HIRED	RELATIVE	TRACTOR	TOTAL % BY TASK
Land/ Clear	10.0	8.2	11.4	23.0	12.3
Plow	27.5	20.5	18.2	68.0	32.6
Plant **	20.0	17.7	18.2	1.0	13.8
Weed	22.5	34.1	40.9	3.0	26.2
Irrig ***	2.5	1.4	2.3	0.0	1.2
Harvest	17.5	10.0	9.1	8.9	
Other	0.0	7.3	0.0	1.0	4.2
TOTAL	100.0	100.0	100.0	100.0	100.0
NO.HHL	40.0	220.0	44.0	100.0	405.0

**This table displays results only for those tasks that are known; "none" and "missing" are excluded but account for 0.7 percent of total.*
***One person used animal traction for weeding.*
****Includes task of post-harvest field-cleaning as well as harvesting.*

Although plowing and weeding are the predominant tasks requiring outside labor, some types of labor groups are used more for one kind of task than another. Tractors are used predominantly for land-clearing and plowing, while about one-third of those who are hired for a wage are hired for weeding. Nearly 41 percent of relatives who are asked to perform tasks are engaged for weeding as well. Animal traction is almost nonexistent—in fact, many valley residents say they have never seen it although they have heard about it.

There are some differences in the cost of tractor plowing services used in Jubba Valley. Most people in Middle Jubba rent tractor time from the government tractor hire organization called ONAT. Near the banana plantations, small farmers often rent privately-held tractors when they are not being used. There is usually stiff competition for tractor services at peak labor demand times. Farmers who want a tractor to arrive on time and do a good job on their farms pay a premium to the driver to assure the work is done correctly.

Tractor rental from private individuals or groups is usually more expensive than from ONAT, but most farmers feel that the assurance of a timely, well-done job is worth the extra expense. The growth of tractor rental and farmers' persistent requests throughout the valley that more tractors be made available, are another indication that there is not enough family labor available to cover the needs of valley farmers.

A large percentage of valley farmers hire some labor or rent tractors, particularly during peak demand periods. Nearly 35 percent of the people interviewed by SEBS hired or engaged voluntary groups (Table 85). The highest percent of people using extra-familial labor is 40 percent in Middle Jubba, while the lowest percent is among pastoralists. Nearly one-quarter of the latter group hire or share labor for agricultural purposes. Table 85 indicates that land preparation (plowing) is the single most important task for which outside labor is engaged, followed closely by weeding.

Table 85. PERCENTAGE OF HOUSEHOLDS HIRING LABOR FOR DIFFERENT AGRICULTURAL TASKS (Percent of Total Households)*

	SAMPLE	REGIONS			SECTORS			
TASKS	JUBBA VALLEY	LOWER JUBBA	MIDDLE JUBBA	GEDO	AG RIV.	AG.NON RIV.	PAS-TORAL	URBAN
Land/ Clear	4.3	3.4	5.5	4.0	4.9	8.7	2.2	2.6
Plow	11.4	12.4	11.8	10.1	12.3	12.8	8.1	11.7
Plant	4.8	3.7	6.1	4.7	5.2	3.6	3.2	6.1
Weed	9.1	9.0	11.3	7.3	9.9	11.2	8.6	8.2
Irrigate	0.4	—	—	1.2	1.1	—	—	0.3
Harvest**	3.1	2.1	4.4	2.8	3.0	2.6	2.1	4.7
Other***	1.5	1.6	1.7	1.2	0.5	0.5	0.5	3.8
% Hiring Labor	34.5%	32.3%	40.8%	31.3%	37.0%	39.3%	24.7%	37.3%

**Labor hire includes hired labor and voluntary group or individual labor.*
***Harvest includes harvesting, post-harvest field cleaning, burning stubble, and pruning fruit trees.*
****Other includes some reports of domestic service labor in urban areas (see text for percentage).*
Percentages were rounded to the nearest integer.

Peak periods of labor demand are for soil preparation and weeding. Land preparation is usually done just prior to the rains–which is before gu' in most areas, and sometimes before deyr as well. Locales that receive coastal rains in the xagaa season or that have a late gu' may also prepare the soil then. Number of weedings depends upon family and outside labor availability, the farm owner's ability to pay, and the nature of the season and soils. For instance, areas of riverine land that receive frequent flooding often suffer from more weeds than dryland areas and, therefore, demand a greater labor input. Table 86 shows the percentage distribution of hired labor per task across seasons or combination of seasons. For example, 61 percent of all land-clearing done by any kind of outside labor group or tractor is done in gu' season.

Table 86. PERCENTAGE OF LABOR TYPES ENGAGED BY SEASON AND TASK

TASKS	GU'	XAGAA	DEYR	JIILAAL	GU'&DEYR	ALL YEAR	NO.HH
Land/ Clear	61.2	2.0	14.3	22.4	-	-	49.0
Plow/ Cult	69.9	3.0	12.8	12.8	1.5	-	133.0
Plant	76.8	-	12.5	1.8	7.1	-	5.06
Weed	73.6	3.8	13.2	4.7	3.8	0.9	106
Irrigate	40.0	0.0	0.0	20.0	20.0	20.0	5.0
Clean*	83.3	0.0	16.7	0.0	0.0	0.0	6.0
Harvest	66.7	13.3	3.3	6.7	10.0	0.0	30.0
Other	29.4	11.8	5.9	23.5	11.8	17.6	17.0
% engaged by HHL each season for all tasks 100%	68.6%	3.7 %	11.9 %	10.4 %	4.0 %	1.5%	402

**Includes cleaning fields, burning stubble, pruning fruit trees.*

Percentages shown indicate the overwhelming demand for labor in the gu' season. Deyr season is the next heaviest demand period, but it and all the other seasonal categories combined do not equal the demand in gu'. Those engaging labor in jiilaal, gu', and deyr, and all year long are generally those with irrigated farms. The 17.6 percent of those who engage for "Other" tasks all year are generally urban people who hire domestic servants. Other than this latter category, and herding tasks, SEBS only asked about labor hire for agriculture. The breakdowns for seasonal of labor engagement by geographical and SES category is given in Table 87.

The scarcity of deyr rains in Lower Jubba Region is evident from the low percentage of people hired there compared to Middle Jubba and Gedo regions. The much higher percentage of people in Lower Jubba Region who hire labor during jiilaal can be explained by those who engage in pre-gu' land preparation and those who use irrigation (see Table 86). The low river level in jiilaal and an increasing problem with saltwater intrusion are making irriga-

tion in Lower Jubba Region less of an option than before.

Table 87. PERCENTAGE OF DIFFERENT LABOR TYPES USED SEASONALLY BY REGION AND SES FOR ALL TASKS*

AREA	GU'	XAGAA	DEYR	JIILAAL	GU+DEYR	ALL YEAR	NO.HHL
Low Jub	75.0	3.2	3.2	16.9	-	1.6	124
Mid Jub	64.9	3.4	16.2	6.8	8.8	-	148
Gedo	66.7	4.5	15.2	8.3	2.3	3.0	132
Ag-Riv	65.9	3.7	17.8	8.1	2.2	2.2	135
Nonriv	62.0	2.5	10.1	21.5	3.8	-	79
Urban	69.5	3.1	9.4	7.8	7.8	2.3	128
Pastor	82.2	8.9	6.7	2.2	-	-	45
Whole Valley	68.6	3.7	11.9	10.4	4.0	1.5	404

**Includes labor hired in all four seasons plus that hired in the combination of gu' and deyr, or all year.*

There is some compatibility between the demand periods of the large scale projects and family farm operations. With large-scale irrigation, the big state projects can produce at times when many small farms cannot. At these times, many farm family members shift over to wage employment.

However, in gu' season, the projects admit that it is difficult to find enough labor, and the labor they do find is usually among those who don't have their own farms, or families in urgent need of cash. State farms give some added incentives that do not show up in strict wage rate comparisons: workers at certain levels are given project-grown commodities on a monthly basis or allowed to buy them below market price. For instance, workers at Juba Sugar Project could buy five kg of sugar for 350 SSh at a time when sugar cost 200 SSh/kg on the black market. Long-term employees at Fanoole Rice Project were recently given an allotment of 15 kg of rice each month following government price controls.

Wages and Rental Rates

Wages for agricultural tasks vary greatly among employers in Jubba Valley. Wages paid by the public sector, which includes state farms, have been restricted in what they could offer by official policy. The wage offered for unskilled labor was 12 SSh/day when Fanoole Rice Project first opened. It has not risen and inflation has decreased its value. The sign of its unsatisfactory level came when nearby Juba Sugar Project was able to offer a better wage due to the input of foreign aid monies. Fanoole project management has complained that they cannot keep workers as long as Juba Sugar Project is hiring.

Many of the more skilled positions within state projects serve as training grounds for young people. It is common for projects to train drivers and mechanics only to have them leave to join the private sector at a better wage. The same is true for administrative personnel, such as accountants, bookkeepers, and secretaries. The Jubba Valley projects have an added disadvantage in that health problems (such as malaria) abound there and often drive young employees away, as do the low salaries. Many of the middle-level administrative and management positions are filled with people who come from outside the Jubba Valley rather than with local people.

In 1987, a per capita "living wage" was probably about 150 to 200 SSh/day. Although one individual could theoretically live on the wage of 37 SSh/day formerly paid by Juba Sugar Project, such a wage would cover only staple food purchases leaving nothing for additions of meat, fruit or vegetables, oil, sugar, or any other condiments.[16] It also leaves nothing for replacing clothing, buying drugs, taking transport, or contributing to housing costs. Further, a wage of 37 SSh/day could sustain only one person at a maximum for a short period of time and would not support a family. It is no surprise that the daily wages paid by private farmers, even traditional smallholders, for farm work averages 150 to 200 SSh/day.

After reviewing Jubba Valley wage rates, it is apparent that public-sector wages are below living standards while private-sector rates are marginally above. A family cannot depend on wage labor as the sole source of income because earnings are usually not enough to sustain more than one person. How-

[16] One-third kilogrm of maize is the base for one adult meal. The cost is approximately seven SSH–not including the cost of fuel. If a piece of bread (five SSH) or a glass of tea (five SSH) were added, the cost of one meal would be 17 SSH. Two meals per day would cost 34 SSH.

ever, if family members are not willing or able to travel to find alternate employment, they can "get by" for short periods of time by hiring themselves out to the private sector.

G. Household Nutrition

The basic diet of Jubba Valley residents consists of a large portion of staple grains—either maize, sorghum, or both—accompanied by milk, tea with sugar, and occasionally meat or fish. In some areas, especially in Lower Jubba Region, bananas are eaten nearly everyday along with the main dish.

Locally produced cereal grains are usually eaten as *soor*, in which the pounded grain meal is boiled into a porridge; as *cambuulo*, in which the hulled grain is boiled whole and served with milk and ghee, or sugar and oil, if these are within the family's means; or as *moofo* which is an unleavened bread made from maize meal. In some areas, the pancake-like *canjeero*, which is made from a slightly fermented mixture of wheat flour or sorghum flour mixed with maize meal, is eaten although this is much more common in northern Somalia. Rice and spaghetti are the main alternate foods used in place of the local grains, particularly among urbanized groups. Availability of milk, meat, fish, fruits, and vegetables varies from region to region, between ecological zones, and from season to season. Diets in Jubba Valley are changing rapidly as consumption of spaghetti, potatoes, and new vegetables increases; the number of small irrigation pumps increases; more herders settle into agro-pastoral or pure agricultural livelihoods; and rural populations have increasing contact with urban areas.

The following discussion is based on socioeconomic survey work in Jubba Valley. The JESS team was able to determine which crops are grown and consumed where (from SEBS), seasonal availability of those crops in some areas (through the Market Survey), and a frequency of consumption for certain foods on a seasonal basis (through the Women's Survey).

Changes in food availability and nutritional levels are key indicators of other kinds of socioeconomic change (*e.g.*, farm or livestock sector productivity or income sources) and are closely linked with changes in incidence of disease. More precise nutritional measurements currently are being carried out by UNICEF field teams that go out to regions of Jubba Valley every three months or so.

Staple Diets in Jubba Valley

The following discussion is based mainly on information gathered in the Women's Baseline Study (WBS). The nutritional part of the survey focused on how frequently a family consumed 42 different food items in each of four seasons. (See Appendix B for questionnaire). Responses permit some rough analysis of who is eating what, where, and in which seasons.

Data are presented in tables with three frequency categories: "often", which sums together daily and weekly frequencies;"occasionally", which sums together monthly and seasonal data; and "rarely", which comprises frequencies from "special feasts", "yearly", and "don't eat". The same basic data presentation will be used for each of seven food groups:

- full frequency data for the whole sample in all four seasons;
- urban, pastoral, riverine agriculture, and nonriverine agriculture populations for just one season;
- each of the three regions for just one season.

1. Staple Grains

Sorghum is the traditional cereal crop of Somalia with maize having been introduced somewhat later—perhaps, in the 17th or 18th century. Historically, maize was only grown in the wetter areas of Lower and Middle Jubba regions, but the introduction of small pumps has permitted its expansion into the lower rainfall areas of the northern river valley.

There are two principal kinds of sorghum: red and white. The sorghum zone extends from Saakow north and in most of the dryland areas away from the river, particularly in the northern part of Middle Jubba and Gedo Region (see Map Figure 1). A major limiting factor on producing sorghum further south is the *Quelea* bird which wreaks havoc on this crop.

The maize eaten in Jubba Valley is a yellow, traditional variety of field corn. It has a husk covering that is so dense and tightly wrapped that only the most persistent of insects can penetrate. Some farmers report being able to keep maize edible in underground pits for five to 10 years; three to five years is not unusual (Abikar 1987).

Three other staples that enter into Jubba Valley diets are rice, spaghetti, and bread, which are consumed

most often by people in the urban and pastoral areas who enjoy higher incomes than people in the agricultural communities. Among farmers and herders, consumption of rice and spaghetti was formerly reserved for special occasions, or for severe drought when other commodities were not available. However, consumption patterns are changing. JESS data show relatively high consumption of rice among the pastoral population.

Table 88 shows frequency of consumption of these staples for the whole WBS sample by season. JESS unexpectedly found little seasonal variation in the frequencies with which grains and other basic foods were consumed. Because of this fact, many of the subsequent tables in this chapter will show consumption frequencies for one season only. The figures shown in this and all subsequent tables are the rounded percentages of responses from 270 households.

Approximately three-quarters of the sample eat maize daily while only about 40 percent eat sorghum as frequently. Rice is eaten daily by approximately 45 percent of the sample, spaghetti by 30 percent, and bread by only about 25 percent. This is evidence of major dietary change since the mid-1950s when an FAO study showed sorghum constituting 85 percent of the diet of police force members (whose diet can be viewed as being somewhat more "urbanized" than rural people of the time). The study showed rice constituting only 15 percent of the diet (in grams) and no spaghetti or bread (Ferro-Luzzi 1954).

Although sorghum is not consumed throughout the valley (which explains why its average daily consumption involves only 40 percent of the population), in some areas it is *the* staple cereal. As such, its role as a basic food is indicated by the stability over all seasons of the percentage of people who consume it daily as opposed to any other frequency period.

When daily and weekly percentages are added together to form a category designated as "often", the percentages of people consuming maize and sorghum remain relatively stable (around 80 percent and 55 percent, up from approximately 73 percent and 46 percent daily, respectively). However, because rice, spaghetti, and bread are consumed more frequently on a weekly basis than maize and sorghum, combining daily with weekly percentages causes the percentage of people who consume these foods to climb from an average of 44 percent, 30 percent, and 25 percent to 65 percent, 49 percent, and 40 percent, respectively. The higher percentages of people consuming these latter staples on a frequent (daily plus weekly) basis relative to maize and sorghum may indicate that their popularity is growing.[17] Table 89 displays reported grain consumption patterns of the different socio-

Table 88. SEASONAL CHANGES IN FREQUENCY OF CONSUMPTION OF GRAIN FOR WHOLE VALLLEY SAMPLE (rounded percent of WBS households)

	MAIZE	SORGHUM	RICE	SPAGHETTI	BREAD
GU'					
Daily	75%	40%	45%	29%	25%
Weekly	7	7	22	20	16
Monthly	0	2	6	6	5
Seasonally	2	3	4	2	3
Yearly/feast	1	0	2	3	1
Don't eat	15	48	21	40	51
XAGAA					
Daily	72%	38%	43%	30%	25%
Weekly	7	8	20	19	15
Monthly	2	2	6	5	
Seasonally	2	2	4	3	4
Yearly/feast	0	5	1	2	1
Don't eat	18	51	25	41	51
DEYR					
Daily	72%	39%	43%	29%	24%
Weekly	8	7	20	20	16
Monthly	1	2	6	6	5
Seasonally	2	3	4	3	4
Yearly/feast	0	0	1	2	1
Don't eat	18	49	25	41	50
JILAAL					
Daily	73%	38%	44%	31%	24%
Weekly	7	7	22	20	15
Monthly	1	3	6	6	5
Seasonally	2	2	3	2	4
Yearly/feast	0.5	0	1	2	1
Don't eat	17	50	23	40	52

[17] Such a supposition is supported by evidence from other African countries where rice and bread quickly establish a niche in consumer demand when they become available. This is particularly true where rapid urbanization favors the ease of preparation of these local grain substitutes, and where cost and availability of fuel is a greater factor. See nutrition studies in Dakar, Senegal, and Bamako, Mali.

ecological sectors for the 1987 gu' season. Frequency categories from the questionnaire that were seen in Table 88 have been combined in this and subsequent tables: "daily" and "weekly" frequencies have been combined to form "often","monthly" and "seasonally" frequencies now form the category "occasionally" and "feasts", and "yearly" and "never" have been combined to form the category "rarely/never".

Table 89. COMPARISION OF CONSUMPTION FREQUENCIES FOR GRAIN BY SECTOR - GU'
(rounded percent of WBS households)

	MAIZE	SORGHUM	RICE	SPAGHETTI	BREAD
URBAN					
OFTEN	87%	25%	93%	77%	84%
OCCASIONALLY	0	9	4	11	7
RARELY/NEVER	13	65	3	11	9
PASTORAL					
OFTEN	56%	50%	75%	45%	15%
OCCASIONALLY	4	0	13	4	11
RARELY/NEVER	38	4	11	49	72
AG-RIVERINE					
OFTEN	95%	64%	36%	28%	18%
OCCASIONALLY	0	3	18	10	8
RARELY/NEVER	3	33	46	63	75
NONRIVERINE					
OFTEN	73%	48%	54%	29%	15%
OCCASIONALLY	0	0	7	7	7
RARELY/NEVER	26	52	38	64	79

Only 56 percent of herders often consume maize compared to 86 percent of the whole sample. Ninety-five per cent of the agricultural riverine populations consumes maize often as opposed to only 73 percent of nonriverine agricultural populations.

Only 25 percent of urban population eats sorghum regularly compared to 64 percent of riverine agricultural populations. Herders eat slightly more sorghum than maize, but the difference is not significant. Maize is obviously the staple among riverine populations. Maize is definitely the most frequently consumed crop among farmers, even in the dryland areas.

Herders have a higher relative consumption of rice and spaghetti than other rural populations—possibly because herders have relatively frequent contact with urban areas for the sale of livestock, livestock products, and the purchase of veterinary drugs and foodstuffs. Rice and spaghetti are nearly always available in towns whereas local grains may disappear from town markets in times of stress in the countryside. In the JESS sample, the high consumption of these foods by herders may have been influenced by the fact that part of the interview year was marked by severe drought, eliminating milk as a major food source for pastoralists.

The urban portion of the sample greatly influenced the results of the overall sample shown in Table 88. This is particularly evident for spaghetti and bread. No more than 10 percent of any rural subsample consumed bread daily, but the overall sample showed a figure of 25 percent. The global figure was increased by the 57 percent of urban families that said they ate bread daily. Table 90 shows frequent maize consumption to be equal in Lower and Middle Jubba regions, but lower in Gedo Region. However, the latter is the primary sorghum-consuming region. Rice consumption is highest in Lower Jubba—where the influence of the valley's largest town and long-term foreign presence and activity is evident. Where this influence is least developed (Gedo Region), frequent rice consumption is also lowest.

Table 90. COMPARISON OF CONSUMPTION FREQUENCIES FOR GRAINS BY REGIONS - GU'
(rounded percent of WBS households)

	MAIZE	SORGHUM	RICE	SPAGHETTI	BREAD
LOWER JUBBA					
OFTEN	93%	15%	80%	63%	57%
OCCASIONALLY	1	3	8	6	12
RARELY/NEVER	5	81	9	30	30
MIDDLE JUBBA					
OFTEN	93%	26%	64%	42%	52%
OCCASIONALLY	0	7	16	20	11
RARELY/NEVER	7	67	20	38	36
GEDO					
OFTEN	69%	87%	56%	42%	20%
OCCASIONALLY	7	3	11	3	3
RARELY/NEVER	24	10	31	54	77

Foreign and urban influence is even more evident in consumption patterns of spaghetti. Here, Middle Jubba and Gedo regions have almost identical patterns of consumption while more urbanized Lower Jubba Region has a much higher consumption frequency.

Bread consumption is about the same in Lower and Middle Jubba regions--a sign of increasing availability in the whole area. In Gedo Region, it is consumed less than half as frequently. Bakeries exist in the towns of Luuq, Garbahaarey, Buurdhuubo, and Baardheere, but the relatively low

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and widely dispersed population of the nonurban areas may explain the region's low consumption of bread.

2. Grain Substitutes

In any area within easy access of banana-growing zones, bananas are frequently consumed along with other foods and often mixed into the main dish. In some areas, particularly in the more isolated areas of Middle Jubba Region, plantains (usually boiled and eaten whole), form an important part of the staple diet.[18] People who have lost their farm land to Mogambo Irrigation Project may be relying on unripe bananas from the plantations for an increasing portion of their diets.

Although banana production in southern Jubba Valley is targeted for foreign markets, as much as half of all produce is culled as unsuitable for export (MMP 1987) and finds its way into the local markets. As a result, this food is plentiful in that area and always available. In addition, many farmers grow their own bananas and plantains.

In urban areas, sweet bananas are usually eaten with the main meal at midday—often cut up or mashed into dishes based on rice or spaghetti. In rural riverine areas, bananas are eaten along with or instead of another carbohydrate. There are a number of traditional bananas that are or were grown in the area, but nowhere is there evidence of bananas serving as a staple.[19]

In Somalia, only the sweet potato tuber is eaten; the leaves are discarded or occasionally sold as animal fodder (JESS Market Survey 1986 to 1988).

White potatoes are well-liked in Jubba Valley, and are incorporated into a number of stews and sauces. Since most are imported,[20] their expense leaves them beyond the reach of most except urban inhabitants. However, potato consumption is of increasing importance in the urban areas.

In Somalia, cassava (*manioc*) can be found growing only in a few villages in Lower Jubba Region (and perhaps in lower Shabeelle Valley). Few people consume this tuber. Cassava will grow on soils that are severely depleted and where almost no other food crop can be grown. Possible declines in soil fertility due to flood control with the Baardheere Dam may cause an increase in the production of this crop, particularly if fallow times fall or people are unable to procure new farmlands. An extension of cassava production in Jubba Valley can serve as an indicator that soils are becoming impoverished.

Table 91 shows the frequency with which the staple substitutes of plantains, bananas, cassava, and sweet potatoes are consumed in Jubba Valley. In general, less of these foods are consumed in Gedo Region than in Middle and Lower Jubba regions. Bananas

Table 91. COMPARISON OF CONSUMPTION FREQUENCIES FOR STAPLE SUBSTITUTES BY REGION - GU'
(rounded percent of WBS households)

	PLANTAINS	BANANAS	CASSAVA	SWEETPOTATOES
LOWER JUBBA				
DAILY	8%	57%	1%	14%
WEEKLY	17	9	2	17
OCCASIONALLY	10	5	3	5
RARELY/NEVER	65	28	94	63
MIDDLE JUBBA				
DAILY	10%	46%	0%	13%
WEEKLY	23	30	5	15
OCCASIONALLY	5	8	3	3
RARELY/NEVER	62	16	92	69
GEDO				
DAILY	0%	15%	0%	8%
WEEKLY	0	5	0	1
OCCASIONALLY	3	13	0	0
RARELY/NEVER	97	66	100	91
WHOLE SAMPLE				
DAILY	5%	38%	1%	12%
WEEKLY	12	13	2	11
OCCASIONALLY	6	9	1	2
RARELY/NEVER	77	40	96	75

[18] This does not show up in our sample, but is evident from interviews held in some villages in Middle Jubba during the JESS Rapid Reconnaissance in 1986.

[19] "The [banana] plantations are gradually shifting their production from the local *Giuba nana* variety to the more universally adopted *Poyo* variety which is much less vulnerable to bruises and travels with far less costly packaging." The Ecology of Malnutrition, Jacques May, ed., "The Somali Republic,"1970, pp. 570-571.

[20] JESS found no evidence of white potatoes being grown in Somalia. Most come from Kenya (which has cooler highland areas suited to production of this crop) or perhaps, also from Europe.

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are obviously the most popular item among these four, with both bananas and plantains being consumed more frequently in Middle Jubba than anywhere else. In that region, plantains are commonly boiled as the main breakfast food. In addition, more traditional types of bananas appear to exist in Middle Jubba Region than elsewhere. There are indications that for many of the riverine populations in the lower two-thirds of Jubba Valley, bananas and plantains were a more important item in the diet twenty years ago than they are now.[21] With the spread of small-scale irrigation, banana production may increase.

Consumption of cassava is low in Lower and Middle Jubba regions and nonexistent in Gedo Region. Sweet potatoes are consumed with about the same frequency by people in Lower and Middle Jubba, although slightly more in Lower Jubba, and only about one-third as frequently in Gedo.

The sectoral information on consumption of the above commodities shows clearly how unimportant this food group is for herders. However, urban consumption of bananas is particularly high. Non-riverine agricultural populations consume this crop with much greater frequency than riverine populations. Although bananas are produced on riverine farms in Middle Jubba Region and increasingly, under irrigation in Gedo Region, they appear in only the smallest quantities in inland marketplaces and north of Jilib. The distribution system for this crop works fairly well within the valley—especially given its perishability. The taste for bananas is well-established in Jubba Valley, and people consume them when they can acquire them.

Table 92. COMPARISON OF CONSUMPTION FREQUENCIES FOR STAPLE SUBSTITUTES BY SECTOR - GU' (rounded % of WBS households)

	PLANTAINS	BANANAS	CASSAVA	SWEET POTATOES
URBAN				
DAILY	7%	82%	1%	27%WEEKLY
OCCASIONALLY	7	2	2	4
RARELY/NEVER	67	8	95	52
PASTORAL				
DAILY	0%	6%	0%	2%
WEEKLY	0	4	0	2
OCCASIONALLY	2	17	0	0
RARELY/NEVER	98	70	100	96
AG-RIVERINE				
DAILY	6%	10%	0%	6%
WEEKLY	11	19	2	9
OCCASIONALLY	8	16	2	2
RARELY/NEVER	75	55	96	83
AG-NONRIVERINE				
DAILY	5%	29%	0%	0%
WEEKLY	10	24	0	10
OCCASIONALLY	2	5	0	0
RARELY/NEVER	83	43	100	90

Sweet potatoes and cassava that are consumed in the river valley are eaten mainly in urban and riverine areas. In general, these foods are consumed on a weekly rather than on a daily basis.

3. Animal Protein

Jubba Valley residents get protein from a variety of sources. Besides milk, people consume beef, camel, goat, sheep, hunted meat and fish (fresh and dried). Seasonal consumption of the first three meats is steady over the year. Consumption of the last four items rises slightly in jiilaal.

Camel meat is the most frequently consumed food in this group, but beef and goat are also high. Consumption of fresh fish is slightly less than goat meat, particularly in jiilaal. In that season, with the river water low, fishing is easiest (Meredith 1988). People tend to have more time for fishing during the dry season and often, there are fewer alternative food sources around. Hunted meat, which usually consists of dik-dik antelope or lesser kudu, is subject to dietary prohibitions among many Somali groups. In addition, (in principal), hunting wild game is illegal in Somalia.

Mutton is rarely eaten in Jubba Valley. Aerial census work indicates that goat concentrations are 75 percent higher than those of sheep in Jubba Valley. This supports the supposition that the latter is not a preferred meat, or that there is a problem rearing sheep in that area. Some valley residents have said that sheep are more susceptible to tsetse and tick-borne diseases than goats. Sheep fat is used in traditional medical preparations and is often given to mothers after childbirth to regain their strength.

[21] From Rapid Reconnaissance interviews in both Jilib and Bu'aale districts, 1986.

Table 93 presents differences in relative meat consumption frequencies between sectors and for the whole valley during the gu' season. As with cereals, there was almost no variation between seasons in reported consumption frequencies and therefore, they were not presented.

Table 93. COMPARISION OF CONSUMPTION FREQUENCIES FOR MEAT BY SECTOR - GU'
(rounded percent of WBS households)

	BEEF	CAMEL	GOAT	SHEEP	HUNTED MEAT	FRESH FISH	DRIED FISH
URBAN							
OFTEN	60%	91%	64%	8%	1%	46%	10
OCCASIONALLY	13	5	10	6	1	15	2
RARELY/NEVER	28	4	26	86	98	39	88
PASTORAL							
OFTEN	39%	53%	46%	13%	2%	0%	0%
OCCASIONALLY	35	35	19	11	17	2	2
RARELY/NEVER	26	13	34	76	81	98	98
AG-RIVERINE							
OFTEN	36%	35%	24%	8%	7%	33%	14%
OCCASIONALLY	39	35	40	22	18	13	1
RARELY/NEVER	25	30	36	70	75	54	85
AG-NONRIVERINE							
OFTEN	48%	36%	14%	5%	7%	12%	6%
OCCASIONALLY	21	38	36	5	10	6	0
RARELY/NEVER	31	26	50	90	83	87	94
WHOLE VALLEY							
OFTEN	47%	58%	40%	9%	4%	29%	9%
OCCASIONALLY	26	24	26	12	10	13	2
RARELY/NEVER	27	17	61	80	86	59	90

The urban populations had a higher frequency of most meat consumption than the rural and pastoral groups. Notable exceptions were sheep, hunted meat, and dried fish which are consumed more frequently by one of the rural groups than by urban populations. The high frequency of fresh fish consumption among urban consumers is due largely to the proportion of Kismaayo residents in the WBS sample and the importance of ocean fishing there.

Among urban and pastoral populations, camel is the most important source of meat protein. Beef and goat are actually preferred for their taste and ease of preparation, but camel meat is often more widely available than beef or goat, particularly in the large urban markets.

A breakdown of meat consumption by region shows that goat (50 percent) is the most frequently consumed type in sparsely populated Gedo Region, far ahead of beef (32 percent) and camel (36 percent). It is the reverse in the more densely populated Lower and Middle Jubba regions with camel being consumed frequently by about 70 percent of the households and beef by 55 percent while goat only accounts for 35 percent.

One-third to one-fifth of the rural agricultural populations only consume meat occasionally and five percent consume no meat at all. Table 94 presents a summary of the consumption frequencies of all meat types taken together. This table is broken out into five frequency levels because of the important differences between levels for the different groups.

Table 94. COMPARISION OF CONSUMPTION FREQUENCIES FOR ALL MEAT BY SECTOR - GU'
(rounded percent of WBS households)

	PASTORAL	URBAN	AGRIV.	NONRIV.
DAILY	51%	85%	18%	28%
WEEKLY	29	10	40	46
MONTHLY	20	2	27	16
SEASONALLY*	0	1	9	5
RARE/NEVER*	0	2	6	5

**Ninetypercent of those who ate meat only seasonally or not at all (19 people) said they ate fish. Of these, 12percent ate fish daily and 41percent weekly.*
Source: JESS WBS Survey 1987

When all meat types are combined, the predominance of urban dwellers as daily meat-eaters is clear. More than half of each sectoral group consumes meat at least once a week. The agricultural riverine populations consume meat the least frequently of all groups. Nearly one-third of this sector's population only eats meat once a month. Another 16 percent consume meat only seasonally or not at all. Frequency of milk consumption as well as quantities consumed is less in this group compared with the others. As a result, it is clear that riverine agricultural populations are the group to watch for possible developments of protein malnutrition, especially among the young.

When frequencies of all meat types are viewed for each region, Lower Jubba stands out with 65 percent of its population consuming some kind of meat daily. Only 33 percent of Middle Jubba Region and 35 percent of Gedo Region populations consume meat daily. When daily and weekly consumption

rates are combined, 87 percent of Lower Jubba, 73 percent of Middle Jubba, and 68 percent of Gedo inhabitants eat meat often. For those same regional populations, two percent, 11 percent, and 12 percent, respectively, eat meat only seasonally or not at all.

Although there is no formal prohibition, people of pastoral background tend to avoid fish consumption even after they have settled for several generations. It is usually only under conditions of environmental or economic stress that they begin to consume fish. With abundant sources of meat in Jubba Valley, it will probably be a long time before pastoral and agro-pastoral groups begin to consume fish in large quantities.

4. Milk

Somalia's pastoral tradition means that milk is an important element in the diet. Availability of animal milk for herders depends on the herd size and composition held by a family, the season, or climatic stress on graze and water. Often, in seasons when milk is most abundant such as during the gu' rains, herders are far away from towns and riverine villages. During these times, milk is most scarce for agricultural and urban families without their own animals. However, during the dry season and in times of drought, herders are often close to the river and towns. Although their animals produce less milk then, herders are often forced to sell what exists in order to acquire grain. Therefore, milk is often most available for herding families when it is scarce for nonherding families and most available for sale in towns and villages when herders must go without.

However, there are numerous exceptions to this general pattern. For example, there are often agro-pastoral communities located near towns and other villages which keep their lactating animals in the area and supply their neighbors with milk on a regular basis. Hombooy is such an area—it is a principal source of milk sold to the inhabitants of Jilib.

Table 95 shows the consumption stability of the different types of milk in the four seasons. Milk, for all categories except goat's milk and sour camel's milk, is consumed most frequently on a daily basis.

Table 95. SEASONAL CHANGES IN FREQUENCY OF CONSUMPTION OF MILK FOR WHOLE VALLEY SAMPLE
(rounded percent of WBS households)

	FRESH COW'S	SOUR COW'S	FRESH CAMEL'S	SOUR CAMEL'S	GOAT'S MILK
GU'					
Daily	68%	44%	39%	32%	14%
Weekly	13	22	18	20	11
Monthly		2	6	7	1
Seasonally	2	3	2	3	3
Yearly/feast	0	0	0	0	0
Don't eat	17	30	36	40	71
XAGAA					
Daily	67%	42%	39%	32%	15%
Weekly	12	22	16	20	10
Monthly	1	1	6	7	
Seasonally	3	3	3	2	3
Yearly/feast	0	0	0	0	0
Don't eat	17	32	37	39	72
DEYR					
Daily	68%	42%	38%	32%	15%
Weekly	12	21	17	20	9
Monthly	1	3	6	7	1
Seasonally	2	3	3	2	3
Yearly/feast	0	0	0	0	0
Don't eat	16	31	36	39	72
JIILAAL					
Daily	63%	40%	40%	32%	13%
Weekly	12	19	16	20	8
Monthly	2	2	5	7	1
Seasonally	2	2	3	4	2
Yearly/feast		0	0	0	0
Don't eat	20	37	36	38	75

Animal milk—either alone or combined with human milk—is the main food for infants and young children. Households that cannot get sources of milk year-round complain that their children do not grow up strong.[22] Fresh cow's milk is the most popular milk overall. For all categories of milk, people either consume them frequently or not at all as demonstrated in Table 96.

Urban consumers, with their purchasing power, are the dominant milk drinkers. The high number (91 percent) of those who drink milk daily is heavily influenced by Kismaayo which is the main demand center for southwestern Somali cattle. The peri-urban supply network for milk around Kismaayo is

[22] This is a frequent complaint heard from former pastoralists who have lost their herds and been forced to settle in an area that is not always in contact with other herders.

also responsible for year-round availability at times when transhumant pastoralists may be away from the Kismaayo area (Evans, Cullen, Little 1988). The high percentages of families drinking both fresh and sour cow's milk in the agricultural sectors is due largely to the fact that many families maintain at least one milk cow. Lower consumption of camel's milk in this group relative to either the urban or pastoral populations demonstrates their lack of access to this milk. Goat's milk consumed by agricultural populations is drawn almost entirely from their own herds.

Table 96. COMPARISON OF CONSUMPTION FREQUENCIES FOR MILK BY SECTOR - GU' (rounded percent of WBS households)

	FRESH COW'S	SOUR COW'S	FRESH CAMEL'S	SOUR CAMEL'S	GOAT'S MILK
URBAN					
Often	91%	65%	74%	58%	17%
Occasionally	1		4	3	8
Rarely/never	8	31	23	34	81
PASTORAL					
OFTEN	64%	61%	64%	58%	33%
Occasionally	8	8	8	8	11
Rarely/never	28	31	28	33	56
AG-RIVERINE					
Often	75%	70%	39%	40%	30%
Occasionally	3	3	12	15	7
Rarely/never	22	27	49	45	63
AG-NONRIVERINE					
Often	81%	68%	39%	38%	25%
Occasionally	0	3	13	13	0
Rarely/never	19	29	48	48	74

A large number of herders do not consume each of the different types of milk. Those who have cattle often don't have camels, and vice versa. However, only one pastoral family ever responded that it didn't drink any milk at all and that was only during xagaa season. Tables 97 and 99, which show the percentage of sectoral and regional populations that drink milk frequently (daily or weekly) amply demonstrate this fact. Gu' and jiilaal season consumption patterns are shown in these tables to indicate seasonal variations for all milk types.

Table 97 demonstrates the high frequency of milk consumption in Jubba Valley. Although 90 to 100 percent of valley families report drinking milk daily or weekly, this may still mean that only a few family members drink milk (such as children).

Table 97. COMPARISION OF CONSUMPTION FREQUENCIES FOR ALL MILK BY SECTOR - GU' AND JIILAAL (rounded percent of WBS households)

	PASTORAL	URBAN	AGRIV.	NONRIV.
Drink any milk				
Gu'	100%	100%	90%	97%
Jiilaal	100	99	84	97
Drink no milk				
Gu'	0	0	10%	3%
Jiilaal	0	0	16	3

Table 98 again demonstrates that sour cow's milk is more evenly distributed among consumers in the three regions than fresh. Because it is not as perishable as fresh milk, sour milk can travel longer distances to market. Table 98 shows that Gedo Region is not the most frequent consumer of camel's milk despite the fact that it is premium camel country. Camels are more evenly distributed throughout Jubba Valley than is generally thought (even in gu'). In recent years—particularly in dry years—the camel population of Gedo Region has been moving into Afmadow and farther south than it did before (see Watson and Nimmo 1988; Janzen 1988). Results of the JESS Market Survey further confirm this by showing that the sources for live camels as well as for camel's milk and meat in the southern valley markets are primarily the same districts as the market.

Table 98. COMPARISON OF CONSUMPTION FREQUENCIES FOR MILK BY REGION - GU' (rounded percent of WBS households)

	FRESH COW'S	SOUR COW'S	FRESH CAMEL'S	SOUR CAMEL'S	GOAT'S MILK
LOWER JUBBA					
Often	90%	65%	58%	43%	20%
Occasionally	1	2	8	10	1
Rarely/never	8	33	34	47	79
MIDDLE JUBBA					
Often	77%	61%	62%	67%	22%
Occasionally	2	4	5	6	2
Rarely/never	21	36	33	26	77
GEDO					
Often	74%	69%	53%	50%	37%
Occasionally	6	10	9	11	13
Rarely/never	20	22	38	39	50

Consumption of goat's milk shows a higher concentration of goats as one moves from south to north.

When results of milk consumption frequencies are viewed on a regional basis, predominant consumption in Lower Jubba is confirmed. Gedo Region has slightly lower frequent consumption and slightly higher percentages of people who rarely or never drink milk—possibly due to the fact that the interview year was a drought year in Jubba Valley and Gedo Region was particularly affected. Future studies will be needed to demonstrate whether the drought was the cause of the higher percentages drinking no milk in Gedo Region or whether something else is happening in that region to prevent access to milk.

Table 99. COMPARISION OF CONSUMPTION FREQUENCIES FOR ALL MILK BY REGION - GU' AND JIILAAL
(rounded % of WBS households)

	LOWER JUBBA	MIDDLE JUBBA	GEDO
Drink any milk			
Gu'	100%	95%	94%
Jiilaal	99	92	90
Drink no milk			
Gu'	0	5%	6%
Jiilaal	1	8	10

5. Vegetables

Vegetables are not widely consumed in Somalia, especially among pastoral and semi-pastoral peoples. Because of their perishability, vegetables are frequently absent from the diets of nonfarming, transhumant peoples.

There is little seasonal variation in the consumption of vegetables (see Table 100). Riverine agricultural populations tend to consume the most vegetables as they have the greatest year-round access to them. Nevertheless, the urban areas still consume the greatest quantities of vegetables. Often, vegetable production begins as a cash-earning proposition to take advantage of a nearby urban market. Extent of this development depends on the incomes and dietary tastes of urban inhabitants.

The above discussion explains the consumption frequencies shown in Table 101. Squash, tomatoes, onions, and green peppers are popular in Jubba Valley urban areas. These are also the most important vegetables in the rural sectors, but the frequencies of consumption are much lower there. For herders, these are almost the only vegetables eaten. For example, leafy greens are eaten by a modest portion of urban and agricultural populations, but almost not at all by herders. For the most part, carrots are consumed only in urban areas.

Table 100. SEASONAL CHANGES IN CONSUMPTION FREQUENCIES FOR VEGETABLES - WHOLE VALLEY SAMPLE
(rounded percent of WBS households)

	SQUASH	TOMATO	ONION	CARROT	LEAFY GREEN	GREEN PEPPER	WILD PLANTS
GU'							
DAILY	36%	56%	55%	11%	10%	31%	1%
WEEKLY	19	14	14	2	1	7	1
MONTHLY	2	1	2	0	0	1	<1
SEASONALLY	3	2	2	1	3	0	2
YEARLY	<1	<1	<1	0	0	1	<1
DON'T EAT	41	26	27	87	86	61	96
XAGAA							
DAILY	34%	55%	55%	11%	7%	30%	<1%
WEEKLY	18	13	13	2	1	6	<1
MONTHLY	2	1	2	<1	0	<1	1
SEASONALLY	3	1	2	<1	2	0	0
YEARLY	<1	0	<1	0	0	0	0
DON'T EAT	44	30	29	87	91	63	98
DEYR							
DAILY	34%	55%	54%	11%	9%	31%	1%
WEEKLY	18	12	13	2	1	6	1
MONTHLY	2	2	2	<1	0	<1	<1
SEASONALLY	2	1	2	<1	2	0	2
YEARLY	0	0	<1	0	0	0	0
DON'T EAT	43	30	29	86	88	63	96
JIILAAL							
DAILY	33%	52%	53%	11%	6%	30%	36%
WEEKLY	17	9	13	2	1	5	10
MONTHLY	2	1	1	<1	0	<1	1
SEASONALLY	2	<1	1	0	2	0	2
YEARLY	<1	0		<10	0	0	0
DON'T EAT	46	37	32	87	92	64	52

Table 102 shows regional breakdowns for vegetable consumption. Despite the predominance of Kismaayo town in Lower Jubba Region, Middle Jubba's consumption frequencies are higher than Lower Jubba for all vegetables shown here except carrots, green peppers, and wild plants. Gedo Region still consumes fewer vegetables than the other two regions, but has made great gains over the past 10 years. Part of this increase is due to rapid urbanization and changing tastes among urban inhabitants. A more important element is undoubtedly the rapid expansion of small-pump irrigation in this region, under which many vegetables not previously available in the area are grown. Over the past ten years, the areas around Baardheere and

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Luuq have become the principal producers of onions in Somalia.

Table 101. COMPARISON OF CONSUMPTION FREQUENCIES FOR VEGETABLES BY SECTOR - GU' (rounded percent of WBS households)

	SQUASH	TOMATO	ONION	CARROT	LEAFY GREEN	GREEN PEPPER	WILD PLANTS
URBAN							
OFTEN	79%	96%	96%	30%	15%	78%	1%
OCCASIONALLY	0	0	1	2	2	2	0
RARELY/ NEVER	21	3	3	68	83	20	99
PASTORAL							
OFTEN	22%	33%	35%	4%	2%	18%	2%
OCCASIONALLY	11	6	11	0	0	0	2
RARELY/ NEVER	67	61	54	96	98	83	96
AG-RIVERINE							
OFTEN	46%	60%	55%	4%	11%	12%	2%
OCCASIONALLY	6	1	5	0	6	0	2
RARELY/	48	39	39	97	83	88	95
AG-NONRIVERINE							
OFTEN	48%	71%	69%	0%	10%	13%	5%
OCCASIONALLY	5	7	2	0	2	0	2
RARELY/ NEVER	48	21	29	100	88	86	93

Table 102. COMPARISON OF CONSUMPTION FREQUENCIES FOR VEGETABLES BY REGION - GU' (rounded percent of WBS households)

	SQUASH	TOMATO	ONION	CARROT	LEAFY GREEN	GREEN PEPPER	WILD PLANT
LOWER JUBBA							
OFTEN	61%	82%	79%	19%	6%	56%	3%
OCCASIONALLY	5	3	3	2	3	0	1
RARELY/ NEVER	33	14	17	78	90	43	95
MIDDLE JUBBA							
OFTEN	76%	91%	85%	11%	24%	28%	0%
OCCASIONALLY	1	1	0	0	5	3	1
RARELY/ NEVER	23	8	15	89	71	69	99
GEDO							
OFTEN	28%	41%	43%	6%	6%	22%	2%
OCCASIONALLY	6	3	9	0	0	0	3
RARELY/ NEVER	65	55	48	94	94	77	95

To put total vegetable consumption frequencies in perspective, Table 103 shows the percentage of people who do and do not eat vegetables as a group. The category, "Eat Some Vegetables", refers to people who consume a variety of vegetables with some frequency (at least seasonally). The second category, "Eat tomatoes and onions only", refers to people who consume no other vegetables except tomatoes or onions or both. The third category refers to people who either eat no vegetables at all or no more frequently than once or twice a year.

TABLE 103. PERCENT CONSUMPTION OF ALL VEGETABLESBY SECTOR —GU' (in rounded percent of WBS households)

	PASTORAL	URBAN	AGRIV.	NONRIV.
Eat some vegetables[1]	40%	98%	54%	73%
Eat tom. and onions only[2]	12	1	14	12
Eat no vegetables[3]	48	1	32	15
Total	100%	100%	100%	100%

1Includes consumption of tomatoes and onions and other vegetables.
2Combines those who eat only tomatoes, only onions or both.
3No vegetables eaten more frequently than once or twice a year.
Source: JESS WBS Survey, 1987.

The two surprising elements in this table are the high percentage of pastoralists who report eating some vegetables on a regular basis, and the relatively high number of agricultural riverine people (32 percent) who say they don't eat any vegetables. The results of the urban population is expected, but the fact that a greater number of nonriverine than riverine people reported eating a variety of vegetables frequently warrants investigation. Severe drought conditions away from the river occurred in 1987 as well as severe flooding in much of the riverine zone. Severe crop loss in riverine

lands could have resulted in a smaller amount and variety of vegetables in agricultural villages.

TABLE 104. PERCENT CONSUMPTION OF ALL VEGETABLES BY REGION —GU'

	LOWER JUBBA	MIDDLE JUBBA	GEDO
Eat some vegetables[1]	83%	89%	39%
Eat tom. and onions only[2]	2	8	17
Eat no vegetables[3]	15	3	44
Total	100%	100%	100%

1Includes consumption of tomatoes and onions and other vegetables.
2Combines those who eat only tomatoes, only onions or both.
3No vegetables eaten more frequently than once or twice a year.
Source: JESS WBS Survey, 1987.

The regional comparison of combined vegetable consumption frequencies shows that Middle Jubba has the highest frequent consumption. In this case, the inclusion of many pastoralists in the Lower Jubba sample influenced the finding that 15 percent of the population reports eating no vegetables at all. Gedo Region, with its high proportion of pastoral population, shows that 44 percent do not consume vegetables. In addition, in this same region, nearly twenty percent eat only tomatoes and/or onions. The overall consumption gap for vegetables between Gedo and the two southern regions is approximately 40 percent.

6. Fruits

Many tropical fruit varieties flourish in Jubba River Valley so that relatively little care is needed for these crops to prosper. In addition, several fruit crops (particularly mangos, limes, and papayas), are important cash crops for the area. In many cases, these are the only cash crops available for some farmers.

Table 105 shows the seasonal changes in consumption patterns for the whole sample for a select number of fruits. Here, seasonal consumption is more evident than for the food groups already reviewed. Lime consumption remains relatively constant, but watermelon consumption reaches a pronounced peak during jiilaal, which is the major producing season. Mangos and wild fruit have two periods of increased consumption—gu' and deyr—that coincide with their peak fruiting seasons. Papaya production and consumption appear to diminish slightly after the gu' rains. In all, with the exception

Table 105. SEASONAL CHANGES IN CONSUMPTION FREQUENCIES FOR FRUIT - WHOLE VALLEY SAMPLE (rounded percent of WBS households)

	PAPAYA	LIME	WATER MELON	MANGO	WILD FRUIT
GU'					
Daily	24%	34%	26%	17%	18%
Weekly	17	14	9	8	7
Monthly	5	1	4	3	3
Seasonally	4	3	6	17	6
Yearly/least	0	0		2	3
Don't eat	50	48	56	54	62
XAGAA					
Daily	23%	35%	23%	11%	8%
Weekly	18	14	8	11	4
Monthly	5	1	4	3	4
Seasonally	4	2	6	15	6
Yearly/least	0	0	0	0	1
Don't eat	51	47	57	59	77
DEYR					
Daily	21%	33%	21%	18%	17%
Weekly	19	14	9	9	7
Monthly	6	1	3	3	3
Seasonally	3	3	7	15	7
Yearly/least	0		0	0	0
Don't eat	50	49	60	54	65
JIILAAL					
Daily	19%	34%	43%	10%	5%
Weekly	14	14	11	9	2
Monthly	6	2	3	3	2
Seasonally	3	2	5	16	5
Yearly/least	1	1	1	1	2
Don't eat	56	49	36	62	84

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of watermelon, more fruit is available during gu' than at any other time.

As can be seen in Table 106, sectoral consumption of fruit is highest in urban populations, followed by riverine cultivators, nonriverine farmers, and then herders. The only exception to this pattern is wild fruit which is consumed most by rural and pastoral populations.

Table 106. COMPARISON OF CONSUMPTION FREQUENCIES FOR FRUITS BY SECTOR - GU'
(rounded percent of WBS households)

	PAPAYA	LIME	WATER MELON	MANGO	WILD FRUIT
URBAN					
Often	65%	76%	48%	42%	14%
Occasionally	6	1	8	24	7
Rarely/never	29	22	44	34	79
PASTORAL					
Often	4%		8%	8%	4%
Occasionally	8	6	8	8	2
Rarely/never	85	83	81	85	64
AG-RIVERINE					
Often	40%	39%	34%	19%	31%
OCCASIONALLY	6	8	14	18	17
Rarely/never	47	53	52	63	52
AG-NONRIVERINE					
Often	29%	43%	28%	21%	31%
Occasionally	7	0	5	21	10
Rarely/never	64	57	67	57	59

Due to low consumption of most vegetables, most rural people in Somalia receive most of the essential vitamins and minerals through the consumption of fruits. This is particularly true since there appears to be a decline in per capita milk consumption as people settle away from the main herding areas in the valley.[23]

For the most part, cultivated fruits are consumed more frequently in Lower Jubba Region than anywhere else. This is due to the fact that imported varieties of fruit such as limes, papaya, and mangos were first established in the lower river and local diets have incorporated them for a longer period than elsewhere. Rainfall tends to be higher there, as well. However, the primary mango-growing area is now Middle Jubba where riverine trees have been less disturbed by conversion of riverine land to other commercial production than in Lower Jubba. Fruit production is important economically, and in some villages in Jilib and Bu'aale districts, mangos are the principal cash crop.

Wild fruit is consumed most in Gedo Region where there is a larger concentration of pastoralists and other fruits are still relatively scarce. Nevertheless, with the expansion of small-scale pumping along the upper reaches of the Jubba River, many farmers are now cultivating fruits in Gedo Region.

The two tables that follow show the frequency with which all fruit as a group is eaten by the sectoral and regional populations. Table 107 shows that 30 percent of the pastoralists don't eat fruit compared to 48 percent who don't eat vegetables. For the most part, this is because nearly one-third of this group consumes wild fruit with some frequency. Urban consumers remain in the 90th percentile for consumption of fruits as they do for all other food groups. However, the only fruit eaten by six percent of urban dwellers is bananas.

Table 107. COMPARISON OF CONSUMPTION FREQUENCIES FOR FRUIT BY REGION — GU'
(rounded percent of WBS households)

	PAPAYA	LIME	WATER MELON	MANGO	WILD FRUIT
LOWER JUBBA					
Often	57%	63%	53%	31%	21%
Occasionally	4	0	6	24	8
Rarely/never	40	37	42	43	71
MIDDLE JUBBA					
Often	42%	58%	27%	36%	24%
Occasionally	15	1	12	23	6
Rarely/never	40	41	61	41	69
GEDO					
Often	22%	22%	21%	9%	32%
Occasionally	9	11	12	13	14
Rarely/never	69	65	67	78	54

[23] Many villagers have told the JESS team in village interviews that they used to drink more milk. Many who complained were former herders. But even some settled people claimed that herders in their area tend to take milk to small towns to sell. Consequently, the villagers that are far from town have to do without. This depends upon the location of the village vis-a-vis major herd migration lines and the season.

In the agricultural sector, a low frequency (only 10 percent) of rural settled populations eat no fruit. More than 70 percent of both riverine and non-riverine inhabitants eat some fruits, including bananas and wild fruits, more than once or twice a year. The consumption of wild fruits only is more important in the riverine than nonriverine sector.

TABLE 108. PERCENT FREQUENCY OF CONSUMPTION OF ALL FRUIT BY SECTOR — GU'
(rounded % of WBS households)

	PASTORAL	URBAN	AGRIV.	NONRIV.
Eat fruit[1]	30%	91%	76%	71%
Bananas only	7	6	1	8
Wild fruit only	28	0	12	8
Bananas & wild fruit only	5	0	1	3
% eating some fruit	70%	96%	90%	90%
No fruit	30%	3%	10%	10%

1 Includes people who eat a variety of fruits including bananas and wild fruits more frequently than once or twice yearly.
Source: JESS WBS Surve, 1987.

As with vegetables, Middle Jubba Region had the highest fruit consumption in terms of frequency. Most people in all three regions only eat fruit occasionally. The percentage of people consuming no fruit in all three regions was much lower than for vegetables, except for Middle Jubba. The results of regional frequencies for all fruits are presented below in Table 109.

TABLE 109. PERCENT FREQUENCY OF CONSUMPTION OF ALL FRUIT BY REGION — GU'
(rounded percent of WBS households)

	LOWER JUBBA	MIDDLE JUBBA	GEDO
Eat fruit[1]	78%	92%	60%
Bananas only	6	8	1
Wild fruit only	7	2	19
Bananas & wild		0	14
fruit only	-	-	-
% eating some			
fruit	91%	93%	84%
No fruit	9%	7%	16%

1 Includes people who eat a variety of fruits including bananas and wild fruits more frequently than once or twice yearly.
Source: JESS WBS Survey 1987.

7. Tea, Sugar, and Honey

Although this is not a standard recognized "food group", it is an important area for discussion with regard to Somali diets. Tea with sugar is the single most frequently consumed food item in Jubba Valley. The extent to which sugar has displaced the more traditional sweetener, honey, is unknown, but it has made considerable inroads on honey consumption over the past 50 years, particularly when its price is low. Both honey and sugar have increased in price over the last five years, although sugar is more widely available and easier to transport in bulk than honey.

Consumption frequencies of tea and sugar over the four seasons is more or less constant: 96 percent and 97 percent of the sample consume each one daily. Tea in Somalia is always consumed with sugar. Although sugar is sometimes used in other preparations, the bulk of sugar consumption is in tea.

Honey consumption shows more variation across the seasons. The least honey is eaten during xagaa and the most during gu' and deyr. Daily, weekly, and even monthly consumption of honey is quite rare. Most groups that use honey consume it only a few times in one season. Only the few people who have access to hives eat it daily.

A sectoral breakdown in Table 110 illustrates that the nonriverine agricultural population consumes the least tea and sugar. In that sector, those who do not consume it daily consume it at least several times a week. Herders reveal the most consistent consumption at 100 percent daily consumption for both tea and sugar. Daily honey consumption is highest among riverine populations, who are generally the producers, and next highest among urban populations. However, combining frequent and occasional consumption, urban areas are the major consumers. Honey is often produced as a cash "crop", which town inhabitants are most able to buy.

Regional consumption of the three food items indicates that sugar and tea consumption is highest in Lower Jubba (99 percent and 100 percent consume daily, respectively), and slightly lower in Middle Jubba (93 percent and 95 percent daily) and Gedo (95 percent and 94 percent daily). The regional breakdown also reveals that Middle Jubba, which is the main honey-producing area, is also the area of highest frequent consumption: 11 percent daily as opposed to three percent for Lower Jubba and five percent for Gedo. However, the highest occasional

consumption occurs in Lower Jubba where honey is drawn into the urban markets by higher purchasing power.

Table 110. COMPARISON OF CONSUMPTION FREQUENCIES FOR TEA, SUGAR, HONEY BY SECTOR - GU' (rounded percent of WBS households)

	TEA	SUGAR	HONEY
URBAN			
Often	99%	100%	8%
Occasionally	0	0	26
Rarely/never	1	0	66
PASTORAL			
Often	100%	100%	0%
Occasionally	0	0	19
Rarely/never	0	0	81
AG-RIVERINE			
Often	100%	98%	10%
Occasionally	0	0	17
Rarely/never	0	2	73
AG-NONRIVERINE			
Often	97%	97%	0%
Occasionally	3	3	23
Rarely/never	0	0	77

H. Health

Evaluating the health status of the labor force requires a baseline of information about current conditions. SEBS took a first step in assessing the health status among Jubba Valley residents.

JESS efforts made in the area of health focused on water-quality work, disease vector surveys, and epidemiological work done on malaria and bilharzia (see Jobin 1988; Klumpp 1988; and Warsame Yusuf 1988). A proposed survey of incidence and severity of anemia in mothers and children is to be carried out by a joint study done by World Concern and Swedish Church Relief using equipment purchased by JESS for this purpose.[25]

In addition to these major consultancy efforts, the JESS Socioeconomic Baseline team included a number of health related questions on both the baseline questionnaire (in village-level interviews), and on the Women's Survey component of the study. Lack of time and human and financial resources limited data collection to the kinds of information appropriate.

As a result, valley inhabitants were asked to recall illness patterns in their immediate families. In addition, families were asked about their seasonal sources of water, and their sanitation practices. In the Women's Baseline Study (WEBS), other questions were asked about women's and children's disease and ailment patterns.[26]

1. Health Environment of the Jubba Valley Sample Population

Health Facilities

Except for a handful of new health posts financed and run by private voluntary organizations, there are few health facilities in Jubba Valley where inhabitants can get reliable treatment. A number of district hospitals are listed with the government that are actually either closed, unstaffed, or devoid of adequate medical materials (Weidleplan Consulting 1987). Most people in Jubba Valley must rely on private, untrained pharmacies or traditional healers for cures to the myriad diseases that exist in the valley.

Sources of Drinking Water

Inhabitants of the valley use a number of sources of drinking and domestic water. Those who live right on the Jubba River tend to use the river almost exclusively except in those areas where the Swedish Church Relief or World Concern have put in concrete-lined wells with hand pumps. Away from the river in the agro-pastoral zone, people depend on hand-dug reservoirs (wars) for domestic and livestock water right after the rains and either wells or the Jubba River in the dry seasons.

This is also true of pastoralists who tend herds in the hinterland away from the river. They bring their herds to the river to drink only when all other inland resources have been exhausted. This is because of the dangers of tsetse to the health of their herds. The dry seasons are particularly hard on agro-pastoral

[24]JESS has received the results of one survey conducted by Swedish Church Relief, summarized in this volume.
[25]Copies of the full questionnaires from the socioeconomic baseline survey and the women's baseline survey are included in Appendix B.

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and pastoral people because women must often walk long distances from the dryland areas in which they live to the river to fetch water after local water resources dry up.

The following table shows the principal source of water for all of the settlements visited by the JESS Socioeconomic Team, presented by socio-ecological sector.

Table 111. SOURCE OF WATER FOR SEBS SETTLEMENTS (percent using)

VILLAGE	RIVER	WAR	WELL	OTHER
Ag Riverine	91.7%	3.4%	4.9%	-
Ag NonRiv	51.1%	4.5%	31.8%	11.9%*
Pastoral	11.8%	9.0%	73.0%	4.5%**
Urban	22.3%	-	41.4%	35.6%***

**Other includes irrigation canal and dhesheeg.*
*** Other includes dhesheeg and piped water.*
****Other includes cistern, donkey cart, and piped water.*

For details on the quality of water from these different sources, see Jobin (1987, 1988). Following are some of the salient points about water quality:

- most sources of water used by valley inhabitants are not clean and are often the sources of health problems;
- some sources of ground water become increasingly salty (often to the point of impotability) as dry seasons progress; and
- education and materials on how to find, establish, and maintain clean water systems is almost entirely lacking in the valley except for efforts made by World Concern/Swedish Church Relief.

Sanitary Facilities

Systematic and sanitary solid waste disposal systems are also almost entirely lacking in the Jubba Valley. Except for the larger towns, it is rare to find households that have or use toilets or pit-latrines. Most households simply use the bush for their needs. The following table summarizes the different types of toilet facilities used by valley inhabitants from the SEBS/SONDEO Survey.

The less urban and settled an area, the more the population uses the bush for bathing purposes. No one in the urban areas reported using the bush for bathing, slightly less than half of the agricultural riverine people do, more than half of the nonriverine people use it for this purpose, and over four-fifths of the pastoralists bathe in the bush. More riverine people use the river to bathe in than nonriverine and pastoral groups.

Table 112. SANITARY FACILITIES USED BY SES HOUSEHOLDS

SES	BUSH	LATRINE	IN-HOUSE TOILET	RIVER	OTHER
AGRICULTURAL RIVERINE					
Bathe	48.2%	21.2%	0.9%	26.7%	0.6%
Urinate	81.3	7.6	7.7	—	1.8
Defecate	88.3	6.4	2.7	—	1.2
AGRICULTURAL NONRIVERINE					
Bathe	58.0%	24.4%	2.3%	8.5%	5.7%
Urinate	84.7	6.3	8.5	—	0.5
Defecate	90.9	5.7	2.8	—	—
PASTORAL					
Bathe	85.3%	2.4%	0.6%	3.5%	8.3%
Urinate	97.1	1.2	0.6	—	—
Defecate	97.1	1.2	0.6	—	1.2
URBAN					
Bathe	0.0%	77.0%	19.1%	—	—
Urinate	2.1	85.9	12.1	—	—
Defecate	1.8	90.0	6.3	—	—

Bathing in the river, wars, or small pools is a primary cause of bilharzia transmission. In-house bathing areas that do not have covered drains running from the house can also be primary breeding grounds for mosquitos and flies.

Except for urban areas, populations in all sectors show a high dependence on the bush for human waste disposal, with herders being the most dependent on this area, nonriverine agriculturalists being next, and then the riverine populations. The slight difference between percentages who use the bush for urination as opposed to defecation is due to the fact that some people have gravelled areas in their compound that can be used for the former but not the latter.

Only 12 percent of the SEB Surban sample has some kind of in-house facility for waste disposal. The variants on these can be a small, sloped opening in the wall where liquid waste is washed into an outdoor canal or drain; an indoor pit-latrine where waste is either flushed or washed (with a bucket) to an outside drain; or a toilet—either tank or bucket-flushed. The first category is not conducive to solid wastes and is not used for such.

2. Health Problems in the SEBS Sample Population

JESS enumerators had to undergo a lot of instruction on symptoms before village-level descriptions could be matched with English disease names. In some cases, only approximations could be made. For instance, without clinical analysis, the symptoms of polio and meningitis are difficult to distinguish, especially from after-the-fact descriptions. Under these constraints, JESS was limited to asking what was the last serious illness for each person in the household.

For the most part, JESS data provides a list of serious illnesses affecting Jubba Valley's population, their seasonal occurrence, whether people were bedridden by certain ailments, and the number of vaccinations received. Asking about someone's last serious illness may not pick up some of the endemic diseases that have low-grade conditions or frequently recurring manifestations to which the respondent may have become accustomed. A person who has suffered from bilharzia for years might mention last week's flu attack instead of the bilharzia, given the manner in which the question is posed. This fact may explain why the known heavy prevalence of bilharzia in Lower Jubba (Klumpp 1988) has a very low percentage of people reporting it on the SEBS sample as the last serious illness. In sum, JESS health data indicate only the kinds of diseases present in Jubba Valley, but not their level of incidence.

The following tables present some details concerning illnesses found in Jubba Valley. Table 113 looks at the most frequently reported problems that were listed as an individual's "last serious illness". The responses indicate villagers' perception of diseases, usually without clinical diagnosis. Data are presented for men and women by sectoral grouping.

Table 113 shows the five or six most commonly reported illnesses or symptoms of illness. In all cases, malaria is the number one illness mentioned.

Fever and headache are also high on the list and could be symptoms of malaria as well as of other diseases. Diarrhea and tetanus (generally neo-natal tetanus) appear on most of these sectoral lists. Upper respiratory ailments are also among the most commonly cited. There appears to be no discernible difference between sectors in terms of the pattern of disease, and few differences between the common illnesses that affect men and women. The only difference between this JESS list of illnesses and those found by Swedish Church Relief (1983) in an earlier survey of Middle Jubba Region is that the latter found intestinal worms among the top four ailments.

*Table 113. MOST SERIOUS ILLNESS BY SES FOR MALES AND FEMALES**

ILLNESS	% FEMALES	ILLNESS	% MALES
PASTORAL			
N = 274		N = 291	
Malaria	12.0	Malaria	18.0
Fever	12.0	Cold	10.0
Bad cough	6.9	Headache	9.6
Headache	6.6	Diarrhea	9.0
Cold	6.0	Bad cough	6.0
Heart Problems	4.4	Back pain	6.0
URBAN			
N = 387		N = 462	
Malaria	20.0	Malaria	28.0
Bad cough	8.5	Fever	9.1
Fever	7.5	Tetanus	8.2
Headache	6.0	Bad cough	7.0
Diarrhea	6.0	Cold	3.5
Tetanus	5.0	Diarrhea	3.5
AG.RIVERINE			
N = 692		N = 662	
Malaria	18.0	Malaria	20.0
Fever	12.4	Fever	14.0
Headache	7.0	Headache	8.2
Diarrhea W/Pain	5.4	Diarrhea	6.5
Polio	5.1	Bad cough	6.0
AG.NONRIVERINE			
N = 363		N = 400	
Malaria	18.7	Malaria	18.4
Fever	9.4	Diarrhea W/Pain	7.2
Headache	9.0	Headache	6.5
Diarrhea W/Pain	8.0	Bad cough	6.5
Polio	6.0	Tetanus	6.2
		Back pain	5.0

** Numbers and percents given for those for whom an illness could be identified and do not include 'unknowns'. Percents are based on the total number reporting by sector and by sex.*

Table 114 is also a list of the most frequently reported symptoms, but with percentages shown by region instead of sector.

Here we see that more people—both men and women—suffer from malaria in Lower Jubba Region than in the other two regions. Percentages are higher in Gedo for this disease than in Middle Jubba Region. The populations reporting fever, *per*

se, are also higher in Gedo than in the other two regions, but not by much.

Table 114. MOST FREQUENTLY REPORTED ILLNESSES FOR MALES AND FEMALES BY REGION

LOWER JUBBA			
N = 519		N = 606	
ILLNESS	% FEMALES	ILLNESS	% MALES
Malaria	23.0	Malaria	26.0
Fever	8.0	Fever	10.0
Diarrhea	7.0	Tetanus	7.0
Headache	6.4	Diarrhea w/ pain	7.0
Tetanus	5.8	Bad cough	6.0
Polio	4.0		
MIDDLE JUBBA			
N = 694		N = 654	
Malaria	14.0	Malaria	15.0
Fever	11.1	Fever	9.2
Headache	8.0	Diarrhea + pain	9.0
Polio	7.0	Headache	7.0
Bad cough	5.0	Tetanus	5.0
GEDO			
N = 608		N = 655	
Malaria	19.0	Malaria	21.0
Fever	12.2	Fever	16.0
Bad cough	5.9	Headache }	7.2
Headache	5.8	Bad cough}	7.2
Heart Problem	4.3	Back pain	5.0
		Cold	4.3

While it is difficult to discern between some illnesses, it appears that valley residents know how to distinguish malaria from other ailments.

The seasonal occurrence of some of the key illnesses are presented in Table 115.

Fever, whooping cough, polio, and malaria appear more in gu' in Lower Jubba Region. In Middle Jubba, only polio and malaria occur more in gu'. All other illness on the list occur more often in jiilaal.

Most people experience illness in the gu' season followed by a high number in jiilaal.

Table 115. SEASON OF ILLNESS FOR SPECIFIC AILMENTS
(Percent Reporting Occurrence in that Season)

LOWER JUBBA	GU'	XAGAA	DEYR	JIILAAL
Fever	38%	22%	14%	26%
Diarrhea	27	19	19	32
Bad cough	29	39	23	11
Cold	24	24	6	47
Whooping cough	53	27	13	8
Polio	44	22	13	22
Malaria	46	35	6	13
MIDDLE JUBBA				
Fever	24%	11%	26%	36%
Diarrhea	12	25	10	47
Bad cough	13	8	13	66
Cold	13	24	6	57
Whooping cough	32	16	—	53
Polio	35	12	17	29
Malaria	31	23	23	20
GEDO				
Fever	49%	33%	11%	5%
Diarrhea	57	43	—	-
Bad cough	33	41	17	10
Cold	42	47	4	7
Whooping cough	32	26	24	18
Polio	40	24	24	12
Malaria	47	46	4	

Women's particular health problems show a much greater number of women affected by anemia, heart pain, and lo'ow [26] than appear in Tables 116 and 117.

A survey done by Swedish Church Relief in an agro-pastoral village in Saakow District revealed that children were severely anemic (with average hemoglobin levels of 6.9 g/ml), while pregnant

[26] JESS believes that the description of symptoms for lo'ow fit those of scurvy, which is known to exist in the refugee camps (personal communication, Basra Farax, Refugee Health Unit).

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women were mildly anemic (with average levels of nine g/ml). A comparable group of nonpregnant women had average hemoglobin levels of 10.4 g/ml, while village men averaged 13.7 g/ml (Swedish Church Relief 1987:7). Four of the children surveyed had hemoglobin levels of less than four g/ml. This report points up the high levels of anemia among population groups that are already at risk.[27] The Swedish report noted that many women in the area had been dying from moderate bleeding connected with childbirth. (Swedish Church 1987:1)

Table 116. FREQUENCY OF COMMON FEMALE AILMENTS BY SES (Percxent SEBS sample)

	PASTORAL		URBAN		AG.RIVER		NONRIVER.	
	NO	%	NO	%	NO	%	NO	%
Flu/ Malaria	1	<1	1	<1	0	0	-	-
Headache	18	7	22	6	47	7	32	9
Chest/Pain	6	2	7	2	17	2	7	2
Miscarr	3	1	7	2	17	2	5	1
Menstrual Problems	-	2		-	-	2	1	
Troubled Pregnancy	4	1	6	2	9	1	4	1
Anemia	4	1	8	2	9	1	5	1
Heart Problems	12	4	9	2	22	3	10	3
Back Pain	4	1	5	1	33	5	11	3
Jinni*/ Spirits	6	2	7	2	18	3	11	3
Lo'ow	4	1	-	-	9	1	-	-

** Generally malicious spirits which take psychological possession of people.*

On the basis of information gathered in village meetings, JESS feels that the most serious illnesses affecting women and children that were underreported on the SEBS questionnaire are bilharzia, malaria, anemia, and lo'ow.

In Table 117, the three most commonly reported illnesses that affected women are highlighted for each region above. As with the SES breakdowns, headache is the most commonly reported ailment in all regions followed by heart pain. The latter is probably a result of anemia (insufficient oxygen reaching the heart). Severe, even incapacitating headaches can accompany malaria, dengue fever, polio, meningitis, or other chronic ailments.

Table 117. FREQUENCY OF COMMON FEMALE PROBLEMS BY REGION

(% of SEBS Sample)

	LOWER JUBBA		MIDDLE JUBBA		GEDO		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%
Flu/Malaria*	-	-	1	<1	1	<1	2	<1
Headache	33	6	55	8	35	5	123	32
Chest/Pain	9	2	19	3	12	2	40	10
Miscarriage	8	1	2	<1	23	4	33	9
Menstrual Problems	3	1	1	<1	-	-	4	1
Troubled Pregnancy	10	2	6	2	8	1	24	6
Anemia	7	1	10	<1	10	2	27	7
Heart Problems	10	2	20	3	26	4	56	15
Back Pain	7	1	28	4	20	3	14	4
Jinni/Spirits	7	1	24	3	14	2	45	12
Lo'ow	2	-	-	-	13	2	15	4

In some areas, the rate of stillbirths and miscarriages was found to be inordinately high. Some of these may be related to *brucellosis* which also causes spontaneous abortions in infected animals. The number of miscarriages and stillbirths presented in Table 118 shows that more occur in Garbahaarey and Luuq Districts than in other districts.

In the WBS sample survey, women were asked a number of questions relating to their awareness of different therapies and health practices. They were asked if they had heard of a practice, whether they

[27] Severity of anemia among women and children is pointed out in a study conducted in Somalia's Northwest Region in 1987. The author expected to find about a 10 percent prevalency level but found instead, that the lowest rate among any sample group was 24.6 percent in the rural areas and 14 percent in the urban areas, for mild to moderate anemia. Severe anemia was found in as much as 16 percent of rural children and 8.6 percent of urban children. Women with the highest incidence of anemia were rural pregnant women (44 percent) followed by rural lactating mothers (32 percent). Sixty-four percent of rural children in the sample had mild to moderate anemia. In urban areas, these groups showed 32 percent, 27 percent, and 46 percent anemia, respectively.

used it themselves and what they thought of it and why. Oral rehydration therapy powder (ORT), vaccinations, and different forms of female circumcision were subjects of this query. Table 119 presents women's awareness of ORT and vaccinations, and Table 120 presents the different variants of female circumcision found, by district.

Table 118. STILLBIRTHS AND MISCARRIAGES BY DISTRICT

	NO. OF WOMEN	NO. OF BIRTHS	AVG. BIRTHS/ WOMAN	NO. OF MISCARR.	NO. OF STILL-BIRTHS	AVG AGE FIRST PREGNANT
Kismaayo	59	251	4.4	13	6	19
Jamaame	46	166	4.3	6	4	17
Jilib	28	145	5.7	6	3	19
Bu'aale	26	92	3.3	3	2	18
Saakow	22	88	3.7		3	2
Baardheere	27	147	5.8	9	5	18
Garbahaarey	24	129	6.4	20	7	18
Luuq	40	223	5.1	17	10	19

Again, Garbahaarey District has the lowest number and percentage of women who have used ORT and have received vaccinations. Saakow District, also a relatively isolated area, is next as the least exposed to these medical treatments. In Lower Jubba, the percentage of women who have used both is high, demonstrating that health care services are more readily available in that area where roads are more numerous and of better quality, and transportation links with the capital are best.

Table 119. WOMEN'S MEDICAL PRACTICE BY DISTRICT

	NO.WOMEN	NO.USE ORT	%USE ORT	NO.USE IMMUN.	%USE IMMUN.
Kismaayo/ Afmadow	59	25	44	48	83
Jamaame	46	18	40	42	93
Jilib	28	14	50	28	100
Bu'aale	26	11	44	20	80
Saakow	22	4	20	16	76
Baardheere	27	6	22	22	81
Garbahaarey	24	1	4	16	67
Luuq	40	13	33	38	95

Female circumcision, as practiced in Somalia, is forbidden by Islam. What is allowed by the religion is a small nicking of the clitoris. However, in Somalia, female circumcision is basically radical clitoridectomy and infibulation, known as *Faraon* or Pharaonic. The type of circumcision condoned by the religion is known as *sunna* circumcision. Another variant discovered on the WBS survey is called *sunna kabiir*, or Big Sunna. It is not materially different from the Pharaonic version except that its name falsely implies religious sanction.

In Somalia, many religious leaders have spoken out against all such practice. In addition, the government has spent considerable time and resources through its Women's Education branch and Somali Women's Democratic Organization to persuade people to stop female circumcision altogether. Many health problems including severe dysmenorrhea, sterility, and difficult childbirth are related to this traumatic procedure.

Table 120 presents the WBS findings on the use of these different methods of circumcision in Jubba Valley. Baardheere town, because of its strong Islamic traditions, contains a large percentage of women who claim to use the mild and nondisfiguring *sunna arab*.

Table 120. TYPE OF CIRCUMCISION BY DISTRICT

	NO.OF WOMEN	NO.USE FARAON	%USE FARAON	NO.USE SUNNA KABIIR	%USE SUNNA KABIIR	NO.USE SUNNA ARAB	%USE SUNNA ARAB
Kismaayo/ Afmadow	59	39	60%	20	38%	11	19%
Jamaame	46	15	35	25	68	10	24
Jilib	28	5	18	16	57	6	21
Bu'aale	26	7	28	21	81	2	8
Saakow	22	5	24	18	86	2	10
Baardheere	27	14	52	0	0	13	48
Garbahaarey	24	13	54	11	46	4	17
Luuq	40	17	43	24	60	0	0

JESS gathered data on who people consult first when they become ill. The results for all illnesses and symptoms is presented in Table 121–first by SES and then by region. Within each of these categories, a breakdown for men and women is given because, in some cases, men and women seek cures from different types of healers. Between 55 percent and 75 percent of both men and women consult "no one". Among the socio-ecological sectors, pastoral and then urban groups seek help less than their agricultural counterparts. In Gedo Region, fewer people seek outside help than in the other areas. Religious healers (who read verses of the Koran as treatment) are consulted by a fairly consistent portion of the rural populations, but quite rarely by the urban inhabitants. Medical professionals and pharmacists are highest on the list of those consulted. Traditional healers are low on the

list. Middle Jubba, which still has the most abundant and best-preserved plant resources for traditional medicine, is the area where traditional healers are sought most often.

Table 121. FIRST PERSON SEEN FOR TREATMENT OF ALL ILLNESSES

	SELF/ NO ONE	SHEIKH	PHARMACIST	DOCTOR NURSE	TRAD. HEALER	FAMILY MEMBER	MISSING OTHERS
URBAN							
Male	69%	3%	10%	15%	%	%	2%
Female	70%	2	11	13			
PASTORAL							
Male	73%	11	4	7	1	3	2
Female	76%	12	2	4		2	3
AG RIVERINE							
Male	66%	11	6	10	1	4	2
Female	66%	11	6	7	2	3	4
NONRIVERINE							
Male	64%	12	6	12	2	2	2
Female	61%	13	5	8	3	2	8
LOWER JUBBA							
Male	68%	5	9	14	1	1	1
Female	69%	4	9	11	1	1	4
MIDDLE JUBBA							
Male	61%	13	5	13	2	2	4
Female	56%	15	5	9	3	2	8
GEDO							
Male	73%	9	5	7	1	4	1
Female	75%	8	5	5	1	3	2

JESS also collected information on who was consulted second, in cases where the first treatment didn't work. However, 85 to 95 percent of all respondents said they consulted no one in the second instance. For the few who did get a second opinion, almost all sought help from a religious healer or sheikh.

Treatments recommended by medical practitioners include drugs which are procured through a pharmacy if there is no health post in the area. In towns, pharmacists who are generally untrained often analyze illnesses and prescribe treatments. In the rural areas, there is heavier reliance on readings from the Koran as treatment for illness. Burning, which is a treatment widely used elsewhere in Somalia, hardly appeared in the JESS sample. This is a practice in which specific areas of the body are burned depending on the symptoms. The soup mentioned in Table 122 refers either to a soup prepared from the catfish known as *mallay madow* which is widely used to relieve symptoms of malaria, or a soup made from goat or sheep which is used for a variety of diseases. If herbal medicine is sought as a cure, it was not widely mentioned on the JESS Survey. Only about one-quarter to one-third of valley residents seek any medical treatment at all.

Table 122. FIRST TREATMENT FOR ALL ILLNESSES BY SES AND REGIONS

	None	Bed Rest	Soup	Burning	Herb Cure	Bone Set	Koranic	Drugs	Exorcism	Misc
URBAN										
male	69.9	-	0.3	0.2	0.7	-	2.5	24.8	-	1.7
female	70.9	-	0.2	-	0.6	-	1.4	23.6	0.2	3
PASTORAL										
male	72.5	-	1.5	0.2	0.9		11.3	12.2	-	1.4
female	75.6	-	0.3	-	1.1	-	12.1	7.7	0.1	3.2
AG RIVERINE										
male	65	0.2	1	-	1	0.3	11	17	0.2	2.4
female	66	0.1	0.7	-	4	-	11	14	1	4
AG NONRIVERINE										
male	63.8	-	0.8	-1.5	0.1	11.1	20.2	0.1	2.4	
female	60.3	-	0.4	-	2.7	0.1	12.8	14.8	0.2	8.5
LOWER JUBBA										
male	67.8	-	0.3	0.2	1.0	0.1	4.7	24.5	-	1.4
female	69.5	-	0.1	-	1.2	-	4.1	20.7	0.1	4.4
MIDDLE JUBBA										
male	60.8	0.1	0.6	0.2	2.6	-	12.3	19.2	0.1	4.2
female	58.6	0.1	0.1	-	4.4	-	14.0	14.2	0.8	7.9
GEDO										
male	73	0.1	1.3	-	1.4	0.1	9.7	13.7	0.1	0.6
female	74.7	-	1.0	0.1	1.8	-	9.1	11.2	0.4	1.8

The following tables show the percentage of sample respondents who indicate that they have been vaccinated at least once. The JESS team found that

Table 123. PERCENTAGE OF VACCINATION BY AGE GROUP/BY SEX IN REGIONS AND WHOLE VALLEY

	VALLEY	LOWER JUBBA	MIDDLE JUBBA	GEDO
0 to 5 years				
male	26	23.9	29.1	25.3
female	20.5	19.9	22.4	19.2
6 to 15 years				
male	25.1	25.2	23.0	26.7
female	21.5	20.7	19.9	24.1
16 to 25 years				
male	19.5	19.1	18.6	20.5
female	24.6	25.3	23.4	24.9
26 to 35 years				
male	9.9	10.1	8.8	10.6
female	15.5	16.3	15.1	15.2
36 to 45 years				
male	7.7	9.3	7.1	6.8
female	9.5	9.5	9.9	9.3
46 to 55 years				
male	6.1	6.1	6.6	5.8
female	4.9	4.6	5.9	4.3
56 to 65 years				
male	3.5	3.8	4.1	2.8
female	2.1	2.2	2.6	1.5
66 years and over				
male	2.3	2.6	2.7	1.6
female	1.5	1.5	1.6	1.3

people could not recall the diseases for which they had been vaccinated, so only the number of vaccinations were recorded. Since vaccination campaigns take place at particular intervals, future work may be able to match people's recall of approximate year of vaccinations with known dates of specific vaccination campaigns to determine how many people have been vaccinated against particular diseases. Table 123 shows the percentages of people vaccinated at least once, by age group and sex on a regional basis, and Table 124 shows the same on a sectoral basis.

Table 124. PERCENTAGE OF VACCINATION BY AGE GROUP/BY SEX BY SOCIO-ECOLOGICAL SECTOR

	PASTORAL	URBAN	AG.RIVERINE	AG.NONRIVERINE
0 to 5 years				
male	20.2	27.0	28.6	26.3
female	19.0	20.4	20.4	21.6
6 to 14 years				
male	28.7	25.0	23.7	24.5
female	23.7	20.0	21.7	21.6
16 to 25 years				
male	21.6	18.5	20.2	17.9
female	22.3	25.9	26.0	22.7
26 to 35 years				
male	9.4	9.7	9.5	10.7
female	17.5	15.7	14.1	14.6
36 to 45 years				
male	7.4	8.3	6.5	7.8
female	9.0	9.6	9.5	10.6
46 to 55 years				
male	6.3	5.9	6.2	7.0
female	4.7	4.2	5.5	5.0
56 to 65 years				
male	4.2	3.2	3.2	3.2
female	2.1	2.3	1.6	2.6
66 years and over				
male	2.1	2.3	2.1	2.7
female	1.6	1.8	1.3	1.4

Young boys are vaccinated more frequently than girls in all areas of the valley. However, when girls reach reproductive age, more of them appear to receive vaccinations than men. This may be due to deliberate campaigns like the one currently run by UNICEF in Lower Jubba (to vaccinate all mothers and children). After their reproductive period, women show a lower incidence of vaccination than men.

The percentages of those ever vaccinated drops off rapidly with age.

As indicated in Table 124, the pastoral sector has had sufficient access to vaccine. The percentages of pastoralists who have received vaccinations is not significantly different from those of their sedentary counterparts.

The highest percentages of immunizable illnesses occurring are measles, polio, and tetanus for all age groups. If separate subgroups are added together, overall percentages contracting these immunizable diseases are high.

The last table in this section displays the ten most frequently occurring causes of death in children age five and younger. Only children who were alive at birth are accounted for here. The table shows the number of children who died from each disease, and the rank and percent for each SES.

Table 125. LAST SERIOUS ILLNESS FOR THOSE WHO DIED: AGE FIVE YEARS AND YOUNGER

	URBAN (N = 167)			PASTORAL (N = 53)			AG RIVERINE (N = 192)			AG NONRIVERINE (N = 112)		
	N	RANK	%	N	RANK	%	N	RANK	%	N	RANK	%
Tetanus*	5	1	34.7	12	1	22.6	36	1	18.8	34	1	30.4
Malaria	18	2	10.8	3	4	5.7	16	4	8.3	18	2	16.1
Polio/ Meningitis	16	3	9.6	6	2	11.3	15	5	7.8	4	6	3.6
Diarrhea**	16	3	9.6	4	3	7.4	19	2	9.9	10	3	8.9
Measles	14	4	8.4	6	2	11.3	19	2	9.9	9	4	8.0
Whooping Cough	9	5	5.4	2	5	3.8	10	6	5.2	4	6	3.6
Cholera	6	7	3.6	1	6	1.9	8	8	4.2	7	5	6.3
Vomiting	8	6	4.8	1	6	1.9	9	7	4.7	-	-	-
Edema	1	9	0.6	-	-	-	3	9	1.6	3	7	2.7
Fever	5	8	3.0	2	5	3.8	17	3	8.9	2	8	1.8

**Symptoms describe neo-natal tetanus called "children's disease" in Somalia.*

***Combination of two separately coded responses: diarrhea and stomach pains accompanied by diarrhea or gastritis.*

Tetanus is the number one killer of children in all SES categories. For the most part, this is neo-natal tetanus that kills a child within the first two weeks of life. Sometimes, this form of tetanus is passed to

the fetus from the mother or results from unclean implements being used during the birth process.

Malaria is the second biggest childhood killer in the valley in the urban and nonriverine agricultural areas. It is the fourth greatest killer in the pastoral and riverine populations. If "fever" were added into the totals for malaria, the latter would become the second largest childhood killer in the riverine populations, as well. As it is, diarrhea and measles are the second most important killers in the riverine areas. Polio/meningitis shares this rank with measles in the pastoral areas. Diarrhea is the third most important cause of death among children in all areas except the riverine zone. In the latter area, as stated earlier, fever, malaria, and then polio are next in importance.

IV. IMPACTS OF PROPOSED DEVELOPMENTS AND RECOMMENDED MEASURES TO ENHANCE THE BENEFICIAL IMPACTS AND MITIGATE THE ADVERSE IMPACTS

Data and information in Section III serve as a baseline against which to measure changes taking place in the socioeconomic environment of Jubba Valley. The objective of this section is to analyze the developments proposed for the valley and project the impact of those developments on socioeconomic life in relation to the data and information provided in Section III, and then to make recommendations for enhancing the beneficial impacts and mitigating adverse impacts of the proposed developments.

Part A focuses on physical description of developments and is followed by analysis of impacts. A brief description is presented of five major developments expected for the valley:

- construction of Baardheere Dam;
- resettlement of families from the impoundment area;
- development of irrigation under several different options;
- growth of urban centers; and
- development of valley infrastructure.

Each succeeding section then analyzes the impact of each of these developments, on different aspects of socioeconomic life in Jubba Valley and proposes enhancing and mitigating measures impact by impact.

A. Proposed Developments In Jubba Valley

1. The Dam

Construction of a high dam at Markabley, 35 km north of Baardheere, and the resulting reservoir that will stretch almost 160 km to just below the town of Luuq is the key development proposed for Jubba Valley. The total surface area to be covered by the reservoir is estimated to be 425 km^2, of which approximately seven percent is currently being used for farmland.

The idea of a Jubba River dam dates from the early colonial era. The current series of dam designs dates from the mid-1970s. According to the current proposed design, the dam will be 75 m high, 500 m wide, and of "roll-crete" construction. At normal operating levels, the reservoir volume is estimated at 3,400 million cubic meters. The current high and low mean monthly flows of Jubba River at Luuq are estimated to be, at a 50 percent probability of occurrence, 462 m^3/sec in October and only 30 m^3/sec in February. After the dam is constructed, these flows will be evened out to a range estimated between 133 and 264 m^3/sec per month, at a 50 percent probability (AHT 1988).

The main purposes of Baardheere Dam are to:

- provide flood control by limiting the downstream discharge to "700 m^3/sec for floods having a return period of less than 100 years"; and
- generate electricity through the use of three to four turbines with an installed capacity of 35 MW each (AHT 1988); and
- provide water for development of the Jubba Valley.

2. Resettlement of Reservoir Inhabitants

Thirteen thousand people currently live on or near the banks of the Jubba River along the 160-kilometer stretch between the dam site near Baardheere and Luuq. All of their present homes will be inundated at the high-water mark of the impoundment created by the dam.

They will have to be resettled at sites in Jubba Valley that are currently unclaimed or not vital to the adaptive flexibility and/or future expansion of valley populations. These sites should also have environmental characteristics that are compatible with the economic and social needs of the people being resettled.

JESS has surveyed the population of the resettlement zone. Sample villages and respondents were randomly selected from the reservoir zone in the course of conducting a valley-wide socioeconomic baseline study. Data given for the resettlement population are drawn primarily from 101 household

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survey questionnaires administered in nine villages (three in the gorge).

The river's upper reaches between Baardheere and Luuq boast one of the highest concentrations and fastest growth rates for use of smallholder irrigation pumps as well as some of the valley's most productive farmers. Thirty percent of the sample population work irrigated plots—an important indicator of a dynamic, smallholder, agricultural economy. This northern region escaped many of the more repressive aspects of colonial development policies. With the exception of land expropriated for refugee camps near Buurdhuubo and Luuq, and examples of aggressive land speculation around Buurdhuubo, this area has no history of land alienation.

Apart from refugees, the current population living in the future reservoir area and designated for resettlement numbers around 1,550 households or a total population of approximately 13,000. These figures are based on two independent research efforts conducted as part of JESS that produced highly corroborative results (Watson and Nimmo 1988; SEBS Field Notes).

The average community consists of 25 qoys, or about 185 individuals. Settlement in the reservoir area has been of considerable duration, particularly on the east bank where most communities have been established for 50 to 75 years and some for 300 to 500 years or longer.

Over time, the east bank's population has adapted to a riverine environment. However, most of those living on the east bank from Saakow to beyond Luuq to the north share a common origin and are historically linked to the agro-pastoral traditions of the people in the Bay Region to the east.

In contrast, the west bank has historically been claimed by more pastorally oriented people. West-bank settlement is generally more recent and has accelerated only recently in response to drought and the gradual decimation of pastoral herds.

3. Irrigation Options

Irrigation is the single most effective technology enabling increased intensity of agricultural production in the valley. With the construction of Baardheere Dam, downstream irrigation will expand. At present, there are several different irrigation formulas practiced in Jubba Valley. Each formula has its own particular profile and implications. Two key factors differentiating forms of irrigation are the size of farm and type of management.

Four irrigation types are pertinent to Jubba Valley:

- large-scale, commercial farms with foreign or state management (500 ha or more);
- medium-scale to large-scale commercial farms with individual, private management (10 ha up to 500 ha);
- small- to medium-scale commercial/subsistence farms with group management (5 to 100 ha); and
- small-scale commercial/subsistence farms with individual or family management (0.5 to 10 ha).

There are three state-controlled farms that currently operate in Jubba Valley and are all located in the lower end of the Jubba Valley between Jilib and Jamaame districts. These farms are Fanoole Rice Project, Juba Sugar Project, and the Mogambo Irrigation Project. All three are funded by a combination of state and foreign investors.

There are two main types of farms that fit in the rubric of medium-scale, private, irrigated farms: the banana plantations of Lower Jubba Region and the commercial onion farms of Gedo Region. Two basic characteristics of this type of irrigation are that its management is essentially private and the crops grown are produced for market. The scale of operation for banana estates is generally between 50 and 500 ha, although one private banana plantation covers 2,300 ha. [28]Some of the private onion farms have between 10 and 50 ha. However, for the most part, medium-scale irrigated farms grow crops for sale and are run as any other private enterprise with skilled managers, a number of overseers, and a waged work force. In addition, capital equipment is privately owned.

[28]Four other banana plantations are not privately managed, but are state owned. These four are all run with the same management and staff and therefore, can be viewed as one enterprise (Evans, Cullen, and Little 1988).

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Small-group irrigation requires the pooling of resources—land, labor, and irrigation technology (usually a diesel pump)—in varying configurations. The capital cost of irrigation pumps is prohibitive for most farmers. Therefore, pooling is necessary as resource requirements of irrigation generally exceed the resources of a single household.

Small-group irrigation differs from state farms and plantations in that workers on state farms and the vast majority associated with plantations are wage laborers. In small-group irrigation, there is currently no problem of land alienation for landowners, and pump owners and sharecroppers share in the rewards of production.

4. Growth of Jubba Valley Urban Centers

Construction of Baardheere Dam will be accompanied by a general rise in economic activity from irrigated agriculture in Jubba Valley and development of the valley's infrastructure. In turn, villages and towns along the river will be affected by these developments in different ways, depending on their current makeup, proximity to development sites, and ability to serve as centers of various kinds of activities during construction and after the completion of the various developments.

Jilib

Jilib will potentially serve as a center of activity for initial stages of road construction because it lies on the route from Kismaayo through which construction materials will probably be sent. It already has electricity, a sizable wage-earning labor force that works on the Fanoole Rice or Juba Sugar projects as well as supporting services for these workers. An enlargement of the work force and their families by several hundred is expected. Its strategic location as a link to Kismaayo and Muqdisho and to the hinterlands to the west through which livestock products and imports from Kenya could flow, makes its prospects for growth almost certain. The population is made up of people from outside the region, so continued growth of wage laborers as well as those at the managerial level will not be particularly disruptive. Its commercial sector will grow, especially retail shops, as well as the sector of services it presently provides or will need to for its increased population.

Baardheere

Baardheere's proximity to the dam site will cause a dramatic increase in its growth. Road and dam construction will boost the population of Baardheere dramatically. Workers will initially arrive to help with road construction. When dam construction begins, it is estimated that up to 2,000 jobs will be created. As families of workers arrive, the support services necessary for them will expand and induce growth in the town. Expatriate workers will also arrive to take on many of the technical jobs. It is expected that some of the workers will remain after dam construction, increasing the Somali population. Patterns of livestock movement may be disrupted with displacement of concentrations of herders who will cross the river elsewhere for water use and grazing for their animals.

Saakow

Saakow is a relatively small settlement which is expected to increase in size with road construction and subsequent changes from dam construction which will alter patterns of agricultural production in the valley. It may improve as an intermediate market town as more locally produced products are sold for local consumption and as the importance of group irrigation projects expand. It could eventually serve as a center for pump maintenance. If the proposed Saakow Irrigation Project is supported, Saakow could grow at a rate equal to Jilib or some of the large towns further south–particularly if irrigation development in the Saakow area occurs after Baardheere Dam is completed. This area will undoubtedly draw some workers and their families away from Baardheere to new employment as farmers.

Bu'aale

Road construction will increase Bu'aale's potential for becoming a market center. As patterns of livestock movement are altered, it may become a center of great livestock concentrations since it is near an important dhesheeg that would serve as a water point. If other areas are cut off, or river crossing points become less available, Bu'aale may become increasingly important.

Dam Site—Markabley

The area around the dam site is likely to turn into a small urban center, not with all the amenities and services of the other urban centers in the region, but at least as a large settlement that supports the laborers engaged in the dam construction and provides services.

Afmadow

This center of pastoral activity will grow if trade of products from Kenya is enlarged due to increased demand from the burgeoning towns along the river.

Increased milk and meat sales would mean improved incomes for many herding families.

5. Development of Infrastructure

Three main types of infrastructural developments will stem from the development program proposed for Jubba Valley:

- roads will have to be built or improved so that construction materials can be transported to the dam site;
- the dam will generate around 100 MW of electricity, 40 percent of which is earmarked for Kismaayo and the Jubba Valley (AHT 1988); and
- state farms will be able to expand their production with the new, constant water regime.

Road Improvement

Neither of the roads linking the dam site with the two major port cities is entirely paved. The two roads are scheduled for improvement or construction in order to transport heavy equipment and construction materials to the dam site. The last section of the Muqdisho-Baardheere road, which is paved up to Baydhabo, will be upgraded from gravel to tarmac. The track that currently links Jilib with Baardheere, which is seasonally impassable, will be upgraded into a surfaced road which will permit Baardheere to be linked with the port of Kismaayo year-round. The road currently linking Baardheere town with the dam site at Markabley will be repaired and repaved, as well. The Muqdisho-Jilib axis will be repaired and repaved relative to its use for the transport of goods and equipment. It is already scheduled for maintenance in the current government budgets.

Availability of Electricity

According to AHT, 40 MW of the approximately 100 MW of electricity produced by Baardheere Dam is destined for use in Jubba Valley. To fully utilize this energy, the main power lines will be extended from Markabley to Kismaayo and distribution networks for other urban areas will be installed or expanded.

Completion of State Farm Targets

Lack of irrigation water in the dry season has been an important constraint to production on the three state farms. With a more constant river flow, these projects are slated to expand their operations. Other irrigation infrastructure will be built throughout the valley to take advantage of the controlled river flow.

B. The Baardheere Dam and Impoundment of Jubba Waters

1. Change in River Hydrology

Impacts

After Baardheere Dam is completed, Jubba River will no longer be subject to wildly fluctuating flows. It will be converted into a relatively docile irrigation canal with few characteristics of an uncontrolled African river. The benefit of a dam in the control of destructive floods is obvious. However, Baardheere Dam will have other impacts that will have a direct effect on the agricultural production systems which, over centuries, have become dependent on a recurrent flood regime.

Specifically, floodplain agriculture is geared to the recurrent cycle of flooding which has given rise to systems of recession agriculture of riverbanks and dhesheegs. The current flood regime is essential to this form of agriculture in the following ways:

- surface flooding enhances soil moisture;
- lateral infiltration of river water enhances soil moisture;
- sediments deposited from floodwater increase soil nutrients; and
- flood water is rich in dissolved nutrients.

The relative contribution made by each of these actions of the river flood to produce fertile floodplains is unknown (Deshmukh 1989). However, a regularization of river flows will substantially alter, if not render inviable, traditional modes of flood-recession agriculture.

Limited downstream flooding will continue (AHT 1988). Much of this flooding will be in Lower Jubba Region, but the highest frequency of flood-recession agriculture, particularly in dhesheegs, is in Middle Jubba Region. Therefore, the projected flood regime will remain damaging to areas where floods are economically most severe but will dramatically reduce floods where floodwater is currently most used for farming. It is not known to what degree Middle Jubba dhesheegs will fill with floodwater from the river in post-dam floods if the dam is operated to maximize electricity generation.

Soil nutrient enhancement from floodwater will be reduced. Sediment will be deposited in the upper reservoir, and dissolved nutrients will be diluted by mixing with reservoir water. Some dhesheegs may fill partially with rain water, but this water has few nutrients.

Lateral infiltration of river water will also be reduced. Projections for the Tana River suggest a deepening of the river channel and a lower floodplain water table which won't spread so far from the river. Erosion of river channels results when clear water released from a dam picks up new sediments from the riverbed. The extent of this possible downcutting in the Jubba River is unknown. If the Jubba River simulates the Tana floodplain projections, several consequences are likely. Distinctive floodplain vegetation will narrow in extent to more closely follow the river channel. Deeper rooting trees close to the river may continue to tap river water seepage. However, shallow-rooting species such as wild grasses and field crops will probably decline in extent and productivity.

Reduced floodplain crop production downstream of dams is documented from other African river systems. Scudder (1988) quotes a 60-percent reduction in yam production within a few years after closing Kainji Dam on the Niger River. Also in Nigeria, Bakolori Dam caused reduced flooding leading to about one-third reduction of area under dry-season vegetable crops (Adams and Hughes 1986).

The magnitude of reduction in crop production in current flood-recession dependent areas is unknown. However, without a flood, the floodplain can be expected to take on more of the characteristics of the dryland areas beyond the floodplain. In terms of natural livestock forage, the floodplain currently produces two to five times more than the nonfloodplain areas. It is reasonable to expect a proportional reduction in floodplain crop productivity in the absence of the current flood regime. Many floodplain farmers will suffer reduced crop production.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The change in floodplain hydrology can be most easily mitigated for farmers through the use of small diesel-powered irrigation pumps. Pump irrigation is not a solution for all farmers since most lack the necessary capital and the level of market demand in Middle Jubba Region currently does not permit farmers to cover irrigation costs.

To prevent impoverishment of the majority of recession-dependent agriculturalists, flood-recession agriculture will have to continue via controlled flooding. Provision for an annual or biannual controlled flood would provide for a transition to other forms of irrigation using pumps on a large scale. Not only would controlled flooding create a transition to irrigation, it could also increase yields and income levels from recession agriculture during a transition period making farmers more capable of investing in purchase of their own irrigation equipment.

Controlled flooding would protect Jubba Valley from uncontrolled, ill-timed floods of destructive magnitude such as the one of June 1987. Secondly, knowing a flood would be controlled by Baardheere Dam would enable farmers to program labor most efficiently for soil preparation and planting activities beginning at the release of the water. An optimum amount of moisture would be assured each year without the dangers of capricious and destructive flooding.

An approach to development incorporating a transitional period of controlled flooding would cause minimal disruption to the local social and economic order. It would also be of relatively low cost to the GSDR. Most of the work would be planned and implemented at the local level using local labor which would dig many of the canals and irrigation ditches necessary to make the transition to other forms of irrigation when controlled flooding comes to a close.

2. Reduction in Forage and Change in Transhumance Cycles

Impacts

The economic importance of livestock in Jubba Valley today has not changed significantly from the past.

Closing Baardheere Dam and controlling the consequent flooding, will cause a decline in quality and quantity of graze and browse. This reduction in forage will lead to a decrease in the number of livestock sustainable by floodplain vegetation. JESS estimates of livestock populations and biomass based on three aerial censuses indicate high livestock concentration in the floodplain—particularly in the dry season (Watson and Nimmo 1988).

Floodplain grasslands show great resilience to flood, fire, and grazing. Crop residues, produced mainly in the floodplain, provide an important

source of fodder alleviating seasonal and drought stresses. During stress periods, additional forage is also made available by cutting the higher branches from palatable trees and bushes which livestock could not reach otherwise.

The most important immediate effect on range resources that closing Baardheere Dam will have will be loss of rangelands in the inundation area. At present, this area seasonally supports 22,600 kilograms of livestock per square kilometer in jiilaal. Approximately one-half this biomass comprises cattle and sheep which are restricted to the floodplain during this season and much of the year.

Approximately 24 million kilograms of currently-used annual forage yield will be lost in the inundation zone. Presumably, large numbers of livestock will leave the area since rangelands around the reservoir will be a poor source of forage (initially, at least), compared with the lost floodplain. Since more northerly areas already seem overstocked, it is likely that most movement will be southward. Some areas further south could absorb the extra animals without greatly altering forage balance. However, stresses will be greater in drought years. Also, animals moved will be exposed to greater health hazards since tsetse is absent from the area to be inundated but is prevalent to the south.

The reservoir drawdown zone may become a seasonally usable rangeland. Soil types in this zone are not known quantitatively. Much of the area is stony or rocky, but there are also stretches of finer soil. Over time, fine river sediments will be deposited in the drawdown zone. Seasonal grasslands will probably develop providing a good dry-season grazing resource. It may be possible to enhance establishment of palatable grasslands by seeding. Drawdown agriculture is another possibility which would produce livestock fodder as a by-product. Until the reservoir edge and drawdown zone are demarcated, it is not possible to predict the potential of such developments.

Tsetse may become established around the reservoir even though it is thought to be absent now. Tsetse distribution is closely linked to air temperature and humidity. A large body of water will decrease air temperature and increase humidity, thereby improving conditions for flies. If bush increases around the perimeter of the reservoir due to increased soil moisture, fly habitat will be further improved.

When the drawdown zone becomes a focus for livestock, crocodile populations, which are expected to increase in the reservoir area, will probably become a serious threat to people and animals.

Downstream, agricultural development will reduce floodplain rangelands. Given the crucial nature of these rangelands as a dry-season resource, greater integration of livestock and agriculture will be required to maintain livestock production at current levels. Some new rangelands may become usable if tsetse eradication is successful, thus compensating for losses of land to agriculture.

Because of loss of forage from the floodplain and the inundation area, there will be increasing pressure on the remaining resources of graze and browse. Herders will have to change their household economic strategies, particularly in the dry season. Alternatives may include using the rangelands of the Shabeelle Valley rather than the Jubba Valley, if this area can support more livestock; increasing participation in agriculture, especially to use crop residues to feed livestock; or dropping out of livestock herding completely.

In addition to declining availability of natural forage, changing access to and availability of water in the Jubba River and its floodplain will have an impact on the livestock sector. The Jubba River and immediate environs are sources of water for livestock year-round, but particularly during the two annual dry seasons. However, dam closure will largely regularize Jubba River flows and maintain a much higher discharge than is now currently available during dry seasons. If livestock access to the Jubba River is guaranteed, then more water will be available for livestock. However, for the purpose of livestock watering, dhesheegs are as important or more so than the Jubba River. Herders prefer dhesheegs for watering because of easier and safer access, gently sloping banks, and placid waters lacking strong currents. The dam will substantially alter the flooding of dhesheegs which will diminish considerably as a source of water.

If the Jubba River and its floodplain are substantially reduced as sources of dry-season forage and water, alterations in herding strategies can be anticipated. A declining access to the Jubba River and availability of water in floodplain dhesheegs will result in increasing dry-season livestock aggregations near wars and boreholes with a concomitant increase in rangeland degradation in the vicinity of

dry-season water points. If graze resources are depleted within a 15-km radius of permanent dry-season water, then cattle, goats, and sheep will be largely deprived of natural forage. The free-range herding of ungulates other than camels may be severely reduced in southern Somalia. Pastoral herds in the area may be more exclusively composed of camels, whereas continuing to keep limited numbers of cattle, sheep, and goats may be more closely associated with an increasing trend toward agro-pastoral settlement.

Jubba Valley range cannot support large livestock concentrations in a given area for long periods of time. Either deteriorating vegetation or dwindling sources of water, or both, force movements of herds in search of better grazing and watering sites. At the simplest level of analysis, pastoral movements are toward greater dispersion of livestock into hinterland areas lacking permanent water supplies during the two rainy seasons and toward greater concentration of herds in grazing areas near permanent wells, wars, and the Jubba River during dry seasons. The following summary of livestock movements is taken primarily from Janzen (1988).

Generally, pastoral herds on both sides of the river move south during jiilaal and to a lesser extent during xagaa, returning north during gu' and deyr. On the east side, movements are from the Bay Region, Luuq, and Diinsoor toward interriverine swamps of the Shabeelle River drainage. Owing to a lack of watering points (bore holes and wars), movement routes are fairly close to the Jubba River. On the west side, livestock movement is from Luuq and northeastern Kenya to Afmadow and Dhesheeg Waamo in southern Jubba Valley. On the west side, government, donors, and private individuals have created a number of watering points which have expanded livestock movement from a narrow river corridor to areas that often extend further west paralleling the border with Kenya.

Livestock herds do not commonly cross the river in either direction, although a west-to-east crossing trend may be developing downstream of Baardheere with western side pastoralists moving toward the interriverine swamp area. In the past, traditional, socially imposed grazing controls prohibited livestock from crossing the Jubba River except in dire emergencies. When the rangelands were nationalized in 1975 by the Agricultural Land Law, these traditional controls began to break down. However, tradition does not change rapidly (even with legislation), so river crossings remain relatively infrequent.

As a result, the Baardheere Dam impoundment will not be a major constraint to conventional livestock movements. Livestock in the reservoir area will be obliged to cross at Baardheere and Luuq with corresponding pressure placed on grazing resources at each of those crossing points. Otherwise, livestock crossing at points other than at the few bridges may be problematic due to the fact that the flow and height of the river after the dam will always be much greater than experienced now in dry seasons when most of the Jubba River is easily fordable in most spots. In any case, the numbers of affected livestock will not be large.

The impact of development of state farms along the lower Jubba River on the livestock sector illustrates a possible scenario of further impact on the sector from the closure of Baardheere Dam. State farms and private banana plantations have eliminated large tracts of graze and browse and restricted pastoral access from much of the river. This has had a negative impact on the pastoral economy and local diets in the area.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

An agricultural development should be encouraged that increases production of crop residues available for livestock. A one-sided expansion of export-oriented crops should be avoided. A spatial pattern of mixed cultivation including sufficient staple crops—such as maize, sorghum, and possibly rice—should be the goal.

Between new cultivation areas, and at an appropriate spacing, a sufficient number of corridors of at least several hundred meters in width must be kept open to facilitate livestock access to the riverbanks, thus avoiding conflicts between pastoralists and farmers resulting from damage to crops and irrigation canals by animals.

A certain number of areas with good grass in the floodplain and coastal plain should be maintained as livestock fodder reserves for dry seasons.

The possibility of rehabilitating herbage yields in the nonriverine zone should be investigated.

Maintenance of livestock watering points along the Jubba River should be an integral part of floodplain development. The possibility of using selected dhesheegs for this purpose should be investigated.

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Those dhesheegs traditionally used as watering points, and others which could be used, should be attached to the river by small canals—as at Dhesheeg Radiile—to make controlled floodings possible. The possibility of diverting post-dam flood waters into Dhesheeg Waamo should be investigated to maintain forage and water requirements for livestock in Afmadow District.

At those points where watering in the traditional way is no longer possible because water will be too deep, riverbanks too steep, or the increase in crocodile numbers too menacing, the GSDR should construct watering facilities by leveling riverbanks (reducing slope to permit access) and constructing troughs and mechanical facilities for lifting water.

At favorable places in the bays surrounding the reservoir, adequate watering facilities in shallow water should be constructed and protective fences against crocodiles should be built.

The number of bridges over the Jubba River should be increased, taking into account the locations of traditional crossing points when planning future bridge construction. It would be advisable to build new bridges at Jilib and Saakow, to at least partly maintain the traditional migration pattern across the river.

Eradication programs for tsetse fly, malaria, and bilharzia should be part of the riverine development program, necessarily including the pastoral population and their livestock,

3. Gains and Losses of Agricultural Land

Impacts

Another effect of impounding Jubba River waters will be changes in available land to farm. The future reservoir area itself will be lost to farming. Currently, an estimated 12,000 ha in the reservoir area are under agricultural use (rainfed, dhesheeg, jiimo, irrigated and/or fallow)and will be lost when the reservoir is filled (Nimmo and Watson 1988). In addition, an indeterminate amount of downstream riverine and dhesheeg farmland will be lost due to the lower constant river flow and the lack of gentle overbank flooding.

Some dhesheegs are filled by lateral infiltration from the river (beneath the levees) and rainfall runoff as well as through overbank flooding. Therefore, some dhesheegs fill in years where there is no flooding (Deshmukh 1989). The Jubba may also scour a deeper channel. Both factors may affect the depth of the water table in the surrounding floodplain with a concomitant reduction of cropping areas and rangelands that depend on both rainfall and a high water table.

However, there may be a gain of 2,000-3,000 ha of seasonal farmland in the reservoir drawdown as impounded water is released through the dam (Deshmukh 1989). This area will benefit from high soil moisture and newly deposited sediments and can be exploited as under a flood-recession system: planting crops sequentially as the water level in the reservoir falls. However, the ability to use this area for agriculture will depend on the degree to which the management of the dam's operations conforms with the requirements of the agricultural calendar.

The reservoir drawdown may remain small for several years after the dam is closed because of a low demand for electricity and the need to fill the impoundment. In this case, little of the drawdown zone would be available for farming. Since many of the soils peripheral to the future reservoir are rocky and nutrient-poor, it may take a further decade or more of silt deposition before much of the drawdown zone is suitable for cultivation.

In addition, each season's drawdown needs to last long enough to harvest a crop. Jobin's drawdown model, based on ELC's hydrological data for 32 years (ELC 1985), shows that a mean vertical fall of 5.1 meters can be achieved over 4.9 months (Jobin 1988). The higher contours of the drawdown would have to be out of water for at least three months to permit a harvest. The area of the future reservoir drawdown zone most conducive to agriculture is in the widest part of the reservoir, near present-day Buurdhuubo. Here, relatively good soils are abundant and there's a gentle slope toward the river. However, Jobin states that this is also the area most likely to be heavily infested by bilharzia snails after the dam is closed.

Many hectares of farmland, in addition to the Buurdhuubo area, may be created in the reservoir drawdown zone in the future through the deposition of nutrient-rich sediments in areas that are currently too rocky or nutrient-poor to farm. Because dam design specifications and planned dam operation procedures have not yet been finalized, it is too early to tell how long the soil-building process may take and how much total hectarage will be available for cultivation.

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Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

In order to minimize the loss of agricultural production by the Baardheere Dam reservoir, releases from the dam should be scheduled and last long enough to permit agriculture in the drawdown zone. More detailed recommendations are not possible at this time since the amount of cultivatable land to be uncovered through water releases from the dam is unknown. The amount of agricultural soils in the drawdown that will be created by depositions is similarly unknown. As recommended above, to the extent possible, water releases should be controlled to aid flood-recession agriculture on former riverbank fields downstream and to permit controlled water flows into the dhesheegs.

4. Creation of Construction Camps

Impacts

Construction of large dams is a labor-intensive effort which attracts large population aggregations. Implementing Somalia's largest capital input construction project will create a human influx in the Baardheere region that will substantially exceed the anticipated 2,000 laborers needed to work on the dam. Baardheere's present population of approximately 12,000 is likely to double during construction. If Kenya's experience with Tana River hydro-development is an apt guide, nearly 30 percent will remain in the area to take advantage of opportunities offered by the newly created reservoir.

The rapid influx of population could easily create slums and shanty towns on the periphery of Baardheere town of sufficient magnitude to pose serious social and health problems. Water and sanitation needs are particularly critical. Currently, the town's toilets are comprised mainly of longdrops and the entire water supply is dependent on house-to-house delivery of untreated river water by private vendors with donkey carts (Tillman 1987). In addition to health problems emanating from crowded and unplanned living conditions, there are potential health risks from immigrating workers. The need for skilled and semi-skilled staff with dam construction experience will undoubtedly draw significant groups of labor from as near as Kenya and as far away as Mozambique. One area of concern is the increasing spread of acquired immune deficiency syndrome (AIDS) in Africa. AIDS was documented in Somalia in 1988; and the arrival of foreign workers, and a concomitant influx of prostitutes (a phenomenon associated with construction camps), could pose a serious threat to the spread of AIDS in Somalia (Tillman 1987).

In addition to health problems, the recreational and religious needs of a large and culturally diverse population needs consideration.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Rapid growth of Baardheere and Markabley towns, in conjunction with the construction of Baardheere Dam, is unavoidable. However, considerable pressure on the towns' limited infrastructures can be reduced by locating the majority of workers near the dam site 35 km upstream from Baardheere. Plans prepared by Electroconsult (ELC 1984) for the layout of the construction camp include a water-treatment plant and pumping station upstream of the dam site. Baardheere Dam Project (BDP) should also insist that this plant have the capacity to supply the entire labor force and not be restricted to exclusive use by expatriate engineers and guests (Tillman 1987).

The camp plan also includes a sewage plant located approximately 200 m below the main contractor's camp. While details are not given, it will presumably be sized appropriately and engineered to safely accommodate all camp sullage. This is especially important because Baardheere town uses untreated river water for drinking and other domestic uses. Further, BDP or the contractors should designate a safety zone around the treatment plant so that unplanned settlements do not arise near it. During normal operation, discharge from the treatment plant should not pose serious health hazards, but it is necessary to consider situations during plant breakdowns or equipment malfunctions.

The planned camp layout does not specify a site for a health post, although an area is set aside for social and commercial buildings. In conjunction with the Ministry of Health, BDP should closely monitor the design, staffing, and provisioning of this medical post. This post will be essential during construction and could be continued as a regional health center following departure of the main labor force. It should be equipped for emergency first aid and minor surgery, and also to serve as the main dispensary of medicine and vaccines for the camp. This post should be functional prior to the arrival of workers.

A small health education effort, including lectures, posters, and discussions with health-post staff, should be used to instill safe health practices among the labor force.

BDP must insist that contractors conform to acceptable international standards in providing housing for the labor force. The World Health Organization has set standards for labor camps that establish guidelines for the amount of living space per worker and availability of facilities. BDP may find it profitable to visit ongoing construction at the Kiambere Dam in Kenya and discuss contracting standards for labor-camp facilities with the Tana and Athi River Development Authority.

ELC appears to have made adequate provision in its illustrative camp layout for a discrete social and commercial area. Presumably, recreation areas will also be included—perhaps a football field and basketball courts. Areas for social gatherings, such as tea shops and a cinema, should be planned for quiet, evening recreation. With a labor force of over 2,000, these recreational and social facilities are of extreme importance for the physical and mental well-being of the workers. Contractors should also make provisions for religious services in the social and commercial area.

Characteristic of most labor camps is the presence of numerous unwanted animals that forage on discarded litter and food wastes. Rodents are the most common and can be important agents of disease transmission. BDP should hold contractors responsible for controlling vermin at the camp site.

Health concerns relative to the labor force include medical screening of employees. BDP should mandate that contractors conduct medical screening of potential employees or require medical certificates before hiring them. The screening and certification process for all contractors and health agencies should be coordinated, controlled, and standardized by the national government, preferably the Ministry of Health (Goodland 1978).

All workers should have recent vaccinations for tetanus, smallpox, cholera, typhoid, and yellow fever (smallpox may be unnecessary, although the last reported case was in Somalia). Workers should also be required to present proof of negative tests for schistosomiasis, malaria, tuberculosis, AIDS, and venereal disease as a condition for employment.

A camp health post should be fully established and functional before the arrival of the main labor force. Health-post staff should conduct tests, keep medical records, and provide vaccinations and malaria prophylaxis for new employees as they arrive. The post should be completely equipped with the personnel, medicines, and vaccines needed to treat or prevent the most common tropical water-related diseases.

While the majority of workers will be housed near the dam site, Baardheere town will accommodate a larger service sector. The MNPJVD master planning unit and town leaders must prepare plans for infrastructure expansion in Baardheere. Water supply and sanitation needs must be assessed in view of the expected population increase.

Currently, Baardheere town has no central facilities for water supply and sanitation, so it will be necessary to begin planning for entirely new systems. New settlement zones that do not reduce the agricultural production potential of better soils along the riverbanks must be identified on the periphery of the village. Settlement in preselected areas can be encouraged by providing domestic water supplies and electric lines to places where settlement is preferred.

A detailed soil inventory of the area immediately around Baardheere should be completed to identify sites that are most suitable for the intensive cropping which will be necessary to feed increasing human populations. Sites should also be identified for long-term herder encampments. At the Bura Irrigation Project in Kenya, herders have established long-term campsites near the center of the project to sell livestock and livestock products to workers, and take advantage of irrigation canals as watering points. The same process could easily occur in Baardheere with the resulting problems of more intense fuelwood utilization and overgrazing. Deforestation and overgrazing would then become especially severe if drought occurred during the construction period.

5. Health

Impacts

The impact of the dam and the reservoir on human health will be important. To some extent, many parasitic infections in the tropics are water-related diseases as water provides the habitat for the disease-bearing vectors. In Somalia, potential dam-re-

lated health problems revolve around the two already prevalent diseases of schistosomiasis (bilharzia) and malaria, and the possible increase of others, such as river blindness.

Bilharzia

Generally, the snail that serves as the intermediate host for schistosomiasis grows in shallow pools containing less than one-half meter of water. However, water temperature, wind, turbidity, and surrounding vegetation are also factors influencing snail presence. JESS studies on potential snail vector habitats found a high rate of schistosomiasis-infected snails in shallow roadside pools and ponds near villages. However, for the most part, irrigation canals, and the Jubba River were not principal sources of the bilharzia parasite, although some snail hosts were found in banana field drains and in some dhesheegs.

Areas of the future reservoir could serve as ideal habitats for the bilharzia-bearing snail depending on how the reservoir is regulated (Jobin 1988). As some of these areas are likely to be the first to be exploited by farmers and herders watering their animals, the spread of bilharzia could be serious in areas where it is currently not much of a problem. The area near present-day Buurdhuubo is such a site because of its gentle slope and fairly deep soils (Jobin 1988).

Irrigation canals that are not kept clean of weeds and have slow water moving through them also become loci of the disease as irrigation works spread. Ponding on improperly leveled fields as well as that resulting from bunding within and around the periphery of irrigated farms may produce the same result. Constructing roads on built-up roadbeds also causes shallow ponding following rains which creates the ideal habitat for *Bulinus* snails. Bilharzia will grow as roads and irrigated farming spread and human settlements near these improvements grow.

Malaria

With the Jubba River damming and an expected increase of irrigated agriculture, a rapid rise in the incidence of malaria is almost certain. Peak malaria outbreaks currently occur just after the principal rainy seasons, but diminish considerably in the drier months. A primary effect of the dam will be to increase the amount of standing water over vast areas providing perfect breeding sites for the vector mosquitos. JESS studies on malaria that were conducted in Lower Jubba Valley in an area of much irrigated agriculture found a 21 percent infection rate in children tested with a variation from three percent in the town of Jamaame to 50.7 percent in a neighboring village (Warsame 1988). During this same study, breeding sites were identified as open wells, water collections near wells, pits excavated for construction, and pools formed from seepage from irrigation canals (Klumpp 1988).

A particularly virulent form of cerebral (*falciparum*) malaria, which was previously unknown in Somalia, is now present. This form of malaria is chloroquine-resistant and more lethal than the more common forms of the disease, making its treatment more urgent and difficult. According to WHO officials in Muqdisho, this type of malaria was known to be prevalent in parts of Kenya—particularly in the coastal areas—and the first recorded cases appeared in Somalia in 1987.

Water-Related Diarrheal Diseases

The increased availability of water year-round has implications for other diseases affecting Jubba Valley populations. Chief among these is the broad category of diarrheal diseases that include cholera, typhoid, and hepatitis. These diseases have not been evaluated epidemiologically, but are known to occur with regularity, particularly at the end of dry seasons when sources of water that are reduced in size become contaminated as rain washes in surrounding fecal material and increased turbidity prevents the normal purification effect of sunlight (Jobin 1988). Periodic cholera outbreaks in Jubba Valley and elsewhere in Somalia are a major source of infant deaths. Other diarrheal diseases are caused by worms (such as *Ascaris*) and bacterial infections like Amebiasis and Shigella, which cause cases of dysentery. Improvements in water supplies due to regulation of Jubba River flows should cause a reduction in incidence of some of these diseases.

Hookworm

Hookworm infections were prevalent in 100 percent of the workers on banana plantations tested in the early 1970s, but in only two percent of herders, but it is not clear if people from Jubba Valley were tested (Cahill 1971). Hookworm is prevalent in Kenya in coffee and tea plantations and in the coastal lowlands (Jobin 1980). The moist, clay soils required for banana cultivation are ideal for transmission of hookworm.

Other Dangerous Diseases

Two more human diseases require mention, even though they are not known to have occurred yet in Somalia. The first, onchocerciasis (river blindness)

has not been found in Somalia even though the blackfly that spreads this disease was once reported in the Shabeelle Valley (Zuretti 1957). However, the disease does exist in a band stretching from Ethiopia down to Malawi (Beneson 1985). The spillway of the Baardheere Dam will create an ideal habitat for the blackfly vector (*Simulium* sp.) as may the broad, rocky area of the river just below the dam site. As a result, there is concern that infected foreign workers who come to Somalia during the dam construction phase could import the disease—if the blackfly vector should become adapted to the Baardheere area.

The second disease that deserves mention is Rift Valley Fever. This disease has had a number of outbreaks in recent years on the African continent, including Egypt, Zimbabwe, South Africa, and Mauretania (Jobin, personal communication and Acha and Szyfres 1987). Epizootic outbreaks of Rift Valley Fever occur frequently in domesticated animals and the disease is transmitted occasionally to humans. In animals, symptoms include fever, spontaneous abortion, and, often, death. In humans, the same symptoms occur. In Mauritania near the Gorgol Dam, the outbreaks occurred in the first year the reservoir filled. Speculation on the cause of the outbreak has focused on the settling of herds near the new body of water and the presence of breeding *Aedes aegypti* mosquitos as the possible vector. Six hundred people died from Rift Valley Fever in Mauretania in 1986 and many more from an outbreak in Egypt in 1977.

The last health aspect deserving mention in this section on dam impacts concerns tsetse. The National Trypanosomiasis and Tsetse Eradication Project in Somalia found little or no presence of the fly north of Baardheere and posited that low rainfall and seasonal, low river flow do not create the necessary conditions for the fly to exist. However, creating a reservoir and greater year-round flow in the Jubba River may produce the humidity and vegetation necessary for breeding and resting. One of the reasons Gedo Region has historically been primary camel country is precisely because of the absence of the disease-bearing fly. Extending the tsetse zone north of Baardheere will have an impact on the livestock sector as described above.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The creation of new habitats for bilharzia and malaria vectors cannot be prevented with the creation of the Baardheere Dam and the spread of irrigated agriculture. However, the diseases caused by these vectors can be controlled.

Public health education in the simplest forms is the best method for reducing the spread of bilharzia. This entails teaching mothers and children, specifically, about the disease cycle and particularly, how people must avoid urinating in or near the same places that they bathe or draw water. The same is true about defecating in or near agricultural fields that might serve as a habitat for hookworm and other worms. Health messages can be carried over radio, television (in the case of the latter's use for mass education at the village level), through posters, and by inclusion in rural curricula.

Control of malaria is more difficult, although steps may be taken to eliminate breeding places near habitation and to dispense malaria prophylactics on a broad scale. Public education can be used to teach families and villages how to eliminate stagnant pools and ponds near dwellings.

Construction of more health clinics that operate full time and have sufficient trained staff and medicines will help mollify the worst symptom of the disease. Some clinics, at least at the district level, will have to be equipped with laboratories and trained technicians who can identify the various forms of malaria so that proper treatment can be administered readily in cases of *falciparum* malaria.

More can be done to help villages and townships to purify their drinking water. Simple sand filters and settling tanks can be built for riverine villages on the model of those used in the refugee camps in Gedo Region. Again, public education is important to instruct people on the causes of these diseases so that they may develop some of their own methods for eliminating the problem. Public education is also needed to teach mothers about rehydration therapy for infants afflicted with diarrhea.

River blindness can be prevented altogether if the specific sites of potential habitat are carefully monitored. The appearance of the blackfly vector in the area of the dam spillway or in the white-water area that may develop just downstream should signal a spraying program in those areas.

Further, foreign workers entering the area to work on the dam should be screened for a number of infectious diseases including the AIDS and the Rift

Valley Fever antibody. This work should be overseen and monitored by WHO.

Finally, the area around the reservoir should be monitored for indications of the increase of tsetse fly. To the extent possible, a control program for the fly should be focused on the reservoir area prior to closure of the dam. The expected concentrations of livestock at the reservoir's periphery will necessitate ameliorating the impact of this pest if the transhumant livestock sector is to survive.

6. Loss of Direct Communication with Garbahaarey

Impacts

Road transportation networks linking east and west banks of the Jubba River will be substantially altered by the reservoir. The reservoir, which will be long and narrow in shape in the gorge area, will open at mid-point to form a shallow 10-km diameter bowl around the current area of Buurdhuubo. The reservoir will cut off east-west road linkages at Buurdhuubo eliminating traffic via the current new bridge and the former, short-run, non-motorized ferry. The bridge and ferry are currently the main links servicing four refugee camps as well as the town of Garbahaarey located 40 km inland west of Buurdhuubo on an all-weather road.

Garbahaarey is a town of approximately 5,000 inhabitants. It is administratively significant as capital of both Garbahaarey District and Gedo Region. Once the road link is broken at Buurdhuubo, the entire western side of the river will be accessible only by bridges at Baardheere and Luuq towns. The connecting west bank roads from Luuq and Baardheere to Garbahaarey are poorly maintained and seasonally impassable. Consequently, efficient and reliable road service to Garbahaarey and the west bank will be substantially curtailed.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The break in communication links with Garbahaarey can be mitigated by improving the roads to Garbahaarey that circumvent the future reservoir via Baardheere and Luuq. Improving the road from Baardheere to Garbahaarey appears the best choice because the Baardheere-Muqdisho road will be paved from Baardheere to the connecting link of pavement just north of Baydhabo. Ferry service across the Jubba River at Buurdhuubo might be continued if the ferry were moved southward a few kilometers and the current road diverted to link the ferry at the narrow part of the reservoir below Buurdhuubo.

7. Loss of Cultural Legacy

Impacts

The reservoir created by Baardheere Dam will lead to a loss of cultural resources. Those forced to resettle will have to cope with the loss associated with uprooting from their ancestral lands and permanent abandoning of burial grounds and sacred shrines. These losses will be experienced exclusively by the population of 13,000 currently resident in the reservoir area.

However, inundation of the valley above the dam site will also result in cultural loss of material objects of historic, scientific, and aesthetic value which are part of Somalia's cultural heritage, in particular, and of interest to the world scientific community, in general.

The JESS cultural heritage studies (Brandt 1986; Brandt and Gresham 1988) conducted along the 160-km riverine strip between the dam site and Luuq indicate a pattern of human habitation for the past 35,000 to 75,000 years. The survey identified 686 sites comprised of six types, all of which will be covered by the reservoir:

- *open-air scatters* (*i.e.*, surface scatters of stone artifacts), the most common form of site, with 394 distributed throughout the reservoir area. Most lithic scatters were classified as dating to the Middle Stone Age between 150,000 and 40,000 to 30,000 years before present;
- *open-air ceramic scatters* with 100 sites throughout the reservoir area and usually found in direct association with stone artifacts of varying ages. It is possible that some sites date to Neolithic encampments from 5,000 years ago;
- *caves and rockshelters* restricted entirely to the southern gorge section, where 23 inhabitable caves and shelters were recorded. Artifacts were observed in five caves and rock art in nine. Caves varied in width from three to 20 meters, and several were more than 20 meters deep;
- *rock art* with painting of highly stylized patterns consisting of dots and line drawings on walls. The paintings are a style unique to

Somalia and possibly to all Africa. All rock art remains undated;

- *cairns or rockpiles* scattered throughout the reservoir but most common in the north where 78 percent of the 160 sites were recorded. While some cairns may be graves, their origins and functions remain essentially unknown; and
- *cemeteries*, found throughout the reservoir but more numerous in the north where 64 percent of the 195 cemeteries were recorded. The vast majority are relatively recent Islamic cemeteries, but some appear to be non-Islamic.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Little can be done to mitigate the personal cultural losses of the reservoir population who will be forced to move south of the dam site. The personal possessions of most of the population are limited in number and are, for the most part, portable, including the majority of the houses which can be moved to new location sites.

The cultural heritage archaeology team completed its fieldwork for JESS in late 1987. The team is continuing its work in the reservoir area under the auspices of MNPJVD and the World Bank. In late 1988, the team conducted excavations which, at one site, yielded evidence of 100,000 years or more of human habitation of the Jubba River Basin. The site is potentially one of the most important discovered in the reservoir as well as one of the most important Paleolithic sites in Africa.

The cultural heritage team has recommended additional fieldwork comparable in effort to that of Phase II of archaeological research in order to do further excavations and analyses of recovered materials. The JESS team endorses the continued program of field activities already under way by the cultural heritage team. No further recommendations are needed.

One of several cave painting sites documented by the JESS Cultural Heritage team which is located in the future reservoir zone.

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8. Increase in Crocodile and Hippopotamus Populations

Impacts

Crocodile and hippopotamus are abundant in the river and in some dhesheegs and swamps. Population size and density were estimated in the sample aerial censuses and during total aerial surveys of the river (Watson and Nimmo 1988). During a total count in jiilaal 1987, 587 hippos and 1,537 crocodiles were seen. Allowing for sampling procedures in the various surveys, the Jubba Valley is probably home to 3,000 to 6,000 hippos and 40,000 to 150,000 crocodiles (Watson and Nimmo 1988). Crocodile populations are especially high.

After filling the reservoir behind Baardheere Dam, a large new water body will lead to increase in crocodile and hippopotamus populations. Fish populations undergo a rapid increase behind new dams creating a large food supply for crocodiles. Although some currently favored basking and nesting sites on sand banks will disappear, the large reservoir perimeter will provide many new ones. The extent of increase in hippopotamus populations is more difficult to predict. Suitable herbaceous forage may be relatively scarce around the reservoir in the early years (Deshmukh 1989).

Crocodiles are currently a major menace to Jubba Valley residents and livestock. Residents are killed while collecting water from the river, washing clothes, and bathing. To provide some protection, villagers build wooden or bush fences extending into the river so water can be collected in relative safety, although people also are killed by crocodiles on shore. Of approximately a dozen riverine villages visited by the JESS fisheries consultant, villagers reported that at least one crocodile-related death had occurred in each village within the previous two months.

Hippos are a major menace to crops and boaters. Fishermen report a reluctance to fish in the river for fear of crocodiles and hippos. The increase in crocodile and hippo populations following the dam construction will increase the hazards to valley residents of these animals.

Woman drawing water near Bu'aale from an enclosure constructed for protection against crocodiles.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The Wildlife Department should initiate a control program aimed at the crocodile.

A controlled concession to harvest crocodile skins could produce a sustainable annual income of U.S. $1.5 million to $3.4 million in foreign currency (Watson and Nimmo 1988). Cropping should be managed not to endanger the populations. To enable legal international trade in crocodile skins, clearance must be obtained from the International Union for Conservation and Natural Resources (IUCN) since the Nile crocodile is included in the Convention on International Trade in Endangered Species (CITES). Successful models can be observed in Kenya and Tanzania.

In addition to a crocodile cropping program, a program to provide clean drinking water to villages should be initiated so that villagers will no longer have to get their water directly from the river. In some areas, Swedish Church Relief and World Concern have already installed concrete-lined wells with hand pumps. Their programs should be investigated as models to provide safe drinking water. In order to protect livestock from crocodile attacks while watering in the river, enclosures should be built at the most important watering sites.

9. Nutrition

Impacts

The impact of Baardheere Dam on nutrition levels will probably be mixed. Expansion of irrigated agriculture accompanying a more constant river flow will permit the production of greater quantities and varieties of food crops. Farmers who produce fruits and vegetables will improve their families' nutrition as well as that of others' who are connected with them by a marketing network. Domesticated animals kept near the compound also benefit from excess or spoiled fruits and vegetables. Those farmers who choose crops such as cotton or tobacco can improve family nutrition through the increased incomes from sale of these cash crops. This is also true for fruits and vegetables to the extent that they are sold instead of consumed.

Sorghum could be substituted for maize as the staple crop in some unirrigated areas where dam impoundment lowers the water table and narrows the floodplain. Rainfed cereal crops that are grown close to the river may currently benefit from a higher water table (Besteman and Roth 1988). Sorghum demands less water than maize. This occurrence is not likely to have an effect on local nutrition unless flocks of Quelea find their way into the new sorghum-growing areas (sorghum is much less resistant to bird attacks), in which case, total grain production could suffer.

The dam is likely to have a negative impact on nutrition among people who currently trade with pastoralists for milk but from whom herder transhumant routes may be diverted by the presence of the reservoir. This involves people who are currently living in the future reservoir zone, as well as others resettled or living in areas to which herder access will be lost with the expansion of irrigation projects. A number of villagers in Lower Jubba Region who have had access to herders cut off by large-scale irrigation projects have noted the negative effect of the loss of milk—especially on their children's nutrition. The magnitude of milk loss in the future among sedentary people will depend on where reservoir inhabitants are relocated and the relation of their new home sites to changing transhumant routes. To the extent that the dam might cause the pastoral sector to decline, the loss of milk and animal by-products will have a very important negative effect on local and perhaps national nutritional levels.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

In order for the benefits of increased water availability to be positive on local and national nutrition, steps must be taken to assure that, depending on water availability, a maximum number of people can irrigate their farms. Reaching this objective may call for development of low technology water-lifting options that are financially and technically accessible to all. Human- or animal-powered shadoofs and Persian wheels might meet these requirements. Secure water means that production levels are more secure.

Production levels can also climb with the expansion of research and agricultural education. Research and extension stations in Jubba Valley must be equipped and staffed so that higher-yielding varieties of cereal, oilseed, and vegetable crops can be developed. The proposed Agricultural Research Station at Baardheere could develop, test, and replicate local consumption crops as well as commercial crops for export or import substitution.

Extension must be carried out throughout the valley and not just in Baardheere District. Research

priorities must be focused on what is happening currently in local agriculture. As with public health messages, some agricultural ideas can be disseminated by radio and village-level television while others require farmers to watch and learn in the field from agents at their own farms or at demonstration plots.

Another method to increase the nutritional benefits of higher production levels is through nutrition education. This education is focused primarily at women to teach them the nutritional values of different foods and how best to prepare them to maintain the nutritional content.

The Somali Women's Democratic Organization (SWDO) has branches throughout the country and has, as part of its mandate, an education program. Besides nutrition and cooking education, SWDO can be used as a vehicle for agricultural and health messages to the countryside. However, its educational aims need support. SWDO needs help reaching outside the district capitals, so that village women can have access to the training and aid it offers. Again, radio and television messages can be used for nutrition education.

Education efforts directed toward women through radio spots and posters should encourage eating a variety of fruits and vegetables in order to reduce nutritional deficiency diseases. In its weekly meetings, SWDO should demonstrate preparation and preservation methods for fruits and vegetables not usually eaten by Jubba Valley villagers. Agricultural extension agents should experiment with new food crops not currently grown by small-group irrigators and demonstrate these crops to local farmers.

Decline in transhumant herding will mean a further decrease in the availability of milk, meat, and ghee in river villages and towns. Improved road networks and refrigeration (for ice-making) may ameliorate this situation for the larger towns and villages near those towns. However, with the availability of electricity, it may be possible to build a milk factory in Kismaayo which would produce inexpensive milk for Jubba Valley and beyond. The potential for such a factory depends on what happens to transhumant movements of cattle after the dam is built, on the ability of local incomes to pay for factory milk, and on the costs of building and running such a plant. Milk is important enough to local diets that it is important to explore these possibilities.

10. Increase in Fish Populations in Reservoir

Impacts

With periodic overbank floods into lateral dhesheegs and high nutrient levels, Jubba River provides excellent habitat for freshwater fish. However, this resource is being exploited only at an artisanal level. JESS fish studies in Jubba River, conducted during deyr 1986 and pre-gu' 1987, indicate a potential sustainable annual catch of 1,600 to 1,800 metric tons with an estimated value of 80 to 90 million SSh at an average local market price of 50 SSh/kg (Meredith 1988). JESS market data indicate that 50 SSh/kg is a common price for fish throughout the valley. Distinct opportunity for export markets in Kenya, Europe, and Asia increases the potential value of this catch and generates foreign exchange. At present, Somali Marine Products' fish-processing facilities are operating below capacity and would be interested in processing and marketing freshwater fish from Jubba River if a dependable supply could be assured and markets aggressively sought (Tillman 1987).

Regardless of export markets, annual fish catch from Jubba River could provide 400 tons of animal protein at an approximate market price of 250 SSh/kg. Considering only protein components, comparable current prices for livestock protein prices are between 1,000 and 1,500 SSh/kg; therefore, Jubba River fish are an excellent bargain for local residents. Fish protein from Jubba River, if fully exploited at a sustainable level, would provide an annual protein requirement for 31,250 people.

Currently, most fishing is *ad hoc*, intended primarily for household consumption. Fishing generally supplements household diets and income from farming, often taking place when farming activities do not demand the entire family labor or when fish are easily caught in shallow pools during late jiilaal (Meredith 1988). Normally, low river flow and reduced farm labor demand occur in late jiilaal. Fishing techniques are primarily limited to hook and lines, although some fishermen use set seines, scoops, and hand-pulled seines which can be purchased at Somali Marine Products (Meredith 1988). Watson and Nimmo (1988) recorded 13 basket traps during a river survey, and JESS field teams noted that several fishermen use fish traps during low flows.

When surplus fish are caught, they are either sold from the fisherman's residence as fresh fish or, more frequently, cut, salted, and sun-dried on racks

or vegetation. Dried fish are most often sold to market vendors for resale. Meredith (1988) found no evidence of efforts to market fish systematically in Jubba Valley except at Dhesheeg Waamo.

After filling the reservoir behind Baardheere Dam, fish populations will explode during initial stages while inundated land vegetation decomposes and releases nutrients into the water—until nutrients wane and fish predator populations increase. Within a decade, potential fish catches will decline and come into balance with a slower rate of nutrient inputs. Even after the reservoir attains maturity, fish populations will still remain a significant resource. In the interim, excellent yields can be expected.

Filling the reservoir will be accompanied by an increase in crocodile and hippopotamus populations which will make exploiting the fish resource more dangerous. For subsistence use, many families currently prefer to fish in dhesheegs where fish are easily killed at low water levels. With control of overbank flooding, lack of water in dhesheegs will eliminate this source of fish. However, the fish population in the reservoir will provide a cheap source of protein and a lucrative cash-earning opportunity for trained fishermen. However, currently, 54 percent of agricultural riverine residents rarely or never eat fresh fish. Very few valley residents list fishing as their primary or secondary occupation.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The GSDR should take inexpensive steps to foster artisanal fishing. Freshwater fish biologists from the Ministry of Fish and Marine Resources have developed fishery cooperatives on the Shabeelle River and, more recently, on the Jubba River. They have evolved a participatory extension model which has been effective on both rivers where a technician is a participating member/advisor for the cooperative. Earnings—after fuel, maintenance, and marketing costs have been deducted—can reach 4,000 SSh per day per member. With few exceptions, members are not full-time fishermen but use fishing to supplement household incomes. Muqdisho fish markets are eager to take the entire catch, and often much of the catch is sold at roadside stops in smaller villages before fish reach urban markets. This program is without heavy capital investment and has limited recurrent costs. It merits stimulation by the Somali government and the international donors. Past large-scale fishing projects have not worked well. Ingredients for successful promotion of small-scale fishing enterprises are already present in the Ministry of Fish and Natural resources.

Freshwater fishing in Jubba River could be further stimulated by simple, low-cost education programs directed at women to encourage purchase and use of fish for its family nutrition benefits. SWDO should include lessons on fish preparation in its weekly meetings with village women. Efforts should be made to insure that simple fishing equipment be available for purchase in villages throughout Jubba Valley. The evidence indicates that artisanal fishing is increasing in Jubba Valley and could benefit from further stimulation by donors and/or the Somali government.

The Somali government should seek partners for fishing concessions in the reservoir as a way to take advantage of its initial burst of fish productivity. These concessions should include payments for fish extracted as well as local training components from the concessionnaire. In return, the government could grant exclusive commercial fishing rights, limited duty-free status for boats, fishing gear, and processing equipment under agreement that these items remain in-country for use by a developing local fishery. Local fishermen should gain skills and experience to maintain an active reservoir fishery after the concession ends.

11. Navigation

Impacts

Historically, the only known upstream-downstream navigation on Jubba River consisted of dugout canoes carrying grain from the Lower Jubba area down to Goob Weyn for trade, and wood-fueled European steamers connecting colonial, riverine outposts (Dundas 1893; Crawford 1896). The construction of tracks and roads along the river led to a rapid replacement of boat traffic by land vehicles. Today, the only navigational use made of the river is cross-river traffic by canoes and cable ferries in a few places. Valley inhabitants state that crocodiles and hippos constitute too great a threat for downriver boating in small craft. Although the dam construction will provide for an even, year-round flow, it is unlikely that the danger from these riverine animals will diminish. Further, in many areas, high, mid-stream sandbanks could continue to pose a navigational problem despite constant flow. The scouring effect of the less turbid dam waters on the river channel pattern and depth may

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bring about a more navigable route in some places. However, upstream navigability from Lower Jubba Region remains compromised by the barrage at Fanoole.

The small possibilities of river navigation that may open with the dam are lessened by the economic effects likely to occur with the completion of the paved road through Middle Jubba Region. It is certain that with this road, land vehicles will secure an even more competitive place in valley transportation than they currently do vis-à-vis river craft.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Downstream navigation is not an important option to develop given the scheduled improvement of riverine roads. However, trans-river and trans-reservoir ferries may be needed at some points to permit contact between the east and west banks of Jubba Valley. These developments should be left to the private sector which is best suited to identify the crossing points and the technologies as opportunities develop.

12. Summary

Impacts

The projected flood regime will remain damaging to areas where floods are economically most severe but will dramatically reduce floods where flood water is currently most used for farming. The magnitude of the consequent reduction in crop production in current recession-dependent areas is unknown. In principle, agricultural production on much of the floodplain will drop to the levels of rainfed fields.

The most important immediate effect on range resources of closing Baardheere Dam will be loss of rangelands in the inundation area. Presumably, large numbers of livestock will leave the area since rangelands around the reservoir will be a poor source of forage (initially), compared to the lost floodplain. Tsetse may become established around the reservoir even though it is thought to be absent now. Loss of forage from the floodplain and the inundation area will increase pressure on the remaining resources of graze and browse. Herders will have to change their household economic strategies, particularly in the dry season. Alternatives may include: using the rangelands of the Shabeelle Valley rather than the Jubba Valley if this area can support more livestock; increasing participation in agriculture, especially to use crop residues to feed livestock; or dropping out of livestock herding completely.

Another effect of the impoundment of Jubba River waters will be changes in available land to farm. The future reservoir area itself will be lost to farming. Currently, an estimated 12,000 ha in the reservoir area are under cultivation and will be lost when the reservoir is filled (Nimmo and Watson 1988). In addition, an indeterminate amount of riverine and dhesheeg farmland will be lost due to the lower constant river flow and the lack of gentle overbank flooding. However, there may be a gain of 2,000 to3,000 ha of seasonal farmland in the drawdown of the reservoir as impounded water is released through the dam (Deshmukh 1989).

The Baardheere Dam construction project will create a human influx in the Baardheere Region that will substantially exceed the anticipated 2,000 laborers needed to work on the dam. The rapid influx of population could easily create slums and shanty towns on the periphery of Baardheere town of sufficient magnitude to pose serious social and health problems. Water and sanitation needs are particularly critical.

Potential dam-related health problems center on the two already prevalent diseases of schistosomiasis (bilharzia) and malaria. Other diseases, such as river blindness, may also increase. As irrigation works spread, irrigation canals may become a source of schistosomiasis if weeds are not cleaned out and if they have water moving slowly through them. A rapid rise in the incidence of malaria is almost certain with the damming of the Jubba River and an expected increase of irrigated agriculture.

Road transportation networks linking east and west banks of the Jubba Valley will be substantially altered by the reservoir created by Baardheere Dam. The reservoir will lead to a loss of cultural resources. Inundation of the valley above the dam site will also result in cultural loss of material objects of historic, scientific, and aesthetic value which are part of Somalia's cultural heritage as well as of interest to the world scientific community.

Creating a large, new water body after filling the reservoir behind Baardheere Dam, will lead to increased populations of crocodile and hippopotamus.

The impact of the Baardheere Dam on nutrition levels will probably be mixed. The expansion of

irrigated agriculture accompanying a more constant river flow will permit the production of greater quantities and varieties of food crops. Sorghum may replace maize as the staple crop in some unirrigated areas where the dam impoundment causes the water table to lower and the floodplain to narrow. The dam is likely to have an important negative effect on nutrition among people who currently trade with pastoralists for milk but from whom herder transhumant routes may be diverted by the presence of the reservoir.

In the initial stages after filling the reservoir behind Baardheere Dam, fish populations will increase rapidly as vegetation decomposes and releases nutrients into the water, until nutrients eventually wane and fish predator populations increase. Within a decade, potential fish catches will decline and come into balance with a slower rate of nutrient inputs. Even after the reservoir attains maturity, fish populations will still remain a significant resource. In the interim, excellent yields can be expected.

Economic effects likely to occur with the completion of the paved road through Middle Jubba Region will decrease the few possibilities of river navigation that may open with the dam.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The change in floodplain hydrology can be most easily mitigated for many farmers through the use of small diesel-powered irrigation pumps. However, to prevent impoverishment of the majority of recession-dependent agriculturalists, flood-recession agriculture will have to continue via controlled flooding.

The main issues in the livestock sector will be mitigating loss of forage resources and access to water holes either directly on the banks of the Jubba River or in dhesheegs fed by the river. A controlled flood complemented by minimal infrastructure will largely compensate herders for their loss of grazing areas and watering holes.

In order to minimize the loss of agricultural production by the Baardheere Dam reservoir, releases from the dam should be scheduled and last long enough to permit agriculture in the drawdown zone.

Growth of the construction camp for the dam will create a number of short-term health and sanitation problems which contractors will have to address as construction proceeds. Authorities will have to monitor the health and sanitation status of the site closely to avert problems that could have a negative impact on the general Somali population later on.

In the meantime, the completion of the dam and the expansion of irrigated agriculture will have long-term impacts on the health and sanitation of Jubba Valley. To avert a general degradation of conditions, programs aimed at public education and prevention of the spread of bilharzia, malaria, and tsetse (in particular), should begin.

Assuring valley residents of good-quality drinking water in adequate quantities is also a priority.

Breaks in communications between the east and west banks of the new reservoir should be addressed by general development of the road transportation system in the region.

C. Relocation and Resettlement

Involuntary resettlement is invariably a traumatic experience that has far-reaching social and economic effects on resettled populations. The dismantling of entire communities, followed by relocation in new and frequently alien environments, results in severe psychological and physiological stress.

The population now occupying the reservoir zone of 425 square kilometers will be the focus of the first major relocation of Somalis due to dam construction, but resettlement in the Jubba Valley is not without precedent. Beginning in 1974, approximately 60,000 Somalis of predominantly transhumant pastoral background were airlifted from the country's drought-ravaged northern regions and settled in Dujuuma.

This massive airlift was an effort to avert widespread starvation. In contrast, the reservoir resettlement population is no more than one-quarter the size of the Dujuuma population. Moreover, the drought was of such magnitude and suddenness that there was little time for thorough planning and location site surveys. Consequently, comparisons between the two groups must be drawn with some caution, but important lessons can be learned from the Dujuuma experience that are of relevance to issues surrounding reservoir resettlement.

The Dujuuma settlement project was officially shut down because its soils were unsuitable for irrigation and rapidly became saline due to poor drainage. At the same time, Dujuuma experienced constant management problems as a large-scale agricultural

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project because it was administered as a monolithic whole in a manner incompatible with the area's soil types. It could have been more successfully run by focusing on individual farmer efforts on small-scale plots.

Dujuuma was run as a state farm. Its settlers primarily had backgrounds of personal ownership of livestock and agricultural lands. When questioned about the Dujuuma experience, settlers expressed negative feelings about working as laborers on a state farm.

The incompatibility of mixed populations contributed to the difficulty of adjusting to a new social environment in addition to radically different physical surroundings. Those who were brought from various parts of Somalia's middle and northern regions came from a broad range of cultural and historical backgrounds. They were settled together along with local Jubba Valley riverine populations, who were incorporated into Dujuuma subsequent to the expropriation of their lands for the project (Tsui 1988). This mixture of people in dense aggregations did not lend itself to a smooth restructuring of community life. Resettlement literature consistently cites the most success for settlements where communities are relocated with their social structure and leadership intact (Merryman 1982:105-119; Scudder 1985). This was not the case at Dujuuma.

1. Resettlement Impacts on Residence Patterns

Impacts

Resettlement of the reservoir population south of the dam site will require considerable adaptation to environments contrasting with present habitats. In general, resettlement on the floodplain below the dam means movement toward environments of higher population density, greater social diversity, and increased tsetse infestation.

The highly dispersed, low-density settlement pattern of the reservoir population stands in contrast to more aggregated villages to the south where resettlement sites are being sought. The low population density in the north reflects an adaptation to a specific set of ecological and geomorphological parameters. The higher banks and steeper gradients of the Upper Jubba Region have produced an environment where riverine soils are found in narrow alluvial bands of varying length, from less than 100 meters to over one-half kilometer.

Unlike Middle Jubba Region, there are no dhesheegs in the north to support an aggregated population practicing flood-recession agriculture. Instead, northern homesteads are dispersed longitudinally along the river to optimize protection of and daily access to crops planted in small, often isolated plots. The average farm size for a household is 4.1 hectares, but the median size is .94 hectares, reflecting considerable variation in farm size.

Livestock are more important to economies in the reservoir area, particularly the gorge, than portions of the Middle and Lower Jubba regions because of the reduced levels or possible absence of tsetse fly above Baardheere. In addition to keeping larger numbers of livestock, reservoir households typically use enclosures close to domestic compounds to facilitate milking, protection, and general supervision of herds. To avoid the accumulation of dung heaps and vermin infestations, residents periodically relocate their livestock corrals and home sites at distances of as little as 20 to 100 meters, which partially explains their preference for portable houses, even in a permanently settled context.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The low population density and widely dispersed settlement patterns of reservoir villages have evolved over time in response to a particular set of environmental opportunities and constraints. Replicating the exact low-population, tsetse-free environment as resettlement sites south of the dam will be impossible. However, the further south resettlement sites are selected, the greater the social and natural environmental dissimilarities will be from the current residence sites of the reservoir population. Consequently, it is desirable to relocate reservoir villages at sites as similar to their present ones as possible.

In addition, some of the valley's most successful small-group irrigators live within the reservoir area; their current production efforts will be terminated by the dam. However, their enterprise can be reinstated by choosing sites for their resettlement according to the availability at the resettlement site of land and water resources appropriate for small-group irrigation.

JESS recommends that a thorough search be conducted of potential settlement sites (as many as 50) between Bu'aale and the dam site for possible relocation. Prospective sites should have the char-

acteristics, where possible, of continued low population density, potential for riverine and dryland agriculture, and access to inland grazing.

2. Resettlement Impacts on Sanitation

Impacts

Because of the dispersed nature of northern settlements, sanitation has not been a major concern for reservoir residents. All of those surveyed use the bush or areas beyond their compounds to urinate and defecate. No pit-latrines were recorded in the reservoir sample population of 101 households. Fifty-five percent of the sample bathe in the bush and another 44 percent, in or near the river. As the reservoir population is relocated among more densely settled communities to the south, health problems related to sanitation may increase.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

If the reservoir population is relocated among more densely settled communities, careful attention must be given to providing culturally acceptable sanitation facilities which meet the health needs of the resettlement population. Based on the current pattern of dispersed agricultural settlement in the reservoir area, which incorporates features of animal husbandry in close proximity to homesteads, it is recommended that planners avoid aggregating the resettled population in as few as four sites in the Middle and Lower Jubba regions where tsetse is endemic and antithetical to keeping larger livestock species near the river throughout the year.

3. Resettlement Impacts on Political Organization

Impacts

The continued social stability of reservoir communities is an important aspect of resettlement adjustment. However, resettlement is a destabilizing experience that threatens the political structure and social solidarity of resettlement communities.

The political stability of reservoir communities is potentially threatened by resettlement. Communities within the reservoir currently function with a considerable degree of internal political autonomy. Each has its own *guddoomiye* (chairman) who is appointed by the government, but rules with the consent and popular support of the community. The guddoomiye and *guddi* (council of advisors) comprise the official governing body of each community. In fact, power is much more evenly and democratically spread throughout the *aqiaarta*, which is composed of all adult males who are considered wise and responsible. The aqiaarta is active in nearly all aspects of village governance, including the settlement of internal disputes. The highly egalitarian nature of most northern communities in the Jubba Valley contrasts with many villages to the south that are more disparate in their socioeconomic makeup.

Supra-village authority is vested in *nabadoons*—traditional leaders who typically function today in cooperation, albeit unofficially, with the national authority structure. Nabadoons are recognized at the local level for their role in intervillage coordination and the integration of affairs at a number of levels. Between Luuq and Baardheere, there are at least three nabadoons, each with jurisdiction over villages within an extended territory of the east bank. By moving south of the dam site, the resettlement population will be placed outside the traditionally recognized jurisdiction of its nabadoons who have played significant roles in local political life. The resettlement population's loss of its traditional nabadoons is one example of potential community political destabilization which threatens the success of the resettlement process.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The most successful resettlement program will preserve the social integrity of communities being relocated by maintaining their political structures. Local political structures should be preserved as a means for continued consensual village governance and resolving disputes within resettled villages and between resettled and host communities. Local political figures that are familiar to and supported by resettled communities will be invaluable in promoting successful adaptation to a new sociopolitical environment. Their leadership will provide a focal point for community-based decision making and future self-determination. With the exception of one nabadoon who is resident of a village in the gorge that will be forced to move, the resettlement population will move outside the jurisdiction of their nabadoons. Although nabadoons of upper Jubba Valley will be unlikely to participate in the political life of the resettlement population, once settled, nabadoons should be invited to assist in settlement site selection and negotiations with host communities.

4. Resettlement Impacts on Education Occupational Structure

Impacts

The resettlement population is minimally educated. Of all males in the sample population 15 years and older, 82 percent have had no education. Of the 18 percent exposed to some education, 10 percent were part of the literacy campaign in the early 1970s. Only eight percent of males have had any formal classroom education, and eight years is the maximum amount for two percent of all adult males. The situation is more extreme for females 15 years and older—96 percent have had no education. Of the remaining four percent, two percent received some education through the literacy campaign. In the overall sample, 82 percent of males and 96 percent of females report that they can neither read nor write Somali.

Table 126 shows the occupational structure of the reservoir population in terms of individuals' first priorities.

Table 126. Primary Occupations of the Reservoir Population

OCCUPATION	PERCENT OF POPULATION
farming and herding	15.2%
farming	13.2%
herding	10.0%
housework*	27.5%
no work**	23.2%
Koran study	3.4%
civil service	.5%
teaching	.5%
trading	.5%
unknown/not applicable	5.1%

Combining the first three categories shows that 38.4 percent of the population is involved in farming and/or herding as primary tasks. Another 27.5 percent (mainly women), listed housework as their first-priority activity, and 24.2 percent (mostly young children and the elderly), reported that they had no primary task. No more than a few percent are involved in occupations besides primary agriculture, livestock, and domestic production.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

With regard to the limited skills and education of the resettlement population, it is imperative that attempts be made to settle them in environments in which their present sets of economic skills centering on agriculture and livestock management will not place them at a disadvantage. Ideally, the educational facilities for the settlers in their new locations would be improved to give them the capacity to improve their economic lot.

5. Implications of Social Diversity and Impacts on Host Communities

Impacts

In addition to adjusting to a new physical setting, the resettlement population will have to make adjustments to new social environments. The reservoir population may have problems adjusting to or being accepted by its new host community. Although Somalia lacks the extreme ethnic plurality typical of other African countries, the Jubba Valley has a considerable amount of social diversity reflecting the wide range of people who have settled there over time. For example, many pastoralists have settled in the valley in response to drought. Different valley communities have ancestors who followed the Jubba River southward from Ethiopia in centuries past, agricultural laborers who migrated from Kenya, and significant populations whose forebears were brought as slaves from Tanzania and elsewhere.

The valley is currently composed of many groups and continually gaining more due to the steady influx of migrants and agricultural developers. Each group has its own set of interests to promote and protect, and all are competing in a finite area with limited resources. It cannot be assumed that the reservoir population can be relocated at any site in the valley without special attention to their successful integration into and acceptance by host communities, or that land-tenure conflicts between these groups will not arise now or in the future.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Considering the contrasting historical backgrounds of east and west bank populations living in the reservoir area, it is desirable that each subpopulation be resettled on the respective bank where it is currently residing. A further concern is the often overlooked impact of the resettlement population on host communities. First, from the outset of relocation-site selection, it is imperative that surrounding communities be consulted to ensure that they do not already have traditional claims to and/or economic dependence on the land designated for resettlement sites. Second, efforts should be made to ensure settler-host compatibility. Knowledge of

their historical interaction can help, but beyond this, opportunities should be provided for the leadership of host and settler communities to meet and establish the basis for their future interaction.

6. Psychological Stress of Resettlement

Impacts

Psychological stress for a resettled population most frequently manifests itself in the form of grief for the lost homeland and a generalized sense of lack of control over their future in an alien and often hostile environment.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Structuring some sense of control can best be accomplished by incorporating the participation of settlers throughout the relocation process. This local participation should begin with a comprehensive explanation and discussion with reservoir populations regarding the meaning of the dam and its impacts on their lives.

After relocation sites have been identified, representatives of communities to be resettled should be taken to visit the sites and then returned to their homes to inform their communities about the conditions and characteristics of the new environment.

Settlers should participate in deciding the future composition of resettlement communities. Since the limited number of available relocation sites will necessitate increased aggregation of communities, settlers should help define units for relocation. These units should perhaps be based on a desire to preserve whole communities and combine groups with similar socioeconomic characteristics and histories of social compatibility.

7. Settler Housing

Impacts

Housing is of immediate importance to settler adjustment. The majority of reservoir households currently live in small portable dwellings (typically two to three meters in diameter) with a wood frame and covering that can be dismantled and reconstructed in a matter of hours.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

With careful planning, settlers can be transported by truck, accompanied by their houses and belongings, directly from the reservoir zone to their new relocation sites. Upon arrival, they can have the comfort and familiarity of their own homes as an immediate buffer against the adjustment to a new and unfamiliar environment.

Because of the preponderance of portable dwellings in the reservoir area, this is one of few resettlement contexts in the world where settlers can take their homes with them to relocation sites. The situation has several advantages. First, benefits in terms of the settlers' psychological adjustment will be considerable. Second, the monetary savings for MNPJVD will be substantial. Third, pressure on forests and other vegetation surrounding resettlement sites will be significantly reduced if settlers do not need to build new housing. Fourth, by retaining local-style dwellings, the apparent material disparity between resettlement and host communities will be reduced.

8. Initial Stages of Resettlement

Impacts

The first two years of resettlement are the most critical for adjustment and necessitate recurrent monitoring of the resettled population. During the initial stages of resettlement, settlers are particularly vulnerable economically.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Monitoring analyses must be especially fine-tuned during this phase to indicate points where special assistance interventions are warranted and at what stages various supports should be withdrawn to avoid permanent settler dependency. For example, settlers will need the provision of basic foodstuffs for at least a year following resettlement—longer, if substantial areas must be cleared before cultivation can begin or harvests are significantly reduced by drought or flood during the first year or two.

Those monitoring the communities need to be aware of telltale signs of economic stress. A reduction in the resettled population could indicate a return of settlers to former home areas or an out-migration, particularly males, to seek wage employment. Other distress signals can include the sale of inordinate numbers of livestock, jewelry, or other household assets, to make up for economic shortfalls following resettlement. Early economic pressures may jeopardize settlers' claims to the land they have been issued—their indebtedness to money lenders may be so great that they are forced to sell or otherwise abdicate control of their land to meet overwhelming financial obligations.

9. Summary

Impacts

From the demographic data given above, the following inferences can be made about the reservoir population that are pertinent to resettlement:

- it is very young and expanding rapidly;
- it is characterized by inordinately low levels of literacy and formal education; and
- it is primarily involved in basic production activities, with a nearly complete absence of additional skills or occupational training.

Based on these characteristics, when resettled, the reservoir population will be almost entirely dependent on the soil and water resources of the new location to continue their livelihood, which is overwhelmingly oriented toward agriculture and livestock production. Their economic adjustment to a new environment will depend on finding an appropriate mix of ecological factors that will be compatible with previous modes of production. Of even greater importance, is how much land will be allocated to each resettled household. If each is given two hectares or less and no additional arable land is available for clearing and cultivation, the settlement will surely fail because it will be unable to incorporate a second generation (Scudder 1987). Given a rapidly expanding population with few skills and little education, the next generation will inherit a marginal agricultural existence, or be forced to accept roles as low-wage laborers, or migrate from the area in search of employment that requires only minimal skills.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Planners of Jubba Valley resettlement should look to previous Somali resettlement experience for guidance in their efforts.

It is desirable to relocate reservoir villages at sites as similar to their present ones as possible. Sites should have the characteristics, where possible, of continued low population density, potential for riverine and dryland agriculture, and access to inland grazing.

The most successful resettlement program will preserve the social integrity of communities being relocated by maintaining their political structures.

With regard to the limited skills and education of the resettlement population, it is imperative that attempts be made to settle them in environments in which their present sets of economic skills centering on agriculture and livestock management will not place them at a disadvantage.

From the outset of relocation-site selection, it is imperative that surrounding communities be consulted to ensure that they do not already have traditional claims to and/or economic dependence on the land designated for resettlement sites (Scudder 1985). Efforts should be made to ensure settler-host compatibility.

After relocation sites have been identified, representatives of communities to be resettled should be taken to visit the sites and then returned to their homes to inform their communities about the conditions and characteristics of the new environment. Settlers should participate in deciding the future composition of resettlement communities.

With careful planning, settlers can be transported by truck, accompanied by their houses and belongings, directly from the reservoir zone to their new relocation sites. Upon arrival, they can have the comfort and familiarity of their own homes as an immediate buffer against the adjustment to a new and unfamiliar environment.

D. Various Irrigation Options

The Somali government and the various international donors will have to promote vigorous expansion of irrigated agriculture in Jubba Valley if only to compensate valley residents for the burdens the changing river flow regime will place on their agricultural systems. In the course of developing irrigation programs, government and donor planners will have to evaluate different irrigation options and adopt the one that comes closest to meeting the objectives of the particular program in question.

Each type of irrigation has its characteristic technical, management, and agricultural profile. Each will require its own set of measures to maximize benefits to the Jubba Valley population.

1. Irrigated State Farms

Impacts

National and Local Nutrition

Crop choices on state farms are based on urban consumption patterns and the substitution of food imports that place heavy burdens on national foreign exchange accounts. Irrigated crops, such as

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rice and sugar, require more water and fertilizers per hectare than traditional field crops, such as maize and sorghum. Somalia is getting less food from its three state farms in lower Jubba Region than it would have if it had not taken resources out of the traditional agricultural sector. The state farms are operating in an economic and technical environment that is well below that expected by their feasibility studies.

In addition, land that was formerly used for traditional food crops has been taken for the cultivation of these import substitution crops. Much of the land taken has been left idle because of production constraints facing the state farms. Fanoole alone holds over 7,000 ha of unused land. Such levels of idle land represent a local and a national loss of food. Local people have lost the land that they need to produce their own food.

Local farmers have had to move back to less fertile land which has yielded less as a result, and they have lost the flexibility of producing many of the vegetable and fruit crops that add needed variety to their diet of staple crops. In most cases, fruits and vegetables can only be grown under flood recession or irrigated conditions in Jubba Valley. The state farm projects have expropriated precisely the types of irrigable lands most appropriate to fruit and vegetable cultivation. Irrigated projects have also cut down forests and bushlands that formerly provided many wild fruits and vegetables, particularly needed in times of crop failures.

Incomes and Household Economic Strategies

The impact of state farm irrigation projects on local incomes and family economic strategies has been essentially negative. Budgetary constraints have prevented all three projects from offering wages that compete with the private sector. In 1986, wages for casual day labor at Mogambo were eight SSh/hour for a work day of eight to 10 hours while permanent labor there earned 30 to 40 SSh/day. Fanoole Project paid 25 SSh/day of six to seven hours (Somali National University Graduate Theses in Economics, 1986). Juba Sugar Project can pay more than the other two projects because it is allowed to set its own pay scale. JSP pays its day laborers according to the task and the length of time the worker stays at JSP. In 1986, weeding and harvesting for a short-term employee paid 33 SSh/line, and most workers can finish two to three lines in one day. On average, wages for daily tasks are about 80 to 90 SSh (Somali National University Graduate Theses 1986).

Despite its capability to set its own wage rate—a rate that has been raised several times over the past few years—Juba Sugar Project is restricted in its overall ability to control wages by the fixed selling price for sugar imposed on it by the government. This price has been set at 35,000 SSh/ton while production costs totaled almost 33,200 SSh/ton in 1987. The wage bill is nearly one-quarter of total production costs, and even a slight increase would wipe out the already small profit margin.

Wages paid by small farmers to their neighbors for agricultural tasks vary between 100 and 250 SSh/day, in Lower Jubba Region, depending on the season and the difficulty of the task. As a result, most farmers prefer to hire themselves out to their neighbors rather than to the state farm irrigation projects.

Although some 5,000 to 6,000 new jobs may have been created by the state farms, many of the higher paying skilled positions went to people from the urban areas of Muqdisho and Kismaayo. When Mogambo Irrigation Project decided to open up some of its area to smallholder farmers, redundant civil servants and those leaving school from the capital were settled on the project while local farmers who had lost their land without compensation to the projects were not. The overall employment effect of the projects has probably been negative as a result.

The Evans, Cullen, and Little study in Lower Jubba Region shows that farmers in Jamaame District (where Mogambo Project is located) earned 19 percent of family income from their own farming operations and 20 percent from wage labor. These figures mask great disparities between east and west bank farmers: those on the east bank (away from the Mogambo Project area) earned 34 percent of total income from their own farms. Those in the Mogambo vicinity on the west bank earned six percent from their own farms. Likewise, wage earnings accounted for 12 percent of family income among east bank farmers while it constituted 50 percent of west bank farmers' incomes (Evans, Cullen, and Little 1988).

These data suggest that there is less family farm activity in the Mogambo area than directly across Jubba River. Since the Mogambo area was an important farming area before the inception of the

project, it is likely that many former farmers lost their farmland to the project. However, most of the wage labor earned by Jamaame District farmers comes from working on neighbors' farms or from the banana plantations, rather than from the state farms.

Potential earnings of a family from its own farm might be over 35,500 SSh from a farm growing maize, sesame, and some cotton (Evans, Cullen, and Little 1988). One person working full time for two seasons on a state farm like Fanoole could hope to earn 7,200 SSh if paid 40 SSh/day. At this rate, it would take more than five family members working on the state farms to earn as much as the average family farm in Jamaame District. The JESS study and the Evans, Cullen, and Little study show that, in general, two family members at most work on the state farms, and these are usually women and children who earn the lowest level of wages. Families who have lost their entire farm rarely send the whole family to work on a state farm. They can still make more money through other activities such as masonry, selling in the market, and local house construction than working for the state farms. The state farms do not constitute a major employment opportunity for local workers but are only an employment of last resort. Those who do work for the state farms are usually the poorest and least skilled of the area, and it is certain that their earnings are less than could be obtained from the family farm.

Impact on Local Infrastructural Development

Establishing state farm agricultural projects necessitated the construction of some new roads in the Lower Jubba area—mostly graded, gravel roads that run within the project areas. Many villages near or on the paved Jilib-Kismaayo road into the Jubba Sugar Project have benefitted from better access to the larger towns for marketing their produce, attending clinics, procuring medicines at pharmacies, and finding alternate employment opportunities. However, the increased number of heavy transport vehicles on the roads has led to a maintenance problem on roads like the main paved road to Kismaayo.

The barrage and power station of the Fanoole Project has produced part-time electricity not only for the project but for the towns of Jilib and Kamsuuma. Partial electrification of these two district towns may have contributed to their rather remarkable growth over the last decade. The populations and the markets of both Jilib and Kamsuuma are two of the largest in the whole area. Electricity enables shops, restaurants, and markets to stay open later; permits merchants to sell refrigerated products and ice; and allows for the development of cinemas and other entertainment, such as television viewing. More importantly, electricity helps small industries like tailoring, shoe repair, and food processing to operate more efficiently.

Impacts on the Livestock Sector

The state farms have eliminated more than 25,000 ha of productive floodplain forage from pastoral use (Fadal, Shego, and Ali 1986). The majority of land held by state farms has yet to come under cultivation. However, livestock have been prohibited from grazing on these uncultivated portions. An exception is Mogambo Project which, since 1987, has rented out parcels of rice stubble after harvest. However, cost of this graze is beyond the means of most local herders. In contrast to Mogambo, Fanoole Rice Project has never permitted graze of either rice stubble or its uncultivated hectares.

Besides the small amount of forage provided by Mogambo, state irrigated farms produce no other by-products that could serve as animal fodder to replace the grazing areas taken by the projects. Rice from the Fanoole and Mogambo projects is milled at the Fanoole Mill, but the bran that results is burned or otherwise discarded. Plans for Fanoole originally included an experimental feedlot for 500 head of cattle for dairy and beef production, based on by-products from the project (Samantar 1986).

Beyond the loss of graze and fodder, access to water has been blocked by the existence of the state farms. The 52 km Fanoole main canal, flood-protection bunds, and drainage canals all prevent the movement of animals toward their traditional watering places on the Jubba River.

At Juba Sugar Project, constant use of sprinkler irrigation has created a habitat for increased tsetse fly infestation. The presence of water and bushland that constitute the breeding and resting sites for the fly enable its spread into areas which were, seasonally, too dry before the projects to support its reproduction. Other animal diseases, particularly respiratory ailments, may occur or be aggravated by the presence of the higher humidity around large irrigation projects.

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Overview

Government-managed farms are expensive relative to the amount of food they produce. They are a drain on foreign exchange and require considerable local funds to remain in operation. Although they provide the region with new roads and electricity, good farmland and jobs have been taken away from local farmers. The level of technology and water control is such that it has little spillover effect on local production techniques. In addition, no research or extension is provided to local farmers so that they might improve their levels of production of traditional crops.

The main crops chosen for state-farm irrigation—rice and sugar—demand more water than any of the traditional crops of maize, sorghum, or sesame. In addition, irrigated varieties of rice and sugar require a higher, constant level of chemical fertilizers and pesticide than traditional crops, all of which require scarce foreign exchange. Without a controlled water regime (and a guarantee of other input supplies like fuel, machinery, and spare parts), plants with high crop water requirements are uneconomic and often produce less under unimproved conditions than traditional crops. Currently, large-scale projects in Jubba Valley operate only in a semi-controlled environment, making them less productive than their feasibility targets. Somali and foreign donors have gone to great expense to construct productive irrigation projects. However, because other factors necessary to support high levels of production cannot be secured when needed, the country has not fared as well as it might have if the funds invested in the large projects had been used to bolster the traditional food-producing sector.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

State farms that currently exist need to increase their productivity. *Juba Sugar Project should not expand its productive area, but should concentrate on improving the ratio of sugar to cane production on the area now under cultivation.* Studies should be made to see what can be done with the rest of the area that was earmarked for Phase II. Suggestions include:

- reforestation to supply future building wood and firewood to the growing urban areas of Jilib, Kamsuuma, and Bu'aale;
- smallholder staple crop and fruit crop production based on family farms with some small improvements in technology such as water control, improved seeds, and inputs; and
- fodder crop production for sale either to feedlots in the area or to transhumant herders at fixed sales points on the periphery of the project area.

A combination of all three of these land uses would incorporate the needs of various groups of local inhabitants as well as that of JSP.

Smallholder families—chosen from the families who lost their land to the project in the beginning—could feed themselves and provide any surplus for sale to full-time project employees. If wage incentives improved, some smallholder family members would be available as labor for the Juba Sugar Project on a more stable basis than at present.

Further, fodder crops could be a lucrative income earner for the project (which might receive backwater and land preparation charges), and for individual growers. Pastoralists would benefit from additions to their herds' diets in seasons of insufficient graze and browse. This would partially offset some of the losses of natural food sources taken up by additional irrigation along the river and a possible narrowing of the floodplain.

Finally, proceeds from a well-managed woodlot could be shared by the project and local woodcutters on a basis that is mutually agreeable. As wood resources dwindle and demand climbs, value of such woodlands will increase. Locating a reforestation project so close to areas that are expected to expand rapidly will be a boon to the finances of both JSP and local woodcutters. *It is recommended that the villagers of Cabdulli Kakane be involved in the selection of tree species for planting since they are already specialized in tree cutting, dressing, and furniture making.* People from this village can be used to train others in their craft.

Similar recommendations are made for *Fanoole Rice Project and Mogambo Irrigation Project which should restrict the areas they use to produce rice until production efficiencies begin to approach economic levels.* The remainder of their areas should be turned over to individual farm families. The block system of production (which has groups of 20 farmers growing the same crop as a block) should be abandoned in favor of individual parcels. Farmers may choose to work as a group or individually. Government resources should be fun-

neled into extension techniques that work for irrigation options that are not highly dependent upon costly inputs. Areas of Fanoole and Mogambo can be turned over to production of fodder, orchards, or wood to supply local communities in need of these products. If fruit is produced, it should not be cultivated as a plantation monocrop so that the maximum return benefits the local economy.

Using idle project land to grow local crops for local purposes will be more economic than keeping land out of production.

The high foreign exchange component of these projects, their level of hard-to-maintain technology, and choice of high water- and input-demanding crops militate for further study into the most economic crop mix for the state farms overall. In judging whether to continue a policy of import substitution or favor one that elevates local and national incomes, the government must consider the degree to which state farms take productive resources from local farmers and contribute to problems of rapid urban growth, rising joblessness, and mounting import-related debt. Because state farms have historically cost more than they produce for the economy, *it is recommended that smallholder farms be favored over state farms in the future choices of agriculture for the Valley*. Such a choice not only favors agricultural production, but also may help the herding sector which is currently blocked from access to the river at many points by state farms. Close association between farmers and herders generally benefits the diets of both groups through exchanges of livestock for agricultural products.

2. Impacts of Private, Commercial Irrigated Farms

Impacts

Landholding Patterns

From the 1950s, when Italy recovered Lower Jubba Valley from Britain, through the 1970s, Somali bananas received favored treatment on the Italian market. Record exports from Jubba Valley were reached in 1972 with 73,282 tons, but conditions imposed by the new Revolutionary Government of Somalia led many expatriate banana producers to leave the country. The area under irrigated bananas fell from nearly 4,000 ha in 1974 to under 1,000 ha by 1981 (National Banana Board Statistics, quoted in Samantar 1985). Since this time, plantation areas have been expanding again, primarily under Somali ownership. By 1987, 2,300 ha under 51 estates in Jubba Valley were again planted to bananas (Evans, Cullen, and Little 1988).

In a sample of nine banana plantations, Evans, Cullen, and Little's study found a great deal of variation in the amount of land controlled by the various estates. The largest plantation is the former *Societa Romano*, now owned by Beder, which covers 2,300 ha. The smallest farm in the sample covered 47 ha. The Beder estate had only five percent under bananas while the smallest farm had 93 percent planted. The average was 14 percent for all nine farms, but without counting the large, unused portion of the Beder estate which skews the average, 23 percent of plantation area was planted with bananas (Evans, Cullen, and Little 1988).

A large portion of banana farms are fallowed at any one time. Water-logging or salinization of soils can cause large tracts to be taken out of production for a number of years. Other portions of banana estates are often used to grow other crops. For example, irrigated maize is grown on the Beder plantation, but the area used for this crop is unknown (Cullen, personal communication).

The impact of these plantations on local landholding patterns was most keenly felt 20 or 30 years ago when the initial plantations were established. Despite independence in the 1960s, villagers never recovered lands which were lost to the Italian plantations. The plantations took most of the best riverine land from just below Kamsuuma to the southern end of Jamaame District out of household subsistence production. The loss of riverine land meant that local farmers had to move out onto dhesheeg and rainfed areas where production was less secure. Many farmers who were forced to cut farms out of the bush on the west bank lost these as well to the Mogambo Irrigation Project. Whereas some farmers lost land to new banana plantations in the 1960s and 1970s, in many instances, the plantation owners helped the villagers clear new land in the nonriverine areas. The state farm projects have never done this.

With pressure from private, commercial and state irrigated farms in the area, Jamaame smallholders have been forced onto less fertile lands which are further away from their villages. Travel time to these new fields adds considerably to the economic if not financial costs of family production, and land remaining for the family near the village is often too

small to subdivide for heirs. Because of these two factors, a number of households and perhaps whole villages may move altogether in the next few years out to the areas of their new farms.

Costs of Production and Yields

Banana production in Jubba Valley is oriented toward the export market. The costs of developing a hectare of new banana land is approximately 60,000 SSh (Evans, Cullen, and Little 1988) which is approximately U.S. $600.

Bananas are susceptible to bruising and wind damage to both the fruit and the roots; consequently, much of the fruit does not pass the standards set for export. According to the banana marketing agency, Somalfruit, approximately 25 percent of total production is damaged and thus retained for sale on the local market (Somalfruit 1987). Yields are slightly less than 20 t/ha. About 14.5 t/ha are exported. Export yields of the banana-producing countries of Central America are commonly in the range of 25 to 50 t/ha (MMP 1987).

Production on many banana farms suffers from insufficient water during some seasons, flooding, saline soils, and inexperienced management. Further, there is little or no agronomic research or extension service to aid producers. Some of the areas first planted with bananas by the Italian colonists have become infertile due to misapplications of water that have led to salinization of the soils (Menkhaus 1988). Other areas that continue to produce are under the threat of the same thing occurring.

Impacts on Foreign Exchange

Somalfruit, which has Italian management and 51 percent Somali government participation, acts as the sole agent for exporting bananas and the sole supplier of inputs used by the estate owners.

Foreign sales are entirely in the hands of Somalfruit which ostensibly returns half the value to the producers (in local currency) from which the cost of inputs incurred on credit to Somalfruit are deducted.

The portion of the official export price that Somalfruit reported paying to producers was 18,900 SSh/ton. Producers interviewed by Evans, Cullen, and Little reported receiving a maximum of 15,000 SSh/ton. According to interviews with Somalfruit, Evans, Cullen, and Little were told that most of the agency's share of the export price was used to purchase and import inputs for banana production and that their profit was only four percent of total export earnings. Therefore, little foreign exchange is left for the country to use for other purposes.

Impact on Local Incomes and Household Economic Strategies

Some 9,400 workers are employed in the banana sector. On average, they earn 150 to 200 SSh/day, but this varies widely with the tasks performed and whether the worker is part-time or full-time (Evans, Cullen, and Little 1988).

An average estate employs 31 workers full-time and 122 part-time, but again, this varies widely with the size of the estate and the amount of land it has planted. Many of the part-time workers are women and children. Women, in particular, carry hands of bananas from where they are cut to the transport trailer. This tasks pays as little as eight to 10 SSh/day (SEBS Field Notes).

Although banana farm wages average about 150 to 200 SSh/day, workers also receive occasional gifts of green bananas that are too damaged for export. In some seasons, these bananas constitute an important part of the local families' diets. For some people, this addition to the family diet is more important than the wages *per se* (Menkhaus 1988). In addition to regular wages, permanent banana workers often receive small plots of fallowed plantation land to use for family food production (Menkhaus 1988). Additional bananas and plots of land are the incentives that banana estates use to attract and keep labor. In general, physical, agronomic problems of soil and water are more serious constraints to expanded banana production than the labor.

Nevertheless, migration to towns in search of other work is highest in the areas around the estates. Young people go to Muqdisho or Kismaayo to work as cooks, waiters, or servants. Many men travel seasonally to Jamaame, Jilib, or Kismaayo to work on house construction, and many of the construction laborers in Muqdisho are from Lower Jubba Region. Although the banana estates absorb some of the local work force, they do not provide sufficient work or wage opportunities to employ all of the local inhabitants of working age.

Evans, Cullen, and Little's work on the benefits of banana production to the locality showed that about

40 percent of the export revenues generated by this crop remain in the region (Evans, Cullen, and Little 1988).

Culled bananas, released onto the domestic market, have an impact on income multiplication in the banana-producing areas and beyond. Culls are picked up from the grading stations by the trailer load and redistributed through marketing networks to most cities and towns of southern Somalia. The official price for these culls is 4,000 SSh/ton, rendering a retail price of two to three shillings per piece. Therefore, culled bananas provide a network of people with a source of income. If the figure of 25 percent of banana production that is rejected and ends up on the domestic market is correct, then this amounted to 5,677 tons in 1987. At least 22.7 million SSh will have to be earned to recover the purchase price of these bananas from Somalfruit.

Impact on Health and Nutrition

Unripe bananas given as partial wages have augmented family diets. Additionally, occasional use of fallow banana lands to grow some family food has helped cover the food requirements of workers' families.

However, as with the state farms, the loss of primary family farm land to banana estates has had a negative effect on local nutrition. Wages earned do not cover the costs of purchasing food needed to sustain the family. Even with three family members earning the average daily wage on a banana plantation, important needs such as clothing and medical care cannot be covered. Wages on irrigated farms are usually earned as a supplement to other sources of income or sustenance and cannot substitute for other sources on a sustainable basis.

Irrigated farms, such as the banana estates, that grow crops destined for outside the region, have impaired local nutrition. The more efficient the estates are and the higher the percentage of production that is put on the export market, the more local and national nutrition will suffer.

Health Impacts

Some of the highest levels of malaria and bilharzia in Jubba Valley were found by the JESS epidemiological team in the areas contiguous to the banana estates (Klumpp 1988; Warsame 1988). Other diarrheal and waterborne diseases listed in the section on large, irrigated state farms can and do occur in the private, commercial estates as well. Jobin mentions that hookworm has adapted to the moist, clay soils of banana plantations in Somalia (Jobin 1988).

Impacts of Banana Estates on Herding

Impact of the banana farms on the livestock sector is similar to the effects on that sector created by the state farms.

Banana plantations are situated on prime floodplain land and have therefore occupied large tracts of what was formerly riverine forage used by pastoralists. In addition, banana estates have altered the water regime in Lower Jubba Region through the construction of dikes, flood protection walls, weirs, and canals. In many areas, former dhesheegs have been leveled, diked, and turned into banana farms. This has altered the vegetative environment in areas well beyond the banana estates and affected available graze and browse throughout a large portion of Jamaame District.

Unlike some of the state farms, the banana plantations do not produce by-products that could be used as animal feed. JESS team members have never observed banana leaves being consumed by livestock, although they are sometimes used for roof thatch.

Like the state farms, banana plantations block pastoral access to the Jubba River. The few potential watering access points that exist between plantations are often too steep or otherwise inappropriate for livestock use.

Untrimmed bush, which is allowed to grow up around irrigation canals, provides an additional habitat for the tsetse fly which creates an increased health threat to livestock. This is also true for much of the banana land that reverts to bush during fallow periods.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Despite the fact that banana production is one of the main earners of foreign exchange, *a detailed study must be carried out to see whether plantation agriculture (and specifically, the choice of cultivating bananas) is the best economic use of agricultural lands in Lower Jubba Region.* The study should be carried out before any more land is put into production in this way and with this crop.

Evans, Cullen, and Little's study showed that maize generates more local income than bananas. The long-term, best interests of Somalia require it to

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determine whether bananas contribute sufficiently to the national income and foreign exchange position to warrant the loss of maize production and income generation in Jubba Valley. To make this determination the government must clarify the division of foreign exchange earnings between the Somali state and Somalfruit. Independent banana growers are apparently losing money (Evans, Cullen, and Little 1988) and yet, the area under bananas continues to expand. Planners need an economic study to decide whether cultivation of bananas or some other crop constitutes the best use of national and valley resources and will return the most benefit to the country.

If banana production is found to be a cost-effective use of resources, *efforts must be made to increase yields per hectare before expanding hectarage.* Much more can be done to improve water-use efficiency and to reduce the fruit damage that limits the percentage of the crop exported. *The agricultural research station at Yontooy should be refurbished with trained staff and equipment to improve yields of commercial crops, such as bananas and cotton, as well as consumer crops, such as maize and sesame.* As in the case of the proposed research station at Baardheere, *staff need more training in the field* for more familiarity with local production problems before designing a research program. The same can be said of a renewed extension staff. In the case of all crops grown in Jubba Valley, efforts should focus on improving local crops in local conditions before moving on to new crops and technologies.

In some cases, the size of plantation land runs counter to national land laws. Much of this land is often held out of production. This is a waste of precious national resources, particularly as many farmers near the holdings have little or no land left. Cases of *excess land concentration should be controlled and land distribution should be carried out on an egalitarian basis* if food production levels are to be maintained. Keeping land out of productive use only creates pressure for increased food imports.

3. Small-Group Irrigated Farms

Impacts

Impact on Land Holdings and Succession

According to SEBS data, 19 percent of all valley plots are irrigated. The mean irrigated plot size is 9.4 ha as opposed 2.9 ha for nonirrigated plots. Small diesel pumps service up to 10 ha of land. Therefore, the capital outlay for a pump cannot be justified and recovered unless an area is irrigated well in excess of the average nonirrigated farm. Pump-owning farmers must either have large plots to begin with, acquire additional land, or use a pump to irrigate plots adjacent to their own. In the absence of having land of his own, a pump owner (typically a local merchant or entrepreneur), seeks farmers who are willing to consolidate their land and together, farm a large plot made up of contiguous smaller plots.

Labor

Because pumps are the scarcest commodity in the irrigation formula, the size of irrigated plots increases in excess of those normally held by a household. The result is an increase in labor input per unit area. The economic benefits of irrigation accrue to both pump owner and laborers. In most cases, the need for increased labor in irrigation results in sharecropper arrangements.

Costs of Production and Nature of Land Use

Irrigated agriculture is dominated by the production of cash crops to cover the capital investment costs of pumps and recurrent costs of diesel and maintenance, plus costs of transporting goods to market. An increase in group irrigation has resulted in a decrease in proportion of land allocated to traditional subsistence cereal crops.

Irrigation makes it theoretically possible for continuous cultivation throughout a yearly cycle. In practice, most Jubba Valley irrigators follow the same cultivation cycle as nonirrigated farms because irrigators want to take full advantage of the rain and use irrigation only for supplemental moisture. Although irrigation helps insure two harvests per year, the strategic reliance on rainfall alone in any cultivation season has a particular benefit for the sharecropper who owns his land but not a pump. If he makes no use of the pump owner's services in a season, then the pump owner has no claim to half the harvests. However, if the pump delivers even minimal water to the plot in a season, the pump owner takes his half.

Improved Nutrition

Small-group irrigation usually has a positive impact on local- and national-level nutrition. In the absence of irrigation, production under rainfed and flood-recession conditions is limited mostly to staple

grains cultivated primarily to meet household subsistence needs. These basic crops include maize, sorghum, and sesame, with some mangos and bananas in certain locations.

There is little variety in the diet and a marked absence of fruits and vegetables. For example, in Jubba Valley among urban, agricultural riverine and agricultural nonriverine households, over 80 percent never eat leafy greens. Section III.G, *Household Nutrition*, indicates the high proportion of individuals in each sector who do not eat fruits and vegetables. Under small-group irrigation, a greater variety of crops is grown (especially vegetables), with an emphasis on tomatoes and onions. These crops are eaten by the farmers but are grown primarily as cash crops for local and regional markets, thereby improving the variety of foods available for purchase.

Not only does small-group irrigation increase the variety of foods, it also increases the reliability of foods. Irrigation eliminates the production uncertainties due to dependence on rainfall and flood. Because of the possibility of year-round cultivation and staggered harvests, irrigation can end the chronic food shortages before harvests when labor demands are high, food supplies low, and wet-season diseases at a peak.

Irrigated production of cash crops of fruits and vegetables removes some land from staple grain production. However, the greater grain yields produced with irrigation mean that there may be little decrease in total amount of staple grains available. Significant cash incomes for farmers who practice irrigation give them disposable resources to augment their diets with purchased foods, including a steady source of protein.

Local Incomes

Group irrigation has a profound impact on local incomes. For example, nonirrigated farm income is only 13 percent of irrigated farm income—an average of 8,000 SShs as opposed to 60,000 SSh annually. Average income among farmers who irrigate rises to 146,000 among those in urban areas whose more immediate access to markets has an appreciable effect on cash earnings.

Health

Small-group irrigation has a positive impact on health by increasing the variety of available foods, especially fruits and vegetables. The availability of a varied diet can have a significant impact on anemia and other nutritional deficiency diseases especially common among pregnant and lactating women in Jubba Valley.

Small-group irrigation currently has little impact on the quality of drinking water. There are few fertilizers or pesticides presently in use, so there is little threat of contamination. However, drainage must be monitored carefully when more fertilizers and pesticides become available. Families generally do not live adjoining their fields, so irrigation does not affect their source of drinking water.

However, small-group irrigation in Jubba Valley produces relatively little or no standing water. Nonetheless, as currently practiced in Jubba Valley, small-group irrigation poses a threat for increased waterborne diseases.

Herding

Elements of competition as well as complementarity exist between farming and herding depending on the type and scale of farming. Cultivation displaces natural vegetation which would otherwise be available as livestock forage. Nonirrigated farming produces maize and sorghum stalks and sesame cake residue as a by-product subsequent to oil extraction, all of which provide edible fodder for livestock. For maize and sorghum, the edible grain residues are three to five times greater than the weight of grain produced (AHT 1988; MMP 1987). In fact, the production of grain residues as fodder for livestock among dryland agro-pastoralists is an important drought-coping strategy in years when insufficient rain results in little or no grain harvest.

In contrast, group irrigation produces cereal crops, (some of which are irrigated—primarily maize), and vegetable cash crops. Although group irrigation takes some land out of production that would have been natural forage for livestock, irrigation intensifies production and helps to ensure two harvests per year. Generally, more crop residues are produced by group irrigation.

Although group irrigation produces valuable residues for livestock consumption, the character of pastoral-sedentary relations is increasingly commercial in nature. The high overhead costs of irrigation, coupled with the potential for high returns, makes the nature of irrigated agriculture distinctly different from nonirrigated crop production. All yields, including crop residues, have a cash value—

consequently, visiting pastoralists are less likely to be allowed free grazing of harvested croplands now than in the past. For example, near Baardheere, sorghum stalks are sold to pastoralists for as much as three to five shillings per stalk.

Additionally, from Baardheere north to above Luuq, much of the narrow floodplain (cultivated and bushland) has been enclosed by farmers living in the floodplain—many of whom are involved in group irrigation. The result is that much of the floodplain grazing above the dam has been excluded from pastoral use or is accessed only in conjunction with a rental fee. Enclosure is not so much an anti-pastoral movement among settled farmers as a manifestation of increasing pastoral settlement, especially in the past 25 years, in response to drought and increased human and livestock pressures on pastoral resources. This form of agro-pastoral settlement reflects a desire for a more risk-aversive livelihood through economic diversification. Irrigation, more than any other intervention, minimizes crop risk. The riverine area above Baardheere has been particularly favorable for agro-pastoral settlement due to a largely tsetse-free environment which favors livestock production in conjunction with cultivation.

Household Economic Strategies

Group irrigation encourages the consolidation of household labor by increasing the need for labor inputs as well as yielding higher incomes for investment in livestock and family-run ventures. However, irrigation tends to change the division of labor between men and women. Irrigation, associated with cash crops, is dominated by male involvement, whereas women's labor is relegated to tending subsistence crops. In households, a wife typically is sent out to care for livestock, while the husband and any remaining spouses remain at the homestead. Because of this sexual division of labor, group irrigation tends to exacerbate wealth inequities between men and women.

Labor and Migration Patterns

Group irrigation increases local economic opportunities. It helps consolidate household labor in family-managed enterprise, and retards patterns of outward rural-urban labor migration.

Investment Requirements

The obvious investment requirement for small-group irrigation is the purchase of a pump, costing an average of U.S. $3,000 or about U.S. $320 per ha per average irrigated farm of 9.4 ha. Estimated total cost of developing small-group irrigated farms is U.S. $440 per ha (MMP 1987). The costs of developing small-group irrigation above pump costs are attributed mostly to tractor fees and rental of large equipment for land-clearing and leveling as well as other labor costs. In contrast to large-scale irrigation, small-group irrigation is typified by low overhead costs, low input levels, and low-technology solutions to engineering and other problems. In general, small-group irrigators use few (if any) inputs of fertilizer, insecticide, or improved seed (with the exception of onion seeds).

Administrative Burden

The administrative burden of small-group irrigation is practically nonexistent. Group irrigation is self-sustaining and self-maintaining; otherwise, it would go out of business. It may place some minimal burden on infrastructure in terms of maintenance of roads.

Multiplier Effect

The multiplier effect is much higher for small-group irrigation than for state farms and private, commercial farms. For example, the returns of income to the community is 40 percent for bananas as opposed to 89 percent for maize. Households tending nonirrigated farms provide for their subsistence needs but rarely produce more than a 10 percent surplus for market exchange (Evans, Cullen, and Little 1988). Most workers on state farms and private, commercial farms earn a meager wage which, at best, covers minimum subsistence needs and leaves little or nothing for investment. Small-group irrigation is significantly different in that subsistence crops continue to be grown to cover most household needs. However, income from cash-crop sales enables considerable discretionary spending in local markets and towns as well as major investment in additional irrigation pumps, trucks for marketing, investment in shops and real estate, and livestock. Small-group irrigation yields substantial returns which are then redistributed through the local and national economies.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Small-group irrigated farms have demonstrated an ability to increase food production for local and national consumption. They have augmented incomes of pump and landowners as well as labor

involved in small-group irrigation. They are generally compatible with herding interests.

The construction of the all-weather road linking Jilib and Baardheere will be an incentive for expansion of small-group irrigation in Middle Jubba Region. The new road will enhance the delivery of necessary irrigation inputs (especially diesel fuel), and enable year-round marketing of produce. The major population growth of Baardheere resulting from dam construction will create an expanded market for produce from new, small-group irrigators.

Small-group irrigation will be significantly enhanced by the permanent and reliable source of electricity made available by a power line running from Baardheere Dam to Kismaayo. The line should be extended upriver to Luuq as well. This line could provide low-cost electricity to power small irrigation pumps for farmers throughout the valley.

Jubba Valley development programs should place a particular priority on electrification of pumping in irrigation development under any of the irrigation options. Electrical energy, especially from local hydro sources, has cost, reliability, and other advantages over fossil-fuel energy for agricultural production.

Pump models should be limited in number to facilitate servicing and delivery of parts to pump owners. Availability of small pumps will be enhanced by reducing import restrictions to a minimum.

Effort should be made to train mechanics skilled in small pump repair and to post them in Middle Jubba Region and elsewhere where requisite skilled personnel are needed. The training of pump mechanics would be an appropriate PVO project.

Small-group irrigation will be enhanced by reliable supplies of diesel fuel throughout the year.

Production will be increased by the greater access to improved seed varieties—in particular, improved fruit and vegetable seeds available for purchase in local markets. In the case of onion seeds, increased availability will be enhanced by improving import channels. Maize production will be enhanced by increased availability of maize varieties most responsive to irrigation. Sorghum production can be increased by access to improved varieties developed at the Bonka Research Station in Baydhabo.

Following closure of the dam, all riverine farms will be deprived of the nutrient-rich silt load derived from recurrent floods. To maintain rich soils, irrigation of all types will require the availability of low-cost fertilizer.

Small-group irrigators should be encouraged to practice mixed cropping including staple grains with stubble available for livestock and marketable fruits and vegetables. The availability of grain stubble will enable farmers to keep their own livestock near home or will feed transhumant herds, which will help ensure a supply of milk.

JESS recommends the expansion of small-group irrigation production as the benefits to local incomes are significant.

4. Household Irrigation

Impacts

Household-level irrigation requires little capital investment and does not drain foreign exchange. All management decisions are made at the household level. Flood-recession irrigation enables many independent producers to meet their families' subsistence needs in addition to supplying a variety of crops for sale. Engineering a supply of water for flood-recession cultivation enables successful farmers to continue irrigating rather than reverting to less productive and less secure rainfed agriculture.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The least expensive way to supply water for flood-recession cultivation is through a controlled flood. This strategy is being practiced in the Senegal River Valley as an interim measure while irrigation works are gradually developed. Authorities there had agreed from the beginning to create a controlled flood for 15 years after the closure of the dam at Manantali to offset losses in flood-recession land due to regularization of the Senegal River's flow. In fact, the rate of hydro-agricultural development on the river is not keeping up with the need to develop irrigated land for farmers who have been dependent on the river's flood cycles for their families' welfare. Therefore, more recently, authorities have been exploring an option that would continue the controlled floods for an indefinite period while only minimally compromising dam performance.

Under the rubric of improved recessional agriculture, a flood would be programmed to a particular contour level in natural depressions but would not last long enough to give the land the soaking it requires. Farmers would have to harvest the floodwater through dikes and channels on their plots to get maximum food-production benefits. Working through local land-tenure and community institutions, development agents would extend improved water management practices to the farmers. Farmers would have to adapt to floods of insufficient duration for agricultural production under post-dam river management by improving their water management practices.

Capital investment per hectare in this type of hydro-agricultural development would be small enough so that large areas could be developed more rapidly than can now be realistically anticipated. The main investment would be in extension training. Farmers would themselves do most of the land improvement on their own plots. In Senegal, this is also seen as a possible transition to irrigation systems with higher levels of water control. Of course, to what degree farmers will be generating income surpluses that might eventually be invested in a pump or masonry regulatory structures on their plots is open to speculation.

The improved recession approach to developing household irrigation builds on the local institutional base. It does not challenge land tenure and resource rights in the ways of the state farm and private commercial farm irrigation options. It is within the management abilities of the local political structure.

Therefore, *the JESS team recommends that this formula for hydro-agricultural development of flood-recession land be seriously studied as an option for development along the Jubba River.* It simply builds upon, extends, and adapts the mandate of local institutions and may also be the most cost-effective option to increase agricultural production and the welfare of families in the area.

5. Summary

Impacts

There are currently three types of irrigation systems operating in Jubba Valley:

- state farms;
- private, commercial farms; and
- small-group farms.

Each irrigation type has its distinctive technical, managerial, and socioeconomic profile.

State farms are large operations, centrally managed by professional, often expatriate, staff. They take advantage of economies of scale to produce on a large scale for consumption outside Jubba Valley and outside Somalia. Lands enclosed in their perimeters have been sequestered from the productive resources of neighboring villages and pastoral groups. Local farmers are employed on the state farms as agricultural laborers. State farms require heavy capital investment to develop as well as access to considerable foreign exchange to operate. They may generate foreign exchange by exporting a share of their production. Incidence of waterborne diseases often rises in the vicinity of state farms.

Private, commercial farms are generally much smaller than state farms. They produce food crops (mainly bananas), for market either in Somalia or overseas. They are organized as a private enterprise with the owner as manager. They also enclose lands that have been sequestered from village resources thereby reducing local production of food staples. In practice, members of local farm families provide agricultural labor for the operations of these farms. The investment for development of a private, commercial farm is less per hectare than for a state farm. Private, commercial farms generate considerable foreign exchange receipts. Incidence of waterborne diseases may also rise in the vicinity of private, commercial farms.

Small-group farms are organized by village landholders as a way to benefit from the availability of a pump. Villagers often consolidate contiguous plots in a shareholding arrangement with a pump owner. Capital investment in a small-group farm is limited to the cost of the pump. Infrastructure is developed by hand by the group members. Small-group farms have a positive impact on local food availability and local incomes, but they do not generate foreign exchange. Incidence of waterborne diseases may also rise in the vicinity of small-group farms.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Increasing the efficiency of production of irrigated state farms will require further inputs and a reliable supply of fuel, technical and managerial expertise, labor, and foreign exchange for spare parts and replacement of equipment. Increasing their efficien-

cy is desirable and can be helped by building the Baardheere Dam. However, JESS strongly recommends that no more state farms be created in the Jubba Valley.

JESS recommends encouraging small-group irrigation as one model for future development of the valley. Small-group farms are very productive requiring little input from outside and not draining national reserves of foreign exchange. Small-group irrigators substantially add to national food supplies and improve the diet by adding variety to the foods available for purchase. Small- group irrigation is the form of irrigated agriculture most compatible with the needs of livestock production allowing foraging on crop residues and better access to riverbank watering sites. Small-group irrigators have been very successful in Jubba Valley with little or no outside intervention; they illustrate the resourcefulness of independent entrepreneurs.

In addition to small-group irrigation, JESS recommends a second model of irrigation for replication in Jubba Valley—household-level irrigation. Currently, many households independently practice simple techniques of flood-recession agriculture in the dhesheegs and on riverbanks, relying mainly on floods to deposit water and soil nutrients. Closing of Baardheere Dam will prohibit flood-recession irrigation unless dam management includes directing water to these areas. JESS strongly recommends that water periodically be supplied to flood-recession areas so that household-level irrigation can continue. There are basically three options for supplying water to these areas: using pumps (preferably electrical when electricity is supplied to the valley); digging canals to connect the river with some dhesheegs; and engineering an overbank flood. Given the variety of land irrigated by flood recession, different options will be appropriate in different locations. All three options must be studied in more detail.

E. Urbanization and Economic Growth

1. Increased Horticultural Production

Impacts

The demand for food by residents of the region, particularly in the urban centers, will increase with population growth. In addition, patterns of demand in the urban centers will include more fruit and vegetables than are currently in rural diets. Therefore, producers will be encouraged to produce more vegetables and fruits and to diversify their production systems more then they do now. Patterns of food demand in growing urban centers will be an incentive to increased horticultural food production in the small-group irrigation systems especially on the fringes of the growing urban areas.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

As urban centers and villages in the region grow, demand will grow for fruits and vegetables that can be grown locally on irrigated plots. To ensure that farmers garner income from such increased demand and potential sales, land near towns and villages that is close to the river and suitable for irrigated production should be made available to farmers to grow these products. Access to markets should also be promoted so that local farmers can capture the markets for such products. Without improved methods of production and access to markets, the farmers and the region, as a whole, will not benefit from the changed agricultural conditions in the valley.

2. Increased Demand for Milk and Meat

Impacts

An increase in urban population will create more demand for milk and meat. Expanding possibilities to sell milk in these newly enlarged urban centers will cause changes in patterns of livestock movement. Some herders will have incentives to take advantage of the proximity of the market to settle their herds on the urban fringes, feed them on crop residues, and sell their milk in the immediate neighborhood. The expanding market will also boost the incomes of local pastoralists.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Efforts should be made to keep the livestock economy viable so pastoralists can help satisfy local food demand and increase their own incomes. Markets must remain accessible to them for meat and milk sales, and the possibility of exporting animals into Kenya or through Kismaayo must be insured.

3. Water Use and Sanitation

Impacts

One consequence of urban growth is the need for potable water and sewage disposal. At present, most communities use river water as their main source of drinking water and, in some cases, water from wells. Incidence of disease is quite high from the consumption of river water contaminated with wastes,

organic debris, and chemical runoff from irrigated farms. Moreover, the expansion of irrigated agriculture in Jubba Valley will increase the level of contaminants in the river.

The increase in urban population will also aggravate problems of disposal of human wastes and debris.

Finally, standing water in the vicinity of human living space will grow with the growth of the urban areas. As a consequence, the incidence of certain waterborne diseases will rise.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

As urban population grows and demand for water and sanitation facilities increases, measures will have to be taken to ensure better water quality than is currently available to prevent the spread of waterborne diseases. Provision will have to be made to purify river water in at least the larger settlements. Additional wells will have to be constructed in some villages to take advantage of available groundwater resources; this will also require planning and expenditures. Measures will have to be taken to dispose of waste and eliminate areas of standing water to curtail the incidence of waterborne diseases.

Health care facilities should also be installed at urban centers to help ameliorate epidemiological conditions which may become worse with urban growth. Dispensaries should be installed wherever possible to provide better health care.

4. Construction of Residential Subdivisions

Impacts

Unplanned urban growth has resulted in chaotic subdivisions of low-quality housing with inferior services in many cities in Africa.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Planning should begin immediately for the Jubba Valley towns that are expected to grow most dramatically to lay out subdivisions in a systematic way and begin to develop the social infrastructure to support the growing population in a safe and sanitary environment.

5. Pattern of Food Demand

Impacts

Increased urbanization and its concomitant changes in food demand will affect patterns of commerce and local agricultural production. Undoubtedly, some portion of the newly enlarged population will increasingly demand imported foods such as pasta and wheat in the form of bread, and prefer rice to maize. High levels of demand for exotic products could offer opportunities for merchants who import and sell such products, but could also dampen demand for locally produced maize. The structure of the increased demand may be the key to the economic viability of the small farm sector and the irrigation systems for the small producers that are now being considered.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Preventing imports from arriving is an unrealistic measure as merchants usually find a way to import what the market demands. Aside from encouraging production of local products such as fruits, vegetables, and grains, little can be done to ensure that local products are consumed in the urban areas. Price levels can affect some patterns of demand, but it is difficult to stabilize prices, and short of a national ban on food imports, there is no way to keep food imports out of the region.

6. Housing Construction Fuelwood Demand

Impacts

Enlargement of the urban centers in the region will require materials and mobilization of a work force to carry out the construction. New residents in the region will determine how elaborate the houses will be—whether they will be built of locally available materials (mud and thatching), or require cement blocks and more elaborate materials. The demand for fuelwood and wood for construction will have an impact on the environment, since there are no measures in place at the moment that ensure reforestation and ample supplies of wood for fuel or construction purposes. The need for materials of any kind may be above the capacity of the region to satisfy them.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Surveys of wood resources indicate that there is little large timber left in the region for construction purposes, which means that other materials must be substituted. For the construction of modest-sized structures such as houses, ample wood is available, though probably not very close to some of the towns that are expected to grow. It would be advisable to investigate the possibility of using other products that could be produced locally, such as mud bricks, or cement blocks (if cement becomes available), to lessen the demands on local wood.

Adequate fuelwood appears to be available to meet present demand, but as the region's population grows, demand for fuelwood will grow accordingly. There are presently no provisions to reforest any areas or renew wood supplies that will undoubtedly begin to diminish at an increasing rate. At the moment, no specific measures can be recommended to reduce demand, since the situation is not yet dire. However, the situation should be continuously monitored to see if conditions change in any alarming way. Solar- powered stoves and more efficient wood burning ones should be recommended for local use, but, in the long run, it will be the use of other power sources that preserves the forest areas.

Resettlement of large numbers of people in any one spot should be avoided to reduce the strain on existing wood supplies. Deliberately promoting concentrated growth in urban centers will put an unnecessary strain on supplies on wood for construction and fuel. Where possible, such concentrations should be avoided.

7. Employment

Impacts

Many jobs will be created by the road and dam construction. These will be filled partially by local labor. There will be demand for unskilled and semi-skilled manual laborers as well as office and managerial workers. The local labor force will undoubtedly not satisfy the huge demand for workers, necessitating a large influx from outside the region. Other jobs will be created in services. However, recent research in the region shows that urban growth in Kismaayo and Jilib contributed to increases in retail business, transportation, and licensing for various kinds of agents, but did not increase manufacturing.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Little, if anything, can be done about filling these jobs if the local labor force is insufficient in number or without adequate skills. Therefore, the expansion and improvement in quality of the educational facilities is a prerequisite to providing valley residents with local employment opportunities in Jubba Valley towns.

8. Income/Revenue Generation

Impacts

Patterns of income generation and distribution will change dramatically throughout the region. First, it is clear that certain producers will be displaced as irrigated production in state farms and private, commercial farms sequester larger tracts of village lands. Many farmers will have to change their household economic strategies to increase dependence on dryland resources away from the river. In addition, if patterns of demand change with the growth of urban centers, they may be hard-pressed to remain economically viable.

Virtually no inputs for road or dam construction are produced in the region. There is no local cement production, no steel production for local purchase, and there are no viable construction companies that could offer the needed services for dam or road construction. The only locally available input is labor, and it is assumed that much of the labor will originate elsewhere. Therefore, implications for the economic impact of the dam construction and other developments is that most of the purchases made for inputs will come from outside the region. Labor may return some of its revenue to the region in the way of consumption but, overall, relatively little income from the huge expenditures will ultimately accrue to the region. Moreover, the multiplier effect of retail shopkeepers increasing their turnover is a limited boost to the local economy.

Pump maintenance services may increase in the region as irrigated agriculture grows, which would be helpful for local revenue generation. However, this would be a small increase in commerce compared to the amount expended for road and dam construction, and the income generated and multiplied throughout the region is not likely to have a dramatic impact on the benefit to the region.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Research recently completed in the valley indicates that income generation is greatest when locally produced products are marketed and consumed within the region. Therefore, where possible, local products should be used for construction, and more importantly, locally produced foods should be promoted so that income generation from the increase in urban population can benefit the region as much as possible. Consumption of imported foods should be discouraged where possible, and consumption of locally produced foods should be promoted so that the predominant irrigated production systems will show economic returns to the region.

9. Trade with Kenya

Impacts

Growth of urban centers will spur an increase in demand for products that are not produced in Somalia—particularly those imported from Kenya. The importation of food items as well as household products will increase in volume from Kenya, since a link already exists and many products are available there (those produced in Kenya and imported from Asia). This may lead to further expansion as transit points for the towns through which the trade passes. It may have a dampening effect on local food production if imports compete with locally produced ones for consumers' preferences. Imports of many small items may discourage local manufacturing, though not much local manufacturing in Somalia can satisfactorily compete with inexpensive imports from Kenya, Taiwan, or China.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Trade with Kenya will continue since the links are already well-established and increased population will boost consumer demand. Little can be done to affect this trade directly. It provides many products to the region that would otherwise be unavailable. However, trade should be monitored so that, in the case of foods, for example, the local markets would not be flooded with commodities that discourage production on new farms. At the moment, there are not too many commodities that enter Somalia from Kenya that compete with Somali production. This condition could change if local demand cannot be met with local production of imports through Muqdisho. Livestock trade would be in greatest jeopardy if exchange rates changed to an extent that altered the terms of trade and, therefore, the direction of animal flows.

10. Summary

Impacts

Urban growth will have an impact on several aspects of socioeconomic life in Jubba Valley. Urban food consumption patterns will transmit demand signals to food producers in the region to change their agricultural and livestock production patterns. Urban dwellers will consume more fruit, vegetables, meat, and dairy products per capita than rural dwellers do.

The growth of urban areas will also have an employment effect. To a great degree, transportation trade and retailing will be the most rapidly expanding employment sectors in growing urban areas if recent growth in Kismaayo and Jilib is an example of what to expect.

The growth of urban areas will also have an impact on the health of residents. Concentrations of people generate problems of waste disposal which creates environments for communication of disease. In particular, safe water for human consumption will be a problem in the rapidly growing urban areas.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Balanced growth of the urban centers will require planning in several sectors. The most important of these will be in public health and in planning for new residential subdivisions. The concentration of numbers of people at one site always raises issues of disease control and sanitation. Water supply and water quality questions will be particularly urgent along the Jubba River with increases of people dependent on it for agricultural, personal hygiene, and water supply needs.

Health care facilities should also be installed at urban centers to help ameliorate epidemiological conditions which may become worse with urban growth. Dispensaries should be installed wherever possible to provide better health care.

Planning for the physical growth and extension of the towns is essential so that public services will be in place when new residents need them. Authorities will have to lay out subdivisions and develop the infrastructure to meet residents' needs.

F. Infrastructural Developments

1. Roads

Impacts

The ability for transport vehicles to pass through the area in all seasons will expand the ability of local people to transport their own produce to the markets that offer the best prices, as well as move more readily to new job opportunities. The number of vehicles operating in the area is likely to expand as well.

In addition, there will be a tendency for villages to develop along the improved roads, and for agglomerations already situated on tracks to expand. There are already myriad examples of "tea-shop" villages springing up on the roads leading from Muqdisho to Baydhabo and Jilib, particularly after those roads were paved. These villages consist of a

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strip of tea-shops and restaurants running along both sides of the road that serve food and drink to passers-by. The road through this type of village also tends to be a magnet point that draws woven mats, charcoal, dressed wooden sticks and poles for construction, and other artisanal products for sale to travelers from within the village as well as from nearby villages that are not on the road.

A potential outcome of the Jilib-Baardheere road is that people and goods from Middle Jubba Region will move north as the dam construction town becomes established. Middle Jubba is most likely to become an important supplementary grain-producing area for the towns of Baardheere and Markabley (the dam site) as more people move into the area and demand for food increases. There may be some movement north of forest products as well, such as building materials, thatching, and firewood of which there is a greater supply in Middle Jubba than in the immediate area of Baardheere. However, Middle Jubba will experience some competition in Baardheere with grains and fuel products coming in from Bay Region. Charcoal is already produced in large quantities in Bay Region.

The paved road through Middle Jubba Region will improve commerce with southern areas as well. Fruits and vegetables from the Jilib-Jamaame area will potentially travel up to Bu'aale and Saakow zone, while grains and forest products from Middle Jubba can travel south in the event of supply shortfalls in southern markets. Connections between Middle Jubba and Muqdisho will also be improved so that manufactured and imported goods coming from the capital can be procured more easily and less expensively. As a result, incomes should improve throughout the area as markets expand, travel is more frequent and prices stabilize.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

The benefits of road development will rapidly decline if new roads are not maintained. Permanent road maintenance capabilities should be located in Jubba Valley with local and national financing. Local people should be trained to help maintain roads on a work-for-food or work-for-pay basis, particularly on unpaved feeder roads. The JESS team traveled over a 20 km road in Gedo Region built almost entirely by villagers who wished to be connected with the main arteries. This demonstrates the local willingness to have and maintain roads. More valley feeder roads should be graded, leveled and gravelled. More culverts should be placed in valley roads even if they are not paved. By investing in some of these interventions, future maintenance costs could be considerably diminished.

2. Electricity

Impacts

A number of small, diesel-fueled processing plants already grind maize and press sesame oil in Jubba Valley. They could be electrified, thereby reducing the costs of transforming agricultural products.

Larger processing plants in Kismaayo, some of which have fallen into decline in recent years, will all benefit from a new constant source of inexpensive electricity. They include the fish exporting refrigeration plant, the meat-packing plant and the factory that treats hides and skins. In addition, new processing plants can be established such as milk bottling and fruit juice canning (particularly mango juice).

Electricity will be a great boon to many smaller commercial enterprises. Tailoring, shoemaking and repair, and cement-mixing for brick manufacture are all possibilities. The commercial expansion brought about by the potential for refrigeration could be enormous as it will permit many perishable fruits, vegetables, fish, and even milk to be held longer by both wholesale and retail sellers and to be transported (on ice) over greater distances than it can be at present.

Municipalities will also benefit from a constant source of electricity. Electric lighting and municipal water pumps will become a fixed rather than intermittent feature. The latter, in particular, should provide inhabitants with a constant supply of water, thereby diminishing some diseases related to low water availability. Domestic uses of electricity will also provide more comfort to local residents, permitting electric lighting. Those with means will benefit from refrigeration and other amenities.

However, greater productive benefits will be gained from the electrification potential of small irrigation pumps. Switching from diesel fuel to electricity could amount to a large savings of foreign exchange as well. The possibility of replacing diesel pumps with electrically driven pumps will further fuel the expansion of irrigation—particularly under the small-group formula—in Jubba Valley. The costs and uncertainties of operations and maintenance of electrically driven pumps are much less than those of diesel pumps.

The availability of electricity in Jubba Valley opens an opportunity for communications that did not exist before. Telephone and radio contact between regions in the valley and with Muqdisho can be established or upgraded. Furthermore, there is an opportunity, with some investment in communications infrastructure, to develop mass media communications with people in rural areas. One possibility employed in other countries has been to conduct mass education by remote television, even out to rural villages.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Baardheere Dam electricity should be made widely available to Jubba Valley residents. The potential benefits in expanded agricultural, commercial, and industrial production will contribute to a better life for all Somalis. Electric lines should be run to Kismaayo as well as Muqdisho. *Electricity should be made available throughout the valley to towns, villages and agricultural enterprises for lighting, milling, refrigeration, pumping, water treatment, sanitation and industrial manufacture.*

3. Expansion of Present State Farms

Impacts

With the construction of Baardheere Dam, the three state farms in Lower Jubba Region will want to expand over more of their target area than they have been able to do at present. The new, more constant flow of the river should permit them to do this, if other constraints in labor and functioning machinery are solved. The state farms are such large water users that if they are able to expand to the size originally planned, they may have a negative impact on the private, commercial farms south of them. In addition, if water is used inefficiently downstream, flows may well be so low that Jamaame District water tables will be more frequently affected by salt intrusion from the estuary even further upstream than it does now. If this happens, many of the rainfed farms that depend on occasional flooding and a higher water table, as well as many irrigated farms, will be adversely affected—particularly in the area of Goob Weyn and Mokomane.

Other impacts from expanded state farm activity include an increase of water-related diseases. These diseases are referred to in the section of health impacts under irrigation options, and are fully developed in the JESS paper on water quality and health (Jobin 1988).

There will also be a further generation of employment opportunities but these may not be fully utilized if state farm wages are not allowed to keep up with the prevailing wage scale in the private sector. This is all the more true given the expected boom in commercial and other private activity. If wages on state farms are not allowed to keep pace, labor may become an absolute constraint to production and the projects may not be able to expand, despite the improved water regime.

If the state farms can expand, one beneficial impact will be the increased production of import substitution food crops such as sugar and rice. However, there will be an increased expenditure of foreign exchange necessitated by this expansion given the fuel-dependent nature of production on these projects.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Recommendations concerning the further extension of irrigated state farms appear in Section D.1 above.

4. Summary

Impacts

The development of a road network and an electrical grid in Jubba Valley will further spur agricultural production forward. Roads will drive down the cost of transporting goods and people. In particular, they will drive down the cost in time and cash outlay of taking agricultural production to market.

Electricity will further decrease the costs of agricultural production under irrigated conditions. Electrically driven pumps have a number of advantages—in particular, cost and reliability—over diesel driven pumps.

The impact of further state farm development is speculative. It presents possible environmental problems and possible threats to production of their downstream neighbors.

Measures to Enhance Beneficial Impacts and Mitigate Adverse Impacts

Provision will have to be made from the beginning to maintain the infrastructure to gain maximum sustained benefit from its development. In addition, residents in Jubba Valley should benefit from electricity produced by Baardheere Dam. Electricity could play a major role in the conversion of the agricultural systems of Jubba Valley toward irrigated production.

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V. MONITORING OF THE PROPOSED DEVELOPMENT IN THE JUBBA VALLEY

Experience from elsewhere in Africa and the developing world shows that large-scale projects have enduring and often unexpected impacts that even extensive pre-dam studies fail to predict. Long-term monitoring can track changes in key indicators and thereby confirm progress or signal unwanted developments. The JESS Socioeconomic Baseline Study has attempted to predict the impacts of Baardheere Dam and subsequent development, and recommend enhancements and mitigating measures commensurate with those impacts. In spite of efforts to implement a comprehensive scope of research, SEBS' list of recommendations unavoidably falls short of an inclusive set of guidelines. For example, unknown factors, such as the exact design of the dam, will have an impact on river hydrology and, by extension, on social and economic life in Jubba Valley.

JESS has established benchmarks against which future change can be measured for an indefinite period. By establishing these benchmarks, the first step has been taken toward systematic time-series data collection and development planning analyses. If done properly, time-series data provide a feedback loop that informs the process of change—actively redirecting and fine-tuning development by providing timely reporting and advice on appropriate interventions.

Monitoring depends on a sensitive response to the needs and problems of development populations. It channels the views of those populations into an ongoing development planning process. Monitoring is best undertaken by establishing a special unit with guidelines for monitoring activities and the freedom and flexibility to examine flash-point areas of interest and importance as they arise and require attention. The monitoring unit should be attached to Baardheere Dam Project, which is likely to be accountable for the dam loan within MNPJVD.

A. Monitoring Information

In addition to survey work and the collection of quantitative data, the monitoring unit should rely heavily on firsthand observations of change and qualitative discussions with valley residents. However, the monitoring program should focus on a few areas which are most critical to the valley's development and the economic and social well-being of its people. These include change observed in the following topic areas:

- health and nutrition;
- range condition, livestock numbers, and species mix;
- agricultural land use and crop yields;
- resource access;
- out-migration; and
- resettlement.

1. Health and Nutrition

JESS studies indicate a significant increase in disease, especially for waterborne types with the construction of the dam and irrigation development. All the elements for explosive increases in malaria and bilharzia are present without any strong deterrent, such as effective health staff and facilities. Clearly, a health-monitoring program needs to be established to record or document the expected increases. Health monitoring should be performed by the Ministry of Health (MoH) which is the most able unit in Somalia and the only agency which is mandated to deal with health.

Equipment and staff well-trained by WHO to conduct vector or disease surveys are already present in MoH. WHO would probably not agree to train a second set of medical professionals and technicians in Somalia. Likewise, WHO would probably be unwilling to supply an otherwise affiliated monitoring unit with medicines to treat diseases as they do with MoH.

The Jubba Valley monitoring unit should work closely with MoH teams to coordinate survey work and assure MoH of adequate vehicles and fuel. In return, the monitoring unit should be assured of receiving data sets and cooperation of ministry personnel.

Specific health-monitoring parameters and schedules are omitted here. Professionals in MoH and the Faculty of Medicine are well aware of what constitutes effective monitoring for bilharzia and

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malaria, both in terms of disease and vector surveys. MoH and the Faculty of Medicine are capable of designing excellent health-monitoring programs for Jubba Valley and their expertise should be used.

UNICEF has been making height/weight measurements of children in Lower Jubba Valley for the past few years. Children are most likely to show first signs of community malnutrition and are used as indicators for the group as a whole. Similar surveys are needed in Middle Jubba and Gedo Region. A Jubba Valley monitoring unit should coordinate surveys by UNICEF or the Refugee Health Unit which also has personnel trained in nutrition and anemia testing. The monitoring unit should not duplicate the staffing and capability of these groups by developing a capacity to conduct actual field nutrition studies. The monitoring unit could more usefully coordinate studies in different Jubba Valley regions and handle logistics for participating agencies.

The monitoring unit would perform a valuable service if it were able to secure and administer funding for these surveys from donors. These surveys are relatively inexpensive if vehicles are already available. Equipment is limited to height boards, scales and hemoglobin spectrophotometers which cost approximately U.S. $600 and will last for many years. Health and nutrition studies should be conducted during the five-year, post-dam completion period.

2. Range Condition, Livestock Numbers, and Species Mix

Monitoring is important to determine significant changes in range conditions and range use in the valley as these determine absolute numbers of livestock and changes in herd mix. Monitoring is advisable because closure of the dam will have an impact on natural vegetation of the floodplain. Changes in vegetation on the floodplain may have an impact on pastoral household economic strategies and may result in greater agro-pastoral settlement and shifts in species mix.

Resources needed to monitor range and livestock require a complementary blend of aerial technical methods and ground-truthing. A program of remote sensing using aerial video would be useful for illustrating change in range over time. An aerial census of all species of livestock should be conducted similar to that done for JESS. Ground-truthing operations should be carried out by the monitoring team to corroborate any changes recorded by aerial means and to indicate how those changes affect the livestock economy at the household level.

The time frame for monitoring range includes seasonal low-level video over a five-year period beginning with closure of the dam. Ground-truthing should also continue over the same five-year period, in conjunction with other ground-based survey work. An aerial livestock census should be conducted at the end of the five-year period following dam closure. These methods are further developed in Deshmukh (1989).

3. Agricultural Land Use and Crop Yields

Monitoring of valley agricultural lands will be necessary to show how changes in flood regime affect cultivation patterns in the floodplain. Again low-level aerial video will be useful for measuring major changes in area under cultivation and intensities of production. Ground-truthing will be necessary to interpret how changes in cropping area or intensity affect local populations in the valley. For example, overall valley crop yields may increase. However, those increases might accrue only to pump owners, while the remaining population without pumps may realize a serious decline in production. Monitoring should include an annual count of irrigation pumps and an estimate of river off-take from these pumps.

Monitoring time frame should include a program of aerial video and ground-truthing for the five-year, post-impoundment period carried out in conjunction with other ground-based monitoring activities.

4. Resource Access Monitoring

Monitoring will be required to examine the effect of the dam on land tenure. Continued increases in land registered by individuals from outside the valley may result in increased alienation of land from local populations. Monitoring resource access should be almost solely a product of random spot checks of villages in the valley carried out throughout the pre- and post-dam impoundment period.

Monitoring procedures should begin with a yearly check on volume of new land registration applications at regional Ministry of Agriculture offices throughout the valley. A team from the monitoring unit should then visit two or three villages which showed above average land registration activity during the year. The team should determine the degree to which villagers lost resource rights in the process of registering parcels in the village.

At the same time, based on the SEBS list of sample villages, approximately two villages per district should be selected for monitoring on a biannual basis to conduct informal village meetings on the topic of resource access. Of main concern is how increasing land registration affects local land security. Problems with local land security should be reported to MNPJVD and MoA to take appropriate steps to correct problems of resource access.

5. Out-migration

Monitoring of out-migration will indicate how changes related to the dam and other developments affect the valley's local economy. Increasing land alienation or decreasing productivity of agricultural land may result in greater labor out-migration from the valley. Patterns of out-migration should be observed by the monitoring team in the course of its survey work for the five-year period following closure of the dam. The SEBS data have already established baseline out-migration rates to compare with the rates determined by the monitoring unit.

6. Resettlement

In addition to a general monitoring program for the entire valley, the unit should be responsible for tracking the social and economic adjustment and integration of the reservoir resettlement population at relocation sites in the Jubba Valley. Assessment of this population will require particularly sensitive observation and dialogue. Quantitative indicators of the resettlement population's adjustment can be derived from data gathered using a simplified questionnaire similar to that used by SEBS. Most important will be questions regarding economic well-being including annual income, crop yields, and livestock numbers. It is suggested that follow-up surveys be conducted with 50 of the 101 households surveyed by SEBS in the reservoir area in 1987.

B. Structure of Monitoring Unit and Resource Needs

The terms of reference for the reservoir resettlement program already includes a long-range monitoring section which is tentatively scheduled to begin as early as late 1989. A single Jubba Valley monitoring unit should be developed, incorporating resettlement and all other monitoring tasks. It is critical that well-qualified, highly motivated staff be selected for the positions discussed below. All permanent positions would be substantially field-oriented, and candidates should be prepared to spend up to six months per year working in the valley. Special permission should be granted to pay monitoring unit personnel at levels above GSDR pay scales in order to attract and retain qualified staff. Depending on the level of training and expertise of unit staff members, it will be necessary to incorporate the part-time services of an expatriate monitoring specialist.

In terms of resources, the unit will need office space in the ministry, its own computer facilities, a minimum of two new four-wheel drive vehicles, camping and field equipment sufficient for a field staff of 10, and a budget adequate to cover recurrent operating costs.

Director

The director of the monitoring unit would be responsible for planning and directing field research as well as performing timely data analyses and reporting research results to MNPJVD, other ministries, and relevant donor agencies. The director should have extensive knowledge of the valley and its populations as well as in-depth experience in qualitative and quantitative field techniques. In particular, this individual and unit staff should have good communication skills that allow them to relate effectively to a broad range of people, including valley populations, government administrators, and expatriate donor representatives. The director's language skills should include fluency in speaking and writing English. The director should have data-management skills, including knowledge of appropriate computer programs.

Assistant Directors

The director of the monitoring unit should be assisted in tasks by two assistant directors—ideally, a man and a woman. It is imperative that a qualified Somali female be included on the team to direct field research dealing specifically with women's issues. The two assistant directors should also have extensive prior field-research experience.

Enumerators

Six enumerators, including at least two women, should be attached to the unit specifically to conduct field surveys. They should have previous field experience with survey-research methods. In particular, enumerators should show rapport with and respect for field populations.

C. Monitoring Activities

Having established a baseline for Jubba Valley, the simplest most effective means of identifying change and impacts in the six designated core areas is through socioeconomic baseline study updates—follow-up studies using a subsample of 200 households from the original SEBS survey population of 1,028. The subsample should be selected using random-cluster sampling and should include households from all four socio-ecological sectors located in each of the valley's three political regions. The 200 households selected should be surveyed using an abridged version of the SEBS questionnaire, focusing on a limited number of questions of particular relevance to economics (income, farm size, crop yields, livestock numbers), health, and nutrition.

Ideally, a Jubba Valley monitoring unit should be a permanent fixture of post-dam operations. Realistically, however, upon completion of the dam, national priorities will necessitate the redirection of attention and limited resources elsewhere. Therefore, it is advised that a monitoring program of limited duration should start as soon as the resettlement process begins and should continue for at least five years following closure of the dam.

The monitoring team should publish quarterly reports listing major observations and recommendations. Reports should be circulated to MNPJVD, and donor groups participating in funding Baardheere Dam and related development.

D. Summary

Monitoring in Jubba Valley should focus on identifying change in key variables in six different areas:

- health and nutrition—to signal changes in incidences in infectious diseases (principally waterborne diseases) and changes in nutritional profiles of the Jubba Valley population;
- range condition, livestock numbers, and species mix—to signal changes in livestock numbers and herd mix as an indication of the economic health of Jubba Valley;
- agricultural land use and crop yields—as indicators of trends in agricultural production that reflect the economic health of Jubba Valley and the equity of distribution of development benefits;
- resource access—as an indicator of inequities in the distribution of benefits of development of Jubba Valley;
- out-migration—as an indicator of the assessment of local opinion of benefits accruing from the implementation of development in Jubba Valley; and
- resettlement—to assess the economic well-being of the population that will lose their homes with the filling of the Baardheere Dam impoundment.

The monitoring of health and nutrition parameters should be carried out by a unit of the Ministry of Health. A special monitoring unit should be created under the Ministry of National Planning and Jubba Valley Development to take charge of monitoring all of the other factors recommended.

Monitoring should begin with implementation of development programs. The first program will probably be the resettlement of residents from the reservoir area. Monitoring should continue for at least five years past the closure of the Baardheere Dam.

Monitoring methodology should rely on aerial reconnaissance as much as possible with ground-truthing and spot surveys from the monitoring unit. The unit should routinely monitor a small sample of the households interviewed for the JESS Socioeconomic Baseline Survey.

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With the exception of scattered historical accounts and a few development reports, literature on the Jubba Valley is sparse. After a review of the literature, it was determined that no comprehensive social profiles had ever been developed for the area. Consequently, JESS undertook development of a broad data base, starting with the most rudimentary characteristics of the valley's population. The outline for socioeconomic data collection was presented in the Phase II work plan developed by the JESS team in February and March 1986 (ARD 1986).

For reasons described below the JESS team decided to carry out socioeconomic data collection in three separate field studies: the socioeconomic baseline study, the women's baseline study and the market study.

A. The Socioeconomic Baseline Study (SEBS)

1. Rapid Reconnaissance

As outlined in the Phase II plan, formal socioeconomic survey research was preceded by an initial period of rapid reconnaissance in the tradition of the *sondeo*. This rapid reconnaissance was conducted from mid-March through August 1986.

The purpose of rapid reconnaissance was to develop a general overview of the Jubba Valley's social and economic characteristics. This overview was based largely on qualitative assessments made from on-the-ground observations and extensive interviews with public administrators, local leaders, and long-term residents in the valley. One objective of the rapid reconnaissance was to gain enough familiarity with the area's physical characteristics to permit careful planning of the scale, scope, logistics, and timing of SEBS. An equally important objective was to inform valley residents, police, and local authorities of the team's purpose. Linkages established during this phase proved invaluable during JESS' two-year presence in the field.

The rapid reconnaissance field investigations focused on local-level social and economic production systems and their relationship to valley resources. Information pertinent to this topic was gathered principally through village meetings—open-ended forums conducted in 26 villages throughout the Jubba Valley. At this stage, village sampling was done very informally on an ad hoc basis. Meetings lasted from one to four hours and covered a wide range of subjects, including a brief historical sketch of the village, number of current households, economic activities, adaptive responses to floods and drought, village governance, land tenure, interaction with other groups in the valley (especially between settled agriculturalists and seasonally transient pastoralists), health issues for livestock and people, and development priorities.

In addition, historical chronologies were established for several parts of the valley. These listed historical events commonly known by valley residents that were then tied to the Gregorian calendar. These lists of events served as reference points so that informants' responses regarding temporal events, such as births, deaths, marriages, and important economic transactions, could be meaningfully recorded.

The rapid reconnaissance also included the compilation of nearly complete lists of villages and *beels* (subdistrict units) for each district. Sample villages were later randomly selected from these lists.

During this phase, considerable time was spent locating and outfitting a base field station at Jilib, in addition to the station at Baardheere. Both functioned as primary depots for fuel and field equipment as well as sites to house JESS field teams.

The rapid reconnaissance results were of immediate value, not only informing construction of the surveys to be implemented, but also providing qualitative findings incorporated into the study's conclusions.

2. Enumerator Selection and Training

During the rapid reconnaissance phase, JESS recruited and trained 12 enumerators. Hiring was a protracted process. With the exception of two upper-level field staff with prior field experience and one year of university training each, the local-hire SEBS team was composed of high-school graduates that had no specialized training and limited English-language skills. At the request of the GDSR, an effort was made to recruit most of the enumerators from the valley. Once selected, field staff were trained extensively in survey-research methods, interview techniques, response coding, and remedial English, if necessary.

3. Pretests and Field Training

Prior to actually launching the survey, the socioeconomic baseline survey questionnaire underwent a total of three pretests, followed by a fourth and final revision. The first two pretests were done in the Jilib District in mid-September and late October 1986, with the final pretest conducted in the Baardheere District in early December.

The final questionnaire was 27 pages long and consisted of several hundred possible questions, depending on the particulars of an individual respondent's family size and economic holdings.

4. Three-Stage, Stratified Random-Cluster Sampling

The main objective of the SEBS survey was to establish valid socioeconomic indicators for use in future planning and monitoring, based on information gathered from households in three different production-system/settlement categories drawn from the entire length of the Jubba Valley. The socio-ecological sectors (SESs) that most closely represent socioeconomic activities in the valley are settled agriculture/agro-pastoralism, nomadic pastoralism, and urban residence.

Reliable population figures based on an acceptable census were not available. Given this major constraint, the JESS team had to base its sampling strategy on evidence available from an aerial survey of the Southern Rangelands conducted in 1983 and 1984 (Watson and Nimmo 1987). It found the valley's population to be slightly over 1,000,000, of which 45 percent were settled rural people, 25 percent nomadic, and 31 percent urban dwellers. Estimates from this survey diverge sharply from updated estimates of the 1975 census.

JESS decided it had the time and resources to enumerate about 1,000 households or approximately .85 percent of Watson and Nimmo's total population estimate. The team also decided that the sample should be comprised of roughly the same proportions found by Watson and Nimmo for the three production systems or SESs—50 percent rural, 25 percent nomadic, and 25 percent urban. JESS felt that this slight weighting in favor of the settled rural population over urban residents was justified by the former group's greater importance in planning future impacts of the Baardheere Dam. The team also expected to get complementary information on two of the Jubba Valley's largest towns from the Evans, Cullen, and Little study being conducted at the same time as JESS.[1]

SEBS covered all resident populations of the eight districts transected by the Jubba River, plus Afmadow District, in the three political regions of Gedo, Middle Jubba, and Lower Jubba.

The first stage of sampling involved stratifying the population into SESs—agricultural, pastoral, and urban. Not only was it necessary to ensure that each sector was appropriately represented, but it was desirable for each to be represented in every district to permit analytical comparability among the valley's political divisions.

Because each SES exists within each district of the valley, a district was used as the territorial unit for sampling. By sampling from each sector in all districts of the valley, it was possible to analyze the data by sociological sector as well as by political unit. Given the limited space of this volume, data were analyzed at regional but not district levels. However, data base figures were aggregated by district and await further analyses by interested parties.

The second stage of sampling involved the random selection of population clusters within each SES. Clusters were defined as the type of aggregation in each SES where household heads could be identified for sampling, such as villages for the agricultural sector and water holes for the pastoral sector. The third stage consisted of randomly choosing household heads from the randomly selected clusters, from whom specific survey information was to be elicited for each member of the household.

To select household clusters, JESS followed a different procedure for each SES.

Rural Settled Sector

For the rural settled populations, JESS decided it was important to assure that agro-pastoral settle-

[1] *Rural/Urban Exchange in the Kismayo Region* (Evans, Cullen, and Little 1988) is part of Clark University's SARSA project, which is being executed concurrently in a number of African countries. In Somalia, the study was conducted from approximately March 1987 to March 1988.

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ments and more purely agricultural villages were represented in the rural settled lifestyle group. The number and size of agro-pastoral villages have grown rapidly since many pastoral families suffered herd losses during the droughts of the 1960s, 1970s, and 1980s. Because most of these villages are located in the dryland zone outside the floodplain, far enough from the river to avoid the tsetse belt associated with riverine flora, the team decided to use a system of stratified quota sampling to select villages close to and far from the river in the same way for each district. This division created two agricultural sectors—riverine versus nonriverine or agro-pastoral.

The stratified quota sampling system required JESS to obtain a list of all settled villages in the eight districts selected. It was necessary to obtain village lists from district headquarters and, in some cases, solicit additional help from traditional area leaders. Once the lists were drawn up, villages were located as accurately as possible on a map. A table of random numbers was used to assign a sequential order to villages selected for inclusion in the survey using the criterion of one on each bank near the river and one on each bank outside the floodplain. Thus, in every district, four villages were chosen to represent rural settled populations.

The reason for differentiating between the two sides of the river is that the west bank is generally less developed in terms of roads, other infrastructure and services than the east bank along the Jubba's middle and upper reaches. The same number of villages in each district was sampled to assure that each major ecological zone was represented and to allow for comparable analyses across political districts and regions. District boundaries do not coincide exactly with the ecological zones defined in *Terrestrial Ecology Baseline Studies* (Deshmukh, Volume II, Part A of this report). The SEBS team felt it was preferable to maintain administrative divisions as its sampling areas because political districts and regions are important entities to valley residents and administrators, and much of the future development planning and project implementation in the valley will be carried out at the district and subdistrict levels.

Sample agricultural villages were contacted one or two days in advance of the actual survey day. The purpose of the research and survey procedures were discussed with village elders, who were asked to disseminate that information to villagers and try to assemble all household heads on the day of the survey.

On the appointed day, the SEBS team arrived in the village at a previously scheduled time, usually 7:30 or 8:00 a.m. The *guddoomiye* (head of the beel) was asked to recite a list of all household heads residing in the village. The names were assigned numbers from a table of random numbers and then announced in sequential order (*i.e.*, 1, 2, 3, etc.) to indicate which household heads were to be interviewed. If a respondent was unavailable, a substitute was called in order from the sequential list of household heads. Following the selection of respondents, each interviewee was assigned to a JESS enumerator, who accompanied the respondent to their home so that demographic and economic responses to the questionnaire could be more easily verified visually and also to ensure a greater degree of privacy and confidentiality.

While the selected respondents were being interviewed, the SEBS team leaders (with the help of field assistants/translators) conducted village meetings with all the other villagers. Separate meetings were held for men and women. These were open-ended sessions that covered a wide range of topics of general concern to the village as a whole, but usually centered on economic and health-related issues.

Pastoral Sector

A different form of sampling procedure was used to identify pastoral households, defined as those with primary economic dependence on livestock, but not necessarily to the exclusion of agriculture or other economic interests. In general, the SEBS team informed itself of the key watering points in each district, the most likely places to find aggregated clusters of pastoral household heads for sampling. The team then chose two watering points per district (one from each side of the Jubba, if possible) located on the river or at wells or dhesheegs that appeared to be in active use when the team passed through a district. Next, the SEBS team proceeded to each watering point and attempted to conduct at least 15 interviews for a total of 30 to 32 per district.

JESS was obliged to use this opportunistic sampling method for several reasons. First, nomads move over long distances in the Jubba Valley and beyond, so a watering site does not have the same level of geographical representation as a district village or town. Second, not only are nomads hard to locate and define as belonging to a specific area, they are

also a difficult group to interview. The purpose of a survey can be explained to a village chief who, in turn, communicates this purpose to villagers, but it is often hard to find the leader of a nomadic group at a water hole.

The quality of data from the 1975 census on the total nomadic population is generally weak for the same reasons. Under the circumstances, the best JESS could do was to try to find nomads at watering points distributed around the valley and balance the number of sites visited between the Jubba's east and west banks.

Urban Sector

The urban areas sampled by the team represented the capital of each district. JESS felt these urban areas were better represented by the 1975 national census, so it was used as a guide to determine the proportion of households to be drawn from each town to yield a total urban sample of 250 households. Thus, since Kismaayo had 36 percent of the valley's total urban population in the 1975 census, JESS selected 90 households to interview there (36 percent of 250). In Jilib Town, which had 15 percent of the urban population in the valley, only 40 households were chosen. JESS had no information on growth rates for individual urban areas, so this was deemed the best method of sampling.

Table 1. Percentage of Urban Population in Valley Towns

	Updated 1975 Census	Actual SEBS % Sampled	Actual SEBS No.Sampled
Kismaayo	36%	34%	96
Jamaame	18%	16%	45
Jilib	15%	16%	45
Bu'aale	6%	5%	15
Saakow	3%	5%	13
Baardheere	9%	11%	30
Garbahaarey	7%	7%	20
Luuq	6%	6%	18
TOTALS	100%	100%	282

Table 1 shows the percentage of the Jubba Valley's total urban population found in each district capital, according to the 1975 census (AHT 1985). As can be seen, Kismaayo is so much larger than any other agglomeration that this kind of weighted sampling gives a more accurate picture of differences between urban areas.

Urban areas were subdivided into administratively defined units called *xaafads* or neighborhoods. All xaafads in a town have roughly the same number of households. For the JESS sample, an equal number of households was drawn from each neighborhood in a town, but this number varied from town to town depending on the predetermined number of households to be interview in each place. For example, JESS interviewed 96 household heads in Kismaayo, but only 30 in Jilib. Thus, in each of Kismaayo's four neighborhoods, 24 people were interviewed, while in each of Jilib's two divisions, only 15 people were surveyed. Most towns had fairly accurate lists of the number of households in each xaafad, so once the total number of households was determined, the JESS team knew it had to choose every fourth or tenth house to complete the designated number of interviews.

Household selection was accomplished by walking through a division of a town with the official xaafad representative (who knew the neighborhood's boundaries) and counting houses until the sampling interval was reached. If an interview was declined or the household head was absent, the house next door was chosen, if possible, to replace the missing household.

5. Field Procedures

Careful planning was required to conduct the survey during the dry season in the many villages that are inaccessible in the two annual wet seasons.

A SEBS field team typically consisted of an expatriate SEBS team leader, seve male Somali enumerators, an expatriate WBS team leader, five female enumerators, two drivers, and a cook.

The duration of a typical field trip was 10 to 15 days, and the SEBS team made a total of eight trips, in addition to numerous trips devoted to rapid reconnaissance and pretests prior to the actual survey. The survey covered one political district per field trip. For each trip, tents were erected at a central base camp, from which day trips were made to each survey site. The field schedule entailed visiting one village (conducting 15 SEBS interviews) per day. On every trip, regional and district authorities were notified of the team's presence and purpose.

6. Survey Design and Data Management

The design of the main socioeconomic survey instrument began in 1986 during Phase I of JESS. The principal areas of inquiry were drawn from requirements set forth in the AID project paper, the JESS Scope of Work and what JESS social scientists knew were relevant topics, given the large changes

likely to result from construction of a major dam. As originally conceived, SEBS was supposed to collect specific kinds of data for the AHT master-planning unit. However, guidelines from AHT in this regard were unavailable when the SEBS team developed its questionnaire.

Because of the very large scope of this study, much consideration went into defining the most important subjects for inclusion.

After defining the important areas of inquiry, time was also spent on the questionnaires' physical design with a view toward more efficient data entry and subsequent analysis. This was particularly important as the JESS team depended entirely on IBM personal computers (PCs) to perform all of the analysis on this data set. A computer consultant helped direct these efforts based on his previous experience with IBM PCs and the data set for the Gambia River basin.

The problem of defining the unit of analysis was that information concerning each individual in a household could not be mixed up in a section of the questionnaire with information relating only to the household. The units of analysis used were individual, household, crop, and farm plot. For example, the age, sex, occupation, and education of each family member relates strictly to that individual, so the individual constitutes the unit of analysis. The number of cattle or fruit trees owned by a family does not relate to a specific individual, but the household as a whole. The production, sales, and consumption of each crop grown by a family relates just to that crop, not to an individual or a household, so crop constitutes its own unit of analysis. Information about absent individuals and marriages concerned only a few people in the household, and the team did not want to ask questions of all household members that were irrelevant to most. Finally, information about the size and tenure of each farm plot is specific to that plot and no other unit of analysis. Thus, questions were separated into sections according to their units of analysis.

The questionnaire reproduced in Annex E details the survey's content, but the focus of each subsection is summarized here. The SEBS survey was finally comprised of 10 subsections:

- individual—to provide demographic information as well as data on educational levels, occupations, languages spoken, and some cursory health problems;
- absence—to find out where absent family members have gone, why they are absent, and whether they send or receive aid from the family group;
- marriage—to trace each marriage of the household head, when it occurred, what kind of exchanges took place at the time of marriage, how long it lasted, and if it ended, whether this was due to divorce or death;
- household—to elicit information about property held by the family, housing and sanitary facilities, and sources of water;
- income—to gather detailed information on family income and expenditures over the last year, as recalled by the household head;
- livestock—to focus on what happened to a family's animal holdings over the past year;
- farm plot—to provide information on each agricultural landholding possessed by a family, how it was obtained, current tenurial status, size, and what kind of crops are usually grown;
- crop A and crop B—to follow what happens to a crop from the time it is planted to the present in the two preceding cropping seasons. Sales, consumption, gifts, and storage of a crop are all recorded, as are purchases of the same kind of crop, so the team could determine how self-sufficient a particular family or area is in terms of specific crops in each of the two seasons; and
- labor—to focus on a few details about labor used for farm work—which tasks, whether it was volunteered or hired, and what type of payment was offered.

Besides breaking the questionnaire into relevant subsections, the SEBS team also had to assure that these sections could be linked during the analysis phase. The team decided to accomplish this by creating a unique number to identify all questionnaire sections belonging to a single household. In each new village, households were assigned numbers starting with 01. Because the combination of village, beel, and district was always unique, no two households could ever be confused. All subsections

of a questionnaire carried the same composite identification number.

In the dBaseIII program that the SEBS team used for data management, two files can be linked on the basis of the composite identification number or part of that number, since component parts of the number are also considered as separate fields. This method of linking files while keeping discreet units of analysis separate offered flexibility. With dBaseIII+, a simple menu-driven statistical package called StatPac, and the ability to use LOTUS 1-2-3 for spreadsheets and graphics, in-depth analyses of socioeconomic information are possible. The data files were easily transferred between these programs.

The SEBS team performed a preliminary check of questionnaires in the field, while the interview was still fresh in the enumerator's mind. When an enumeration team returned from the field, questionnaires were coded and then checked again for enumeration and coding errors. Finally, they were given to specialized data-entry personnel for addition to the computerized data base.

In the beginning, it appeared that data entry would be the bottleneck in producing an analyzable data set, but as it turned out, that step proceeded much more quickly than expected and pre-entry checking of the data was the slowest task. However, it rapidly became clear that this last check was crucial because of the number of errors in enumeration and coding.

Details on the design of data entry and the program are provided in a separate report, *Data Management Report* (Malczynski 1986).

A full-time data management specialist was hired to assist the team in Somalia from mid-January to July 1987. He performed the bulk of data analyses for SEBS, WBS, and the marketing survey, generated computer graphics, and handled general maintenance and troubleshooting for all JESS computer equipment. He continued to perform SEBS analyses for two months at ARD's home office in Burlington, Vermont, during the fall of 1988 while the draft of this report was being prepared.

B. Women's Baseline Survey (WBS)

1. Rationale

As is illustrated in much of the development literature (Tinker 1976; Remy 1975; Etienne and Leacock 1980; Smock 1977; Sen 1982), the benefits of modernizing technology can easily bypass women unless a special effort is made to reach them. With the transition from subsistence agriculture and pastoralism, there is a specialization of roles that is frequently detrimental to women's economic participation.

It is important to gain an understanding of the involvement of women in household production, their control of productive resources, and constraints on women's time. Few of these topics are successfully addressed by male household heads who frequently fail to mention farms owned by wives when asked about their family's productive resources. It is necessary to make a special effort not to overlook women's participation and concerns.

For WBS JESS used the team approach with male and female expatriate social scientists and male and female Somali enumerators. Such an approach has been carried out among sedentary Middle Eastern societies by Fallers and Fallers (1976) and Fernea and Fernea (1965). Among pastoral nomads, the male-female team approach has been used by Dyson-Hudson and Dyson-Hudson among the Karimojong in Uganda (1966; 1969; 1972), Dahl (1979) and Hjort (1979) among the Waso Borana of Kenya, and Merryman and Merryman (1984) among the Somali of Kenya. The expatriate team that conducted a socioeconomic baseline study of the Bay Region Agricultural Development Project in Somalia was composed of three male-female sets of researchers (Massey *et al.* 1984).

JESS socioeconomic field studies addressed issues of particular concern to women in a number of ways:

- SEBS data were disaggregated by sex;
- female-headed households in the SEBS sample were analyzed separately;
- the WBS was administered to 272 women in the villages of nine districts where SEBS was simultaneously being carried out;
- open-ended village meetings for women were conducted in all villages where the WBS was administered; and
- in district centers, discussions were held with women leaders of Somali Women's Democratic Organization (SWDO).

Throughout the main body of this report, information relating to women is incorporated in the discus-

sion of various topics, rather than being treated in a separate section.

2. Enumerators

To encourage open discussion of women's concerns, the WBS and women's village meetings were conducted by an expatriate female social scientist and local female enumerators. Recruiting female enumerators with English language skills was difficult. An additional problem was finding women who were able to go on extended field trips. Another constraint in recruiting female enumerators was that most women who complete their education are soon married and, thus, have husbands and young children, which prevent them from spending much time away from home.

Despite these constraints, the female enumerators and female field assistant exhibited much sensitivity and insight in relating to Jubba Valley women. Since the completion of JESS, most were immediately hired by other studies.

3. Survey

The women's questionnaire was developed after the final revision of the socioeconomic baseline questionnaire (see Appendix B). The WBS was designed to focus on issues relating specifically to women and children and household topics on which women would likely be the most knowledgeable informants. The questionnaire was intended to mirror the SEBS instrument by duplicating the "individual," "absence," and "marriage" sections to elicit marriage and reproductive histories from the woman's perspective. The questionnaire also included a section on "family" to gather information on polygyny, inheritance, and family assistance. The "divorce" and "widow" sections focused on a woman's means of support for herself and her children during periods without a spouse. The section on "economic activities" concerned women's control of economic resources and participation in cash-earning activities. The "health and nutrition" section emphasized children's and women's health, reproduction, and family consumption patterns. The questionnaire was revised three times following field trips to the Jamaame, Kismaayo, and Baardheere districts. A codebook was then developed and the data entered using dBaseIII+ for analysis with StatPac.

In addition to the formal questionnaire administered privately to individual women by female enumerators, a public meeting was held with all available village women. As was the case with SEBS interviews and men's village meetings, village elders were notified a day or two before the planned visit and asked to inform all village men and women to gather early in the morning for the meetings. The women's meetings were held to gain qualitative information about village history, women's role in the village production system, sources of water and firewood, medical problems and treatments, knowledge of and attitudes toward health practices, usual diet, cash-earning activities for women, and the status of female heads of households.

The meeting was simply a gathering of all village women available on that day. From the group, individual women were selected for the formal survey and then interviewed by a female enumerator. An effort was made to include women of varying ages in order to gain an understanding of their lives at each stage of the developmental cycle. A random sample was not feasible given the many difficulties involved in interviewing rural Somali women.

The women's survey team accompanied the SEBS team in the field, interviewing women in the same villages, urban centers, and pastoral watering points. This joint research effort provided information about the same area from male and female perspectives, which frequently differed in emphasis, if not in substance.

The men's and women's village meetings were held simultaneously in different locations in each village. Individual SEBS and WBS interviews were conducted at the same time, with respondents participating in the meeting until it was their turn to be interviewed. With patience and a well-planned line of questioning, it was possible to encourage women to participate in discussions, but they seldom expressed their opinions if a man was standing on the sidelines of a women's meeting.

A total of 272 women's interviews were completed in nine districts of the Jubba Valley—128 agricultural, 54 pastoral, and 90 urban interviews. Thirty-eight women's village meetings were held.

C. Market Survey (MARS)

1. Rationale

There is little evidence that any long-term price or market study has been done in the Jubba Valley. Since price information on agricultural and pastoral products reveal much about the volume and flow of

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these commodities and indicate problems with supply and demand, it is a useful planning tool. Thus, the SEBS team felt it necessary and important to undertake a market study.

JESS had an advantage over many studies in that its length permitted the collection of market information for over a year. The longer a time series of prices, the better the chance of explaining what is "normal" versus aberrant change in price. This is particularly true for agricultural products produced in a drought-prone environment where, at the very least, prices fluctuate due to the agricultural cycle and production crises. If price data can be gathered for a long enough period and the timing of production cycles and weather crises determined, better information is gained about what is normal in the price cycle for a certain commodity. This can help flag other causes of price fluctuations that may require government intervention or policy changes. Such causes can include government price interventions, trader hoarding or monopsony (collusive price-setting), transportation strikes, fuel shortages, and highway or market taxes.

Good price information facilitates the planning of import, taxation, and pricing policies for sectors where the government intervenes. It also helps producers and investors make decisions about what and how to produce and where to sell their output. Sellers benefit from knowing where to get their supplies most inexpensively, thus providing consumers with the opportunity to buy products at a lower price.

Of course, price information is already transmitted informally by word of mouth. It is widely known that most Somali pastoralists are aware of animal prices in different markets and when ships will be arriving in various ports. However, making commodity price information more widely known through radio broadcasts and regular publications can only help smooth out price differences and generally helps producers, consumers, and governments make better planning decisions. Before price information can be broadcast, it must be collected systematically.

2. Survey

To gather price information for the Jubba Valley, it was decided initially to establish market surveyors in three major valley towns, expanding to another seve towns if this proved to be logistically possible. The first three towns selected were Jilib, Kismaayo, and Baardheere. To avoid imposing extra costs for living support on the project market enumerators were selected who already lived in those towns. Moreover, local people know their area and markets best and are attuned to unusual events that might have an impact on a commodity's price or availability. Local vendors are also more willing to cooperate with a local-hire enumerator than with a stranger.

The survey began in January 1986, after several months of pretesting, and continued until February 1988. After the procedure of selecting market surveyors was begun and the difficulties of supervising the study from Muqdisho became known, the study had to be restricted to the original three market points plus Buurdhuubo, which was added later in the year.

3. Market Surveyors

The procedure SEBS used to select market surveyors was lengthy and bureaucratically difficult. Two people were chosen for each of the three towns because it was felt that there was enough work for 2, especially in Kismaayo. The team also wanted to have some backup in case an enumerator proved unsuitable for the job.

JESS did not place a surveyor in Jamaame, although this was the original intent, because it was expected that the Evans, Cullen, and Littel project, which was studying urban-rural linkages in the area, would provide some market and price information for this town in order to make comparisons with other JESS findings. One additional note is that the animal prices recorded for Kismaayo are from the local resale and butchers' market, not the export market. SEBS hoped to get information on animal export prices from USAID's Livestock Health and Marketing Project, which has been tracking prices in Kismaayo and elsewhere.

4. Questionnaire Design

The market questionnaire (see Appendix B) was composed of eight sections—three checklists on the availability of items on a given day and five more detailed price lists on wholesale and retail prices, number of sellers, measures used, product origin and, for certain things, transportation mode and costs, taxes, and brokerage fees. The three checklists for vegetables and grains (*i.e.*, the regular market, which also includes meat and milk), fish, and live animals were filled out every other week to track when things appear and disappear from

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various markets. The questionnaire's regular price sections also covered vegetables and grains, fish, and live animals (with separate pages for interviewing sellers and buyers) as well as wood, thatch, and fodder. The questionnaire was used for one year, from January 1987 to January 1988.

5. Data Collection

There were some obvious differences in the markets covered by the JESS market survey. Kismaayo is a very large town (the third largest in Somalia) and has many daily markets—2 important ones and at least three minor ones—instead of only one as in the other survey towns. At the latter sites, the principal market has separate sections for the sale of meat, milk, wood, and, in some cases, fish. In all towns, the animal market is in a different place, usually removed from the center of town altogether.

Because of Kismaayo's size compared to the other JESS market sites, surveyors had to use a different approach in collecting information there. In Jilib, Baardheere, and Buurdhuubo, the three checklists were filled out every other week and the price lists and more detailed interviews on alternate weeks, thus providing availability and price information at least twice monthly for each item sold in a particular town. In Kismaayo, the surveyors did double duty, covering one major and one minor market each week by completing the checklist one week and then the price list. Because of the uneven number of markets, the schedule for enumeration in Kismaayo was fairly complicated. However, in no town was the survey schedule inflexible; surveyors could arrange data collection to suit their schedules as long as prices and checklists were completed during the first half of each month and again in the second half.

Market surveyors could have recorded prices every week, but based on initial interviews, it appeared that most prices did not fluctuate enough to warrant tracking them so closely in that many places for such a long period. The SEBS team also felt it would place an unwarranted burden on the data-entry facility to collect that much information and gain little in the analyses.

In addition to filling out questionnaires, market surveyors were asked to record sudden price changes or other unusual events affecting their markets. Their notebooks were collected for translation periodically and augmented the marketing analyses of the questionnaires. Examples of observations recorded by surveyors were an overnight jump in the price of maize in Jilib when a busload of traders came down from Muqdisho on a major buying trip, the absence of certain types of wood and fodder grasses from the Kismaayo market with the onset of the rains, and the disappearance of construction wood in the Baardheere market due to new government regulations.

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JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE I

Date _____

Unit of Analysis: Individual

Interviewer _____

1. Region _____
2. District _____
3. Beel _____
4. Village _____
5. Household _____
6. Composite ID _____

7. ID#	Name	8. Relation to HH	9. Age	10. Sex	11. Marital status	12. District of birth	13. Yr. of death	14. Same goys?	15. Same village?	16. Major work performed	17. 2nd major task	18. Koranic level achieved

QUESTIONNAIRE I - Individual - page 2

Date _____

Interviewer _____

Village _____

Household # _____

ID #	19. Level gov't school	20. Literate (reads) Somali	21. Literate (writes) Somali	22. Spoken languages: Maay-maay	23. Maxad tiriy	24. Swahili	25. Speaks Mushun-guli	26. Speaks Arabic	27. Speaks English	28. Speaks Italian	29. Speaks Oromo/ Galla	30. Speaks Amharic	31. Speaks other
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													
11													
12													
13													
14													
15													

Date _____

Interviewer _____

Village _____

Household # _____

ID #	32. Last serious illness/injury	33. Year ill	34. Season ill	35. Bed-ridden	36. Who did individual see for cure	37. 2nd person seen	38. What treatment was received?	39. 2nd treatment received	40. Number of immunizations	41. Type of immuniz.	Comments
01											
02											
03											
04											
05											
06											
07											
08											
09											
10											
11											
12											
13											
14											
15											
16											
17											

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE II

Date _____

Unit of Analysis: Absence

Interviewer _____

1. Region _____ - 1
2. District _____ - 1
3. Beel _____ - 2
4. Village _____ - 1
5. Household _____ - 1
6. Composite ID _____

7. ID #	8. Age	9. Sex	10. Length of absence	11. Reason for absence	12. District now residing	13. Living with whom?	14. Does indiv. work on enterprise? (herds, farm)	15. Does indiv. send money or goods to HH?	16. Type of aid	17. How often?	18. Does HH send money/goods to indiv.?	19. Type of aid	20. How often?	Comments

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE III

Unit of Analysis: Marriage

Date _____

Interviewer _____

Checker _____

Coder _____

1. Region _____
2. District _____
3. Beel _____
4. Village _____
5. Household _____
6. Composite ID _____

7. Spouse ID #	Spouse Name	8. Last residence before marriage	Same Dist.	9. Male's last residence before marriage (district)	10. Female's last residence before marriage (district)	11. Age of male at marriage	12. Age of female at marriage	13. Nth marriage for female	14. Nth marriage for male

QUESTIONNAIRE III - Marriage - page 2

Date _____

Interviewer _____

Village _____

Household # _____

15-18. Bridewealth: Cattle	Camels	Sheep/ goats	Cash & value other goods	19. Cost of setting up house	20. Year of marriage	21. Year marriage ended by divorce	22. Year marriage ended due to death	Comments

JUBBA ENVIRONMENTAL AND SOCIAL STUDIES
SOCIO-ECONOMIC BASELINE STUDY

_____
Date

_____
Interviewer

_____
Coder

Questionnaire IV. (Dec. 23, 1986)
Unit of Analysis: Household

1. Region _____ _ 1
2. District _____ - 1
3. Beel _____ _ _ 2
4. Village _____ _ 1
5. Household _____ _ _ 2
6. Composite ID _____ _ _ _ _ _ _ _ _ 7
7. # consumption units _____ _ _ 2
8. # production units _____ _ _ 2
9. Does your wife or wives ever contribute money for food purchases? _____ _ 1
10. What is the main source of family drinking water now? _____ _ _ 2
11. Do you ever use another source? ____ _ 1
12. If yes, what other source? _____ _ _ 2
13. If yes, why? _____ _____ _ 1
14. Do you ever pay for water? _____ _ 1
15. If yes, when? _____ _ 1
16. What is the distance to the nearest main water? _____ _ 1

17. Where does the family perform the following functions?

a) bath _____ _ 1

b) urinate _____ _ 1

c) defecate _____ _ 1

18. Do toilet facilities change during the year? _____ _ 1

19. If yes, to what do they change and why? _____ _ 1

How many of the following do you own, let or rent?

	20. Own	21. Let	22. Rent	
a. - munduuls				_ _ 2
b. - cariish				_ _ 2
c. # of rooms				_ 1
d. - hoorie				_ _ 2
e. - baraako				_ _ 2
f. # of rooms				_ _ 2
g. - sar				_ _ 2
h. # of rooms				_ 1
i. - other (name/number)				_ _ 2

23. How many of the above have a tin roof?

_____ _ _ 2

24. Do you have grain storage facilities?

_____ _ 1

25. What is the number and capacity of storage facilities?

a. - bakaar _____ _ _ 2

b. capacity _____/_____ _ _ _ 3

c. - drums _____ _ _ 2

d. capacity _____/_____ _ _ 2

e. - clay pot _____ _ 1

f. capacity _____/_____ _ 1

g. - tree _____ _ 1

h. capacity _____/_____ _ 1

i. - raar (on stilts) _____ _ 1

j. capacity _____/_____ _ 1

k. - other _____ _ 1
name/number

i. capacity _____/_____ _ _ _ 3

How many of the following are owned by the household?

26. working radios _____ _ 1

27. working watches _____ _ _ 2

28. working bicycles _____ _ 1

29. tractors _____ _ 1

30. working vehicles _____ _ 1

31. animal carts _____ _ 1

32. hand carts _____ - 1

33. yambos _____ _ _ 2

34. axes _____ _ 1

35. pangas _____ _ _ 2

36. fish line/hook _____ _ _ 2

37. gill net _____ _ _ 2

38. fish trap _____ _ _ 2

39. canoe _____ _ 1

40. spear _____ _ 1

41. other fish equip. _____ _ 1

42. other hunt equip. _____ _ 1

43. goats _____ _ _ _ 3

44. sheep _____ _ _ _ 3

45. chickens _____ _ _ _ 3

46. other fowl _____ _ _ 2

47. donkeys _____ _ _ 2

48. Do you have any cattle? _____ _ _ 2

49. lactating females _____ _ _ 2

50. non-lactating females _____ _ _ 2

51. mature males (bulls) _____ _ _ 2

52. castrated, mature males _____ _ _ 2

53. immature females _____ _ _ 2

54. immature males _____ _ _ 2

55. Do you have any camels? _____ _ 1

56. lactating females _____ _ _ 2

57. non-lactating females _____ _ _ 2

58. mature males (bulls) _____ _ _ 2

59. castrated, mature males _____ _ _ 2

60. immature females _____ _ _ 2

61. immature males _____ _ _ 2

62. Do you own any fruit trees? _____ _ 1

63-70. If yes, list the types and how many of each:

Type	Number	Type	Number

INCOME

Estimated annual monetary income from sales of:

- grain _____
- fruit _____
- cotton, tobacco or sesame _____
- fodder _____
- grazing rights _____
- other agric. prod. _____

71. Total: agriculture _____ _ _ _ _ _ _ 6

From sales of camels _____

- " cattle _____
- " sheep _____
- " goats _____
- " donkeys _____
- " milk _____
- " ghee _____
- " hides _____
- " poultry _____
- " eggs _____

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_ " other animal prod. _____

72. Total: livestock _____ _ _ _ _ _ _ 6

From sales of wild fruit _____

_ " wild fiber _____

_ " fuel wood _____

_ " construction wood _____

_ " charcoal _____

_ " thatch _____

_ " medicinal plants _____

_ " wild meat _____

_ " horn/bone _____

_ " wild skins _____

_ " honey _____

_ " wax _____

_ " other forest products _____

_ " fresh fish _____

_ " dried fish _____

_ " other river products _____

73. Total: Hunt/gather _____ _ _ _ _ _ _ 6

From earnings in carpentry _____

_ " pottery _____

_ " metalwork _____

_ " barbering _____

_ " leatherwork _____

_ " basketry/mats _____

_ " woodcarving _____

_ " butchery _____

_ " bakery _____

_ " other crafts _____

74. Total: crafts earnings _____ _ _ _ _ _ _ 6

From earnings in private business:

- shop owner _____
- trader _____
- Koranic teacher _____
- other private teacher _____
- traditional healer _____
- other business earnings _____

75. Total earnings business _____ _ _ _ _ _ _ 6

From wages in: private agric. _____

state agric. _____

herding _____

civil service _____

private business _____

76. Total wage income _____ _ _ _ _ _ _ 6

---

77. property sales _____ _ _ _ _ _ _ 6

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78. rental income _____ _ _ _ _ _ _ 6

79. remittances _____ _ _ _ _ _ _ 6

80. bridewealth _____ _ _ _ _ _ _ 6

81. inheritance _____ _ _ _ _ _ _ 6

82. gifts _____ _ _ _ _ _ _ 6

83-82. Family seasonal expenditures

Item	Time Unit	Gu' Qty	Gu' Price	Gu' Total	Xagaa TU	Xagaa Qty	Xagaa Price	Xagaa Total	Deyr TU	Deyr Qty	Deyr Price	Deyr Total	Jiilaal TU	Jiilaal Qty	Jiilaal Price	Jiilaal Total	Yearly Total
ag. inputs :																	
input reprs:																	
labor/tractor hire :																	
cattle :																	
camels :																	
sheep :																	
goats :																	
vet. service/ drugs :																	
maize :																	
rice :																	
baasto :																	
sorghum :																	
bread :																	
milk :																	
meat :																	
fr. fish :																	
dry fish :																	
sugar :																	
tea :																	
oil/ghee :																	
other foods:																	

Item	Time Unit	Gu' QTY	Gu' Price	Gu' Total	Xagaa TU	Xagaa Qty	Xagaa Price	Xagaa Total	Deyr TU	Deyr Qty	Deyr Price	Deyr Total	Jiilaal TU	Jiilaal Qty	Jiilaal Price	Jiilaal Total	Yearly Total
property purchase	:																
house repairs	:																
house construct.	:																
shoes/ clothings	:																
jewelry	:																
school fees skoolka	:																
duksi	:																
gifts	:																
loans	:																
ceremonies	:																
govt fees/ taxes	:																
transport	:																
household utensils	:																
medicines/ treatment	:																
other	:																

83. Did you engage in barter exchange last year? _____

84. If yes, what did you exchange for what? _____

_____

85. Have you heard of land registration? _____

86. Have you registered your land? _____

87. If not, why not? _____

DATE_____

INTERVIEWER _____

CODER _____

QUESTIONNAIRE V
Unit of Analysis: Household and Livestock Type (Changes in herd composition in last year).

		CODE
1.	Region _____	_ 1
2.	District _____	_ 1
3.	Beel _____	_ _ 2
4.	Village _____	_ 1
5.	Household _____	_ _ 2
6.	Composite ID _____	_ _ _ _ _ _ _ 7
7.	DO YOU HAVE ANY CAMELS? (Y/N) _____	_ 1
8.	If NO, have you ever owned camels? (Y/N) _____	_ 1
9.	What was the maximum number of camels you ever owned? _____	_ _ _ 3
10.	For how many years have you not kept camels? _____	_ 1
11.	Why did you stop keeping camels? _____	_ 1

If respondent still keeps camels, answer the following.

12.	How many camels were born in the last year? _____	_ _ 2
13.	How many were purchased in the last year? _____	_ _ 2
14.	What type? (age/sex characteristics) _____	_ 1
15.	For what price (total amount)? _____	_ _ _ _ _ _ 6

16. How many camels were sold in the past year? _____ _ _ 2

17. What type? _____ _ 1

18. For what price? (total amount) _____ _ _ _ _ _ _ 6

19. How many camels were slaughtered in the last year? _____ _ _ 2

20. What type? _____ _ 1

21. How many camels died in the past year? _____ _ _ 2

22. What type? _____ _ 1

23. Died of what causes? _____ _ 1

24. How many camels did you give to others? _____ _ _ 2

25. What type? _____ _ 1

26. How many camels did you receive from others? _____ _ 1

27. What type? _____ _____ _ 1

28. <u>DO YOU HAVE ANY CATTLE</u> (Y/N) _____ _ 1

29. If NO, have you ever owned cattle? (Y/N) _____ _ 1

30. What was the maximum number of cattle you ever owned? _____ _ _ _ 3

31. For how many years have you not kept cattle? _____ _ _ 2

32. Why did you stop keeping cattle? _____ _ 1

<u>If respondent still keeps cattle, answer the following</u>.

33. How many cattle were born in the last year? _____ _ _ 2

34. How many cattle were purchased in the last year? _____ _ _ _ 3

35. What type? _____ _ 1

36. For what price? _____ _ _ _ _ _ _ 6

37. How many cattle were sold in the past year? _____ _ _ _ 3

38. What type? _____ _ 1

39. For what price? _____ _ _ _ _ _ _ 6

40. How many cattle were slaughtered in the past year? _____ _ _ _ 3

41. What type? _____ _ 1

42. How many cattle died in the past year? _____ _ _ _ 3

43. What type? _____ _ 1

44. Died of what cause? _____ _ 1

45. How many cattle did you give to others? _____ _ _ 2

46. What type? _____ _ 1

47. How many cattle did you receive from others? _____ _ _ 2

48. What type? _____ _ 1

49. DO YOU HAVE ANY GOATS? (Y/N) _____ _ 1

50. If NO, have you ever owned goats? (Y/N) _____ _ 1

51. What was the maximum number of goats you ever owned? _____ _ _ _ 3

52. For how many years have you not kept goats? _____ _ _ 2

53. Why did you stop keeping goats? _____ _ 1

If respondent still keeps goats, answer the following.

54. How many goats were born in the last year? _____ _ _ _ 3

55. How many goats were purchased in the last year? _____ _ _ _ 3

56. What type? _____ _ 1

57. For what price? _____ _ _ _ _ _ _ 6

58. How many goats were sold in the last year?
_____ _ _ _ 3

59. What type? _____ _ 1

60. For what price? _____ _ _ _ _ _ _ 6

61. How many goats were slaughtered in the past year? _____ _ _ _ 3

62. What type? _____ _ 1

63. How many goats died in the past year?
_____ _ _ _ 3

64. What type? _____ _ 1

65. Died from what cause? _____ _ 1

66. How many goats did you give to others?
_____ _ _ _ 3

67. What type? _____ _ 1

68. How many goats did you receive from others?
_____ _ _ _ 3

69. What type? _____ _ 1

70. DO YOU HAVE ANY SHEEP (Y/N) _____ _ 1

71. If NO, have you ever owned sheep? (Y/N)
_____ _ 1

72. What was the maximum number of sheep you ever owned? _____ _ _ _ 3

73. For how many years have you not kept sheep?
_____ _ _ 2

74. Why did you stop keeping sheep? _____ _ 1

If respondent keeps sheep, answer the following.

75. How many sheep were born in the last year?
_____ _ _ _ 3

76. How many sheep were purchased in the last year? _____ ___ 3

77. What type? _____ _ 1

78. For what price? _____ _____ 6

79. How many sheep were sold in the last year? _____ ___ 3

80. What type? _____ _ 1

81. For what price? _____ _____ 6

82. How many sheep were slaughtered in the past year? _____ ___ 3

83. What type? _____ _ 1

84. How many sheep died in the past year? _____ ___ 3

85. What type? _____ _ 1

86. Died of what causes? _____ _ 1

87. How many sheep did you give to others? _____ ___ 3

88. What type? _____ _ 1

89. How many sheep did you receive from others? _____ ___ 3

90. What type? _____ _ 1

91. DID YOU EXCHANGE ANY LIVESTOCK FOR BARTER (Y/N) _____ _ 1

92. Type of exchange _____ _ 1

93. Amount of exchange _____ _____ 6

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE VI

Date _____

Unit of Analysis: Farmplot

Interviewer _____

Checker _____

Coder _____

1. Region _____
2. District _____
3. Beel _____
4. Village _____
5. Household _____
6. Composite ID _____

List the number of farm plots worked by interviewee; the type of land each plot is on; its total area (in darabs, tacabs, or hectares, etc.); whether it is owned by speaker, rented out (for money), loaned, leased, borrowed or sharecropped; how the person obtained the plot (purchase, inherited, gift, village chief); how long he/she has used it (in years); and the crops grown on each plot. If the area is in boostos, tacabs or other local measure, put the number of steps in the comments column.

						Crops Grown on Plot								
1. Plot #	2. land type	3. acre	4. tenure	5. how obtained	6. year	7. grain.	8. fruit	9. vegs	10. beans	11. oil seeds	12. sisin	13. coton	14. tobac	Comments

15. Are any of the above plots irrigated? _____

16. If yes, which ones (numbers)? _____

17. If yes, who owns the pump? _____

18. Have you ever abandoned or fallowed a farm? _____ - 1

19. If so, what type of land and why? _____ - 1

_____ - 1

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE VII
Unit of Analysis: Household & Crop

Date_____

Interviewer_____

Checker_____

Coder_____

MOST RECENT HARVEST: I

PRECEDING HARVEST: II

1. Region_____
2. District_____
3. Beel_____
4. Village_____
5. Household_____
6. Composite ID_____ 7
7. Season_____ -1
8. Year_____ --2

9. Crop/Tree	10. Area under cultivation	11. If intercropped, with what crop	12. What proportion intercrp	13. Est. field losses (propor)	14. Primary cause of field losses	15. Production (quintals)	16. Part of paid out as rent or share-crop	17. Amount consumed since harvest	18. Total amount sold (kgs.)

Q VII - Household and Crop p. 2

Date_____

Interviewer_____

Village_____

Household #_____

Composite ID_____

Checker_____

Coder_____

19. Total amount received from sales (money)	20. No. of sales, less than or greater than 5	21. Location of principal sale	22. Type of principal sale	23. Volume sold at principal sale (quintals)	24. Price/ unit at principal sale	25. Season of principal sale	26. Total amount bartered (during season)	27. What was received in exchange for main barter	28. Amount of crop given as gifts

Q VII - Household and Crop p. 3

Date_____

Interviewer_____

Village_____

Household #_____

Composite ID_____

Checker_____

Coder_____

29. Amount of crop used as zakat	30. Amount still stored	31. Est. usual storage losses	32. Primary cause of storage losses	33. Amount of crop received as gifts	34. Amount of this crop purchased	35. Location of principal purchase	36. Type of principal purchase (from whom)	37. Price/ unit at principal purchase	38. Volume of principal purchase

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

Socioeconomic Baseline Study

QUESTIONNAIRE VIII
Unit of Analysis: Household & Outside Labor

Date_____

Interviewer_____

1. Region_____:____
2. District_____:____
3. Beel_____:____
4. Village_____:____
5. Household_____:____
6. Composite ID_____:____

7. Did you use labor from outside your household for farm tasks in the last year?_____ If yes, ask the following questions.

8. List tasks for which you used additional labor last year	9. In what season?	10. What type of labor? (group, hired, relative, tractor, animal)	11. How many people at one time	12. How many days?	13. What compensation was given? (salary per work day, value of food, etc.)	14. If food was given, how many meals per work day?

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

SOCIOECONOMIC BASELINE STUDY

Date _____

Interviewer _____

QUESTIONNAIRE I

Unit of Analysis: Individual

WOMEN'S QUESTIONNAIRE

1. Region _____
2. District _____
3. Beel _____
4. Village _____
5. Household _____
6. Composite ID _____

7. ID#	Name	8. Relation to woman		9. Age	10. Sex		11. Marital status		12. District of birth		13. Yr. of death		14. Same goys?		15. Same village?		16. Major work performed		17. 2nd major task		18. Koranic level achieved	

QUESTIONNAIRE I - Individual - page 2

WQ 2

Date _____

Interviewer _____

Village _____

Household # _____

ID #	19. Level gov't school	20. Literate (reads) Somali	21. Literate (writes) Somali	22. Spoken languages: Maay-maay	23. Maxad tiriy	24. Swahili	25. Speaks Mushun-guli	26. Speaks Arabic	27. Speaks English	28. Speaks Italian	29. Speaks Oromo/ Galla	30. Speaks Amharic	31. Speaks other
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													
11													
12													
13													
14													
15													

A-230

Date _____

Interviewer _____

Village _____

Household # _____

WQ 3

ID #	32. Last serious illness/injury	33. Year ill	34. Season ill	35. Bed-ridden	36. Who did individual see for cure	37. 2nd person seen	38. What treatment was received?	39. 2nd treatment received	40. Number of immunizations	41. Type of immuniz.	Comments
01											
02											
03											
04											
05											
06											
07											
08											
09											
10											
11											
12											
13											
14											
15											
16											
17											

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

WQ 4

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE II

Date _____

Unit of Analysis: Absence

Interviewer _____

1. Region _____ - 1
2. District _____ - 1
3. Beel _____ - 2
4. Village _____ - 1
5. Household _____ - 1
6. Composite ID _____

7. ID #	8. Age	9. Sex	10. Length of absence	11. Reason for absence	12. District now residing	13. Living with whom?	14. Does indiv. work on family enterprise? (herds, farm) (Refers to current family or woman's own)	15. Does indiv. send money or goods to woman? (Include all living former husbands)	16. Type of aid	17. How often?	18. Does woman send money/goods to indiv.?	19. Type of aid	20. How often?	21. Frequency & usual length of absence

JUBBA ENVIRONMENTAL AND SOCIOECONOMIC STUDIES

WQ 5

SOCIOECONOMIC BASELINE STUDY

QUESTIONNAIRE III

Unit of Analysis: Marriage

Date _____

Interviewer _____

Checker _____

Coder _____

1. Region _____
2. District _____
3. Beel _____
4. Village _____
5. Household _____
6. Composite ID _____

7. Spouse ID #		Husband's Name	Mart. Stat.	8. Last residence before marriage, Same Vill.		Same Dist.	9. Male's last residence before marriage (district)		10. Female's last residence before marriage (district)		11. Age of male at marriage		12. Age of female at marriage		13. Nth marriage for female		14. Nth marriage for male	

QUESTIONNAIRE III - Marriage - page 2

WQ 6

Date _____

Interviewer _____

Village _____

Household # _____

15-18. Bridewealth: Cattle	Camels	Sheep/ goats	Cash & value other goods	19. Cost of setting up house	20. Year of marriage	21. Year marriage ended by divorce	22. Year marriage ended due to death	23. Length of marriage	24. Marriage Type

QUESTIONNAIRE 4 Family

Date_____ Interviewer_____

Coder_____ Checker_____

Village_____ Composite ID_____

1. Current marital status_____

2. If married, does your husband live with you?

   Yes No N.A.

3. If no, why not?

   0 Husband living with me
   1 Working elsewhere
   2 Studying elsewhere
   3 Living with another wife
   4 Separated or divorced
   5 Getting medical treatment
   6 Traveling

   7 _____

4. Does your husband currently have other wives?

   Yes No N.A.

5. If yes, how many?_____ N.A.

6. Among your husband's current wives, what number wife are you?_____ N.A.

7. How many of his other wives live with you in this compound?_____ N.A.

8. Besides those wives in this compound, how many of the other wives live in this village?_____ N.A.

9. Do you and your husband's other wives help each other with household tasks such as:

a.	preparing food	Yes	No	N.A.
b.	caring for children	Yes	No	N.A.
c.	getting water	Yes	No	N.A.
d.	gathering firewood	Yes	No	N.A.
e.	caring for livestock	Yes	No	N.A.
f.	working on the farm	Yes	No	N.A.

10. Is your mother still alive? Yes No

11. If yes, does your mother live in this village? Yes No N.A.

12. Is your father still alive? Yes No

13. If yes, does your father live in this village? Yes No N.A.

14. Have you inherited (wahad or dhaxal) anything from your father?

15. If yes, what did you inherit?

TYPE	NUMBER or AMOUNT
_____	_____
_____	_____
_____	_____
_____	_____

15a. If no, why not?

0 She inherited
1 Father is/was poor
2 Brothers received it
3 We still have not divided it
4 She is/was too young
5 My mother received it
6 Daughters didn't inherit
7 Father still alive

8 _____

16. Did you inherit anything from your mother? Yes No

17. If yes, what did your inherit?

TYPE	NUMBER or AMOUNT
_____	_____
_____	_____
_____	_____
_____	_____

18. Do any of your brothers or sisters live in this village? Yes No N.A.

19. How many times have you been divorced? _____

20. How many times have you been a widow? _____

QUESTIONNAIRE 5 Divorce

FOR WOMEN WHO HAVE EVER BEEN DIVORCED

Date_____ Interviewer_____

Coder_____ Checker_____

Village_____ Composite ID_____

(Complete this questionnaire for one marriage that ended in divorce. Attach additional sheets for each additional marriage that ended in divorce.)

0. Ever been divorced? Yes No

1. Which marriage ended in divorce? _____

2. When you were divorced, did you receive maher? Yes No

3. If no, why not?

   0 No divorce or received maher
   1 Husband refused to give
   2 Husband unable to give
   3 Woman wanted the divorce so did not ask for maher
   4 Woman's family wanted the divorce
   5 Husband was absent

   6 _____

4. If yes, what did you receive for maher?

TYPE	NUMBER or AMOUNT

5. How many children from this marriage were alive at the time of the divorce? _____

5a. How many of these children were living at home before the divorce? _____

6. Of those children who were living at home before the divorce, did any of them stay with you after you were divorced? Yes No N.A.

7. If yes, number of sons who stayed with you. _____

8. If yes, number of daughters who stayed with you. _____

9. Did your divorced husband ever send money or goods to help support the children who stayed with you? Yes No N.A.

10. For the children who did not stay with you: who did the children live with?

a. _____

b. _____

who cooked for them?

c. _____

d. _____

11. Do you ever see these children who did not stay with you after the divorce? Yes No N.A.

12. When you were divorced from this husband did you go to a different house? Yes No N.A.

13. When you were divorced from this husband did you go to a different village? Yes No N.A.

14. When you were divorced, besides your children, who did you usually live with? _____

15. When you were divorced, did you have a farm to use? use?

Yes No N.A.

16. If yes, how did you get access to it?

0 No farm
1 She bought it
2 She inherited it from parents
3 She and/or children inherited it from husband
4 Received as maher
5 Given ownership of land by someone other than husband or parents
6 She and/or family cleared it themselves
7 Uses land belonging to children
8 She sharecrops
9 She rents
10 Loaned for temporary use
11 Loaned for indefinite use

12 _____

17. How did you get food? (May include two answers)

1 From a relative
2 Produce on farm
3 Earn cash to buy food
4 Given money to buy food

5 _____

18. Did you have livestock to use? Yes No

19. If yes, who did the livestock belong to?

_____

20. While you were divorced, did you do anything to earn cash? Yes No

21. If yes, what activities did you do to earn cash?

(List all activities) _____

_____

_____

22. Did you remarry after this divorce? Yes No

23. If yes, how long was it before you remarried?

_____

For each divorce of this woman, fill out a separate divorce sheet.

QUESTIONNAIRE 6 Widow

FOR WOMEN WHO HAVE EVER BEEN WIDOWED

Date_____ Interviewer_____

Coder_____ Checker_____

Village_____ Composite ID_____

(Complete this questionnaire for one marriage that ended in the death of the husband. Attach additional sheets for each additional marriage that ended in the death of the husband.)

0. Ever been widowed? Yes No

1. In which marriage did your husband die? _____

2. How many children did you have with this husband?

_____

3. What did your husband do for a living? _____

_____

4. How many farms did your husband have? _____

TYPE OF FARM	NUMBER OF FARMS	FARM SIZE

5. How many livestock did your husband have before he died?

SPECIES	NUMBER

6. Was your husband's property divided after he died?

0 Had no property
1 Yes
2 No

7. If yes, what did you and your children together inherit?

TYPE	NUMBER or AMOUNT

8. What did you (the woman) alone inherit?

TYPE	NUMBER or AMOUNT

9. What did your daughters inherit?

TYPE	NUMBER or AMOUNT

10. What did your sons inherit?

TYPE	NUMBER or AMOUNT

11. When your husband died, did you continue living in the same place? Yes No

12. If yes, besides your children who usually lived with you? _____

_____

13. If no, why did you move?

0 Did not move
1 Could not stay in the house
2 Could not support herself. No farm or animals to use.
3 Better job opportunities elsewhere
4 Went to live with children
5 Went to live with parents
6 Went to live with siblings
7 Went to live with other relatives
8 Remarried
9 _____

14. Did you have a farm to use? Yes No

15. If yes, how did you get access to it?

0 No farm
1 She bought it
2 She inherited it from parents
3 She and/or children inherited from husband
4 Received as maher
5 Given ownership of land by someone other than husband or parents
6 She and/or family cleared it themselves
7 Uses land belonging to children
8 She sharecrops
9 She rents
10 Loaned for temporary use
11 Loaned for indefinite use

12 _____

16. How did you get food? (May include two answers)

1 From a relative
2 Produce on farm
3 Earn cash to buy food
4 Given money to buy food

5 _____

17. Did you have livestock to use? Yes No

18. If yes, who did the livestock belong to?

_____

19. What kind of livestock did you have?

TYPE	NUMBER
_____	_____
_____	_____
_____	_____
_____	_____

20. After your husband dies, did you do anything to earn cash? Yes No

21. If yes, what did you do to earn cash? (List all activities) _____

_____

22. Did you remarry after your husband died? Yes No

23. If yes, how long was it before you remarried?

_____

(For each marriage that ended in the death of a husband, complete a separate Widow Questionnaire.)

QUESTIONNAIRE 7 Economic Activities

Date_____ Interviewer_____

Coder_____ Checker_____

Village_____ Composite ID_____

1. Does this family have a farm(s) to use? Yes No

2. If yes, who does the farm belong to?_____

_____ N.A.

2a. What is the tenure arrangement?

0 No farm
1 Family owns
2 Sharecrop arrangement
3 Rents
4 Given for temporary use
5 Given for indefinite use

6 _____

3. How long has your family farmed this land?

_____ N.A.

4. Has your family registered this farm? Yes No N.A.

5. Who decided what will be grown on the farm?

_____ N.A.

6. Who decides what will be sold from the farm?

_____ N.A.

7. Do you (the woman) have a farm of your own? Yes No

8. If yes, how did you get your farm(s)?

0 No farm
1 Inherited from parents
2 Inherited from husband
3 Bought it
4 Given from someone else
5 Given use by someone
6 Received as maher
7 Received from children

8 _____

9. How long have you had this farm? _____ N.A.

10. Have you registered this farm? Yes No N.A.

11. Who does the work on your farm(s)?

_____ N.A.

12. Who decided what to plant on your own farm?

_____ N.A.

13. What do you grow on your own farm (List crops in the order of importance.)

a. _____ N.A.

b. _____

c. _____

d. _____

14. Do you ever sell any of the produce from your farm? Yes No N.A.

15. If yes, what do you sell? (List crops sold in their order of importance.)

a. _____ N.A.

b. _____

c. _____

d. _____

16. If yes, who decides what to sell from your farm?

_____ N.A.

List the number of each type of farm belonging to the family as a whole and the number belonging only to the woman.

	Type of Farm	Number owned by Family	Number owned by Woman
17.	Jimo	_____	_____
18.	Desheeg	_____	_____
19.	Dryland	_____	_____
20.	Irrigated	_____	_____

(Note: Number Owned by Family is the total farms including those of the woman. The Number Owned by Woman is a sub-set of this number.)

21. Does this family have access to a pump? Yes No N.A.

22. If yes, how do you get access to a pump?

0 No pump
1 Owns a pump
2 Sharecrops
3 Borrows a pump
4 Rents a pump

5 _____

23. Do you (the woman) own a pump? Yes No N.A.

24. Does this family have a <u>bakaar</u>? Yes No

25. If yes, number of <u>bakaars</u> of family _____

26. [For women who are currently married]

Do you (the woman) have a bakaar of your own separate from the rest of the family? Yes No N.A.

27. Does this family own any fruit trees? Yes No

28. If yes, do you (the woman) own any fruit trees? Yes No

List the number of each type of fruit trees belonging to the family and the number belonging to the woman.

	Type of Fruit Trees	Number owned by Family	Number owned by Woman
30.	Mango	_____	_____
31.	Papaya	_____	_____
32.	Banana	_____	_____
33.	Limes	_____	_____
34.	Bambelmo	_____	_____
35.	Tamarind	_____	_____
36.	Guava	_____	_____
37.	_____	_____	_____

(Note: Number Owned by Family is the total including those of the woman. The Number Owned by Woman is a sub-set of this number.)

38. Does this family own any livestock? Yes No

39. If yes, do you (the woman) own any livestock?

Yes No

40. If yes, how did you (the woman) get your livestock?

0 No livestock
1 Inherited from parents
2 Inherited from husband
3 Maher
4 Received from children
5 Given by someone
6 Bought it
7 Part of bridewealth for daughters

8 _____

List the number of each type of livestock belonging to the family and the number belonging to the woman.

	Type of Livestock	Number Owned by Family	Number Owned by Woman
41.	Camel	_____	_____
42.	Cattle	_____	_____
43.	Sheep	_____	_____
44.	Goats	_____	_____
45.	Donkeys	_____	_____
46.	Chickens	_____	_____

(Note: Number Owned by Family is the total including those of the woman. The Number Owned by Woman is a sub-set of this number.)

47. Do you belong to any organizations? Yes No

49. Do you ever hire any women to help your family members with any tasks? Yes No

50. If yes, which tasks?

0 No tasks
1 Housekeeping
2 Housecleaning
3 Cooking
4 Child care
5 Farming
6 Herding

7 _____

51. Did you (the woman) do anything in the past year to earn cash? Yes No

52. If yes, list all the tasks which you did to earn cash in the past year. (List in the order of importance.)

a. _____

b. _____

c. _____

d. _____

QUESTIONNAIRE 8 Health/Nutrition

Date_____ Interviewer_____

Coder_____ Checker_____

Village_____ Composite ID_____

1. What are or were your children's most common health problems and the usual treatment you use? (List the three most important problems.)

1. CHILDREN'S HEALTH PROBLEM	2. USUAL TREATMENT
a. _____	a. _____
_____	_____
b. _____	b. _____
_____	_____
c. _____	c. _____
_____	_____

3. Have any of your children age 5 or younger had diarrhea in the last two weeks? Yes No N.A.

4. If yes, how did you treat it? N.A.

   a. _____

   b. _____

5. Have any of your children age 5 or younger ever died from diarrhea? Yes No N.A.

6. What health problems are common to women in this village? (List the three most common problems.)

   a. _____

   b. _____

   c. _____

7. Are you or have you ever been anemic? Yes No

8. If yes, what are or were your symptoms?

   a. _____

   b. _____

   c. _____

9. Have you ever had difficulty with your menstrual period? Yes No

10. If yes, what problems?

    a. _____

    b. _____

11. What is the total number of miscarriages and stillbirths the woman has had?

    a. Number of miscarriages _____

    b. Number of stillbirths _____

12. Have you ever had a difficult childbirth? Yes No

13. If yes, describe what problems you had.

a. _____

b. _____

14. Is there anyone in this beel who can set broken bones?

Yes No

15. Is there anyone in this beel who can treat snake bites?

Yes No

16. Is there anyone in this been who can treat mental disorders? Yes No

17. If no one is available in this beel, where do people go for treatment of these problems?

a. Broken bones _____ N.A.

b. Snake bite _____ N.A.

c. Mental disorders _____ N.A.

18. Have you ever heard of or used any of the following?

Item	Heard of	Used	Good	Bad
Immunization				
ORT for diarrhea				
Pharaonic Circumcision				
Sunna kabiir				
Sunna Arab				

19. Do you think the following are good or bad? Why?

a. Immunization _____

_____

_____

_____

b. ORT for diarrhea _____

_____

_____

_____

c. Pharaonic circumcision _____

_____

_____

_____

d. Sunna kibiir _____

_____

_____

_____

e. Sunna Arab _____

_____

_____

_____

20. How old were you when you first got pregnant? _____

21. How long do you think is best to wait after the birth of one baby before becoming pregnant again? _____

_____

22. Why? _____

_____

_____

23. Do you use any methods to have space between births?

Yes No N.A.

24. What methods?

a. _____

b. _____

25. Do you think that breast feeding works for child spacing?

Yes No N.A.

26. Why? _____

_____

_____

27. For how long do/did you breast feed your children before weaning them?

_____

27a. Why? _____

_____

_____

28. After the birth of your children, how long did you usually wait before your menstrual period began again?

_____

29. What do you think is the best age for a woman to marry?

_____

D = everyday
W = several times a week
M = several times a month
S = several times a season
Y = several times a year
F = only for feasts

Food Item	Gu'	Xagaa	Deyr	Jilaal	Other
babaay					
liimo					
gare					
bambeelmo					
narjin					
seytuun					
cambe					
wild fruits					
bocor					
yanyo					
basal					
carrots					
leafy greens					
ansalata					
barbarooni					
besbes					
swt.potatoes					
mohog					
cabbage					
wild plants					
tea					
sugar					
honey					

32. Was there ever a time when you ate wild plants, fruits or hunted meat in order to survive? Yes No

33. If yes, what circumstance or when?

a. wild plants (roots, leaves) _____

_____ N.A.

. wild fruits _____

_____ N.A.

. wild meat _____

_____ N.A.

30. Why? _____

_____

_____

31. How often does your family eat the following food in each season?

D = everyday
W = several times a week
M = several times a month
S = several times a season
Y = several times a year
F = only for feasts

Food Item	Gu'	Xagaa	Deyr	Jilaal	Other
galley					
masego					
bariis					
baasto					
rooti					
moos bukeeni					
moos (sweet)					
hilib lo'					
hilib geel					
hilib ari					
hilib ido					
hunted meat					
fresh fish					
dried fish					
cow milk fresh					
cow milk sour					
camel milk fresh					
camel milk sour					
goat milk					

34. Do you eat more fish in one season than another?

Yes No Don't eat fish.

35. If yes, when do you eat more fish? N.A.

_____

35a. Why do you eat more fish then? N.A.

_____

36. If you eat fish, who do you get if from and where do you get it?

Source 1

a. From whom? _____

b. Where? _____

Source 2

a. From whom? _____

b. Where? _____

37. If you eat meat, who do you get it from and where do you get it?

Source 1

a. From whom? _____

b. Where? _____

Source 2

a. From whom? _____

b. Where? _____

38. If you eat fruit, who do you get it from and where do you get it?

Source 1

a. From whom? _____

b. Where? _____

Source 2

a. From whom? _____

b. Where? _____

39. If you eat vegetables, who do you get them from and where do you get them?

Source 1

a. From whom? _____

b. Where? _____

Source 2

a. From whom? _____

b. Where? _____

40. List any foods eaten only by -

a. men (but not women) _____

b. _____

c. women (but not men) _____

d. _____

e. children (but not adults) _____

f. _____

g. adults (but not children) _____

h. _____

i. your family (but not other families) _____

j. _____

k. other families (but not your family) _____

l. _____

m. your village (but not other villages) _____

n. _____

o. other villages (but not your village) _____

p. _____

41. What foods do you eat as snacks outside of regular meals?

a. _____

b. _____

42. At what age do your children begin to eat adult food?

_____

43. What foods do your children eat? (for children who do not yet eat adult food)

a. _____

b. _____

44. Do you eat any special foods while you are pregnant?

Yes No D.K.

45. If yes, what foods? N.A.

a. _____

b. _____

c. Why? _____

_____

46. Do you avoid certain foods when you are pregnant?

Yes_____

c. Why? _____

50. Do you avoid any foods after giving birth?

Yes No D.K.

51. If yes, what foods? N.A.

a. _____

b. _____

c. Why? _____

52. Do you grow maize? Yes No

53. If yes, is there any time in a year when you have to buy maize? Yes _____

c. Why? _____

50. Do you avoid any foods after giving birth?

Yes No D.K.

51. If yes, what foods? N.A.

a. _____

b. _____

c. Why? _____

52. Do you grow maize? Yes No

53. If yes, is there any time in a year when you have to buy maize? Yes No N.A.

54. If yes, in what season(s) do you buy maize?

_____ N.A.

54a. For how long do you buy maize?

_____ N.A.

55. Do you grow sorghum? Yes No

56. If yes, is there any time in a year when you have to buy sorghum? Yes No N.A.

57. If yes, in what season(s) do you buy sorghum?

_____ N.A.

57a. For how long do you buy sorghum?

_____ N.A.

58. Do you ever buy food with your own money?
Yes No N.A.

59. If yes, in what circumstances? _____

_____ N.A.

60. Do you every buy water from a donkey cart or truck?

Yes No

61. If yes, during what season or in what circumstance?

_____ N.A.

62. If your family goes for water, how far do you have to go to get water?

_____ N.A.

63. How often do you go for water? _____

_____ N.A.

64. How long does it take you each time to get water?

_____ N.A.

65. Does anyone help you get water? Yes No N.A.

If yes, who helps you?

a. _____

b. _____

66. From where do you get your firewood? (May include 2 answers)

0 Do not use firewood
1 Family collects it
2 Buys in market
3 Buys at house
4 Relatives collect
5 Neighbors collect
6 Servant collects
7 Her husband

8 _____

67. If you or your family collects it, how often do you go to look for it?

_____ N.A.

68. How long does it take you each time you to out to collect firewood?

_____ N.A.

69. Does anyone help you collect firewood?
Yes No N.A.

70. If yes, who helps you collect firewood?

a. _____

b. _____

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JESS SOCIOECONOMIC SURVEY
Form 1. Vegetable/Fruit/Grain Checklist

DATE _____ INTERVIEWER_____ CHECKER_____

MARKET_____ DISTRICT_____ CODER_____

The following items are to be checked if they are in the market and then price and marketing information about each item present is to be filled in on the appropriate sheet: Fish, Foodstuffs, or Livestock. Those items followed by (1) should be studied every time you go into the market. Those items followed by a (2) should be studied at least once a month.

ITEM	PRESENT IN MARKET	ITEM	IN MARKET
1.maize, fresh/cob(1)	____	27.potatoes(2)	_____
2.maize, dry/cob (1)	____	28.eggs (2)	_____
3.maize, dry/shucked (1)	____	29.chickens(2)	_____
4.sorghum,fresh (1)	____	30.fish,fresh(1)	_____
5.sorghum, dried (1)	____	31.fish, dried(1)	_____
6.sesame, wholeseed(1)	____	32.meat,beef(1)	_____
7.sesame oil (1)	____	33.meat,goat(1)	_____
8.other veg.oil (2)	____	34.meat,sheep(1)	_____
9.beans,cowpea (1)	____	35.meat,camel(1)	_____
10.beans,mung (1)	____	36.ghee (1)	_____
11.other beans (2)	____	37.milk,sweet(1)	_____
12.green onions (2)	____	38.milk,sour (1)	_____
13.red onions (1)	____	39.tomatoes,sm(1)	_____
14.yellow onions (1)	____	40.tomatoes,med(1)	_____
15.garlic (2)	____	41.lettuce (2)	_____
16.hot peppers(1)	____	42.carrots (1)	_____
17.grn peppers(2)	____	43.limes (1)	_____
18.squash,orange(2)	____	44.grapefruit(1)	_____
19.squash,green (2)	____	45.papaya (1)	_____
20.okra (2)	____	46.watermelon(1)	_____
21.mango,small(1)	____	47.tea (2)	_____
22.mango,lrg (1)	____	48.sugar (1)	_____
23.banana,sm.(1)	____	49.bun (2)	_____
24.banana,lrg(1)	____	50.salt (1)	_____
25.honey (2)	____	51.charcoal(2)	_____
26.pasta (2)	____	52.rice (2)	_____
		53.break (2)	_____
		54.leafy greens (1)	_____
		55.coconuts(1)	_____

JESS SOCIOECONOMIC SURVEY
Form 2. Vegetable/Grain/Fruit Price List

DATE_____ INTERVIEWER_____ CHECKER_____

MARKET_____ DISTRICT_____ CODER _____

[Every other week go to the local market and fill in the sheet below. If there are three or more sellers of any one item, get a price from three sellers. The first prices taken should be those from Priority List One (attached). Please record the name of the measure used by each seller (suus, kg., glas), and the price per that measure. If the item is sold by number, like three fish, put that in the Measure column. If the item is sold by pile, count the number of the item in that pile, if possible. Only fill in the price per kilo column if you know what the price is per kilogramme. Otherwise, leave it blank. Record the number of sellers that are in the market today for that item. Ask the seller where the item came from (where or from whom did she/he buy the item). Record that in the Source column. If the seller can tell you, record the price the seller paid for the item at the source. BE SURE TO INCLUDE THE MEASURE USED when the seller bought the item. Make any comments that are relevent as to the quality of the item being sold, the willingness of the seller to talk, the reliability of the information].

ITEM	How is it sold? MEASURE	PRICE/ MSURE	PRICE/ KG	#SELLERS TODAY	ORIGIN	PRICE/ AT SOURCE	COMMENT

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JESS SOCIOECONOMIC SURVEY
Form 3. Fish Price List

DATE_____ INTERVIEWER_____ CHECKER_____

MARKET _____ DISTRICT _____ CODER _____

#SELLERS_____ AMT. SOLD _____ TIME/MKT_____

[Go to the fish market every other week. Go when the market is just getting started and stay for a few hours. When you think that the market is at its height, count the number of sellers and record above. If there aren't too many sellers, ask them how much they have for sale when they arrive at the market. When you are ready to leave, ask them how much they have sold. Add together and enter in AMT SOLD. Record the total time you are in the market. Below, fill in information on all the sales that you can: the Name of the fish, whether it is fresh or dried; the number of fish in a pile (if sold by pile), specifying small, medium or large; the weight either of a pile or single fish, if known; the price today by pile or the price by kg.; where the fish came in from; whether the seller is a trader or a producer; how much the seller paid for the fish (be sure to include the measure, as in kgs. or crates, etc.); make comments on the quality or freshness of the fish, whether it is a fish many people like or not].

NAME OF FISH	FRESH/ DRIED	# SOLD TOGETHER	WEIGHT PILE	PRICE PILE	PRICE KG.	SOURCE*	T/P	PRICE AT SOURCE	COMMENT

*Source should include name of place fished and/or whether from river, dhesheeg, or ocean.

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JESS SOCIOECONOMIC SURVEY
Form 4. Livestock Checklist

DATE_____ MARKET_____

INTERVIEWER_____ CHECKER_____ CODER_____

In the Livestock Market, check the presence of the following animals every other week:

Animal Type	Present
CATTLE:	
female, lactating	_____
female, mature non-lactating	_____
male, mature(bull)	_____
male, mature castrated	_____
immature female	_____
immature male	_____
CAMELS:	
female, lactating	_____
female, mature non-lactating	_____
male, mature (bull)	_____
male, mature castrated	_____
immature female	_____
immature males	_____
GOATS:	
immature female	_____
immature male	_____
mature male	_____
mature female	_____
SHEEP:	
mature female	_____
mature male	_____
immature females	_____
immature males	_____
DONKEYS:	
male	_____
female	_____
OTHER_____ (name)	_____

JESS SOCIOECONOMIC SURVEY
Form 5. Livestock Price List

DATE_____ INTERVIEWER_____ CHECKER_____

MARKET_____ DISTRICT _____ CODER _____

#BUYERS_____ #SELLERS_____ #SOLD _____

TIME ARRIVED_____ TIME DEPARTED_____

[Every other week, go to the livestock market and take the prices of the different category of animals that appear in the market. Enter three prices if possible for each type/class of animal being sold. Types of animals are camels, cattle, sheep or goats. Examples of Class are female-lactating or male-calf. The age should be determined with help from the sellers, the buyers or someone who knows. This applies to the Condition as well: healthy-fat, healthy-lean, sick, other, and to the Weight. List the total Number of Buyers in the market today. Write the price. Check whether the person is trader(T) or producer (P), where the animal is from, the price at which it was purchased, whether it was bought from a trader or the producer, the purpose of the purchase, e.g. slaughter, rearing, resale; the destination of the animal, and how it is to be transported to its next destination: on foot, by truck].

Type	Class	Age	Weight	Condit.	Price today	Trader or Producer	Info./ seller		Info./buyer		
							from	price	purpose	Where to	Transport type

JESS SOCIOECONOMIC SURVEY
Form 6. Wood/Thatch/Fodder Price List

Taariikhda_____ Wareeystaha_____

Suuqa_____ Degmada_____

I. Building Wood (poles and sticks)

Name of wood	# pcs. in pile	# of piles	Price/pile	Where from

II. Firewood

Name of wood	# pcs. in pile	# of piles	Price/pile	Where from

III. Thatch (roofs, mats)

Name of thatch	#pcs. in pile	# of piles	Price/pile	Where from

IV. Fodder grass/stover (animal food)

Name of grass	# pcs. in bundle	# of bundles	Price/bundle	Where from

V. Charcoal

Name of tree used	Cabirka	Price/cabirka	Where from

Biological Family

Frequency Distribution for the Gross Biological Family — Table 1
Family Relation for Males — Table 2
Frequency Distribution for Relation Composition of Net Household — Table 3
Frequency Distribution for Relation/Composition, Gross Living Household — Table 4

Marriage

Number of Sheep and Goats Given as Bridewealth for First Marriage by Decades — Table 5
Number of Tropical Livestock Units Given as Bridewealth for Second Marriage by Decade of Marriage — Table 6
Average Marriage Set-up Cost for Male First Marriage — Table 7
Average Length of Marriages in Years that End in Divorce — Table 8
Average Length of Marriages in Years that End in Death — Table 9
Marital Status for Males 15 Years and Older — Table 10
Frequency of Marriage within Same Village — Table 11
Family Relation for Females — Table 12
Marital Status for Females 15 Years and Older — Table 13
Number of Cattle Given as Bridewealth by Year of First Marriage — Table 14
Average Amount of Cash Given as Bridewealth by Year of First Marriage — Table 15
Number of Camels Given as Bridewealth for First Marriage by Decades — Table 16
Average Age of Male at Nth Marriage — Table 17
Age Structure of Household-Heads — Table 18
Average Age of Female at Females Nth Marriage — Table 19
Mean Age Difference Between Husbands and Wives at Nth Marriage for Females — Table 20
Mean Age Difference Between Husbands and Wives at Nth Marriage for Males — Table 21

Education

Koranic Level of Achievement for Females 15 Years and Older — Table 22
Koranic Level of Achievement for Males — Table 23

Livestock

Number and Percent of Jubba Valley Households Having Each Species of Livestock — Table 24
Average Number of Livestock per Household for Percent of Households Having Each Livestock Species — Table 25
Number of Livestock for Households Having Livestock — Table 26

Fruit
Percent of Households Having Some Fruit Trees by Tree Type — Table 27

Labor
Occupation for Males 15 Years and Older — Table 28
Occupation for Females 15 Years and Older — Table 29

Nutrition
Nutrient Composition of Selected Foods — Table 30
Recommended Intakes of Nutrients — Table 31

TABLE 1.

FREQUENCY DISTRIBUTION FOR THE GROSS BIOLOGICAL FAMILY

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
RELATION	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
Household head	1035	12.6	280	13.2	326	12.0	186	12.4	169	12.4	314	13.4	316	12.4	378	12.[illegible]
Wife/spouse	1577	19.2	362	17.0	550	20.2	237	19.1	269	19.7	459	18.0	540	21.2	578	18.4
Son	2978	36.2	821	38.6	959	35.3	543	36.1	487	35.7	942	37.0	881	34.6	1155	36.8
Daughter	2639	32.1	662	31.2	883	32.5	489	32.5	438	32.1	801	31.5	809	31.8	1029	32.8

TABLE 2.

FAMILY RELATION FOR MALES

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
RELATION	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%
Household head	44.0	957	58.0	43.8	247	59.2	42.3	307	61.3	36.1	293	100.0	45.2	169	75.5	45.0	311	61.0	44.7	289	61.0	42.0	357	57.0
Wife/spouse	34.0	6	0.4	19.0	2	0.5	38.7	3	0.6	46.3	167	57.0	20.4	116	39.5	21.0	1	0.2	46.5	2	0.4	3.0	3	0.5
Son	20.3	581	36.0	20.6	144	34.5	19.7	180	35.9	50.0	1	0.3	26.0	1	0.3	20.0	174	34.0	20.9	154	32.7	20.0	253	40.5
Father	78.0	6	0.4	78.7	3	0.7	18.3	4	0.8	15.5	2	0.7	30.0	2	0.7	74.0	3	0.6	82.0	3	0.6	90.0	1	0.2
Brother	26.0	24	1.5	28.6	11	2.6	50.0	1	0.2	86.0	1	0.3	17.0	3	1.0	28.0	10	2.0	23.6	9	1.9	25.0	5	0.8
Spouse's father	72.7	3	0.2	60.0	2	0.5	20.0	1	0.2	90.0	1	0.3	25.0	1	0.3	70.0	1	0.2	50.0	1	0.2	98.0	1	0.2
Spouse's mother	70.0	1	0.1	70.0	1	0.2	98.0	1	0.2	23.0	5	1.7				20.0	2	0.4	20.0	1	0.2	18.0	2	0.3
Spouse's brother	20.0	2	0.1	20.0	2	0.5	16.0	2	0.4	18.0	2	0.7				17.0	2	0.4	60.0	2	0.4	19.0	1	0.2
Brother's son	17.5	10	0.6	21.0	1	0.2	16.0	1	0.2	65.0	1	0.3				25.0	1	0.2	17.5	6	1.3	72.0	1	0.2
Sister's son	22.0	2	0.1	19.0	1	0.2										65.0	1	0.2	16.0	1	0.2			
Father's brother				72.0	1	0.2										16.0	1	0.2						
Other close rel.				16.0	1	0.2																		
Spouse's sis son	16.0	1	0.1																					
Mother's brother	65.0	1	0.1																					

TABLE 3. FREQUENCY DISTRIBUTION FOR RELATION COMPOSITION OF NET HOUSEHOLD

RELATION	JUBBA VALLEY PERCENT	URBAN PERCENT	AG RIVERINE PERCENT	AG NON RIVERINE PERCENT	PASTORAL PERCENT	LOWER JUBBA PERCENT	MIDDLE JUBBA PERCENT	GEDO PERCENT
Household head	16.0	16.0	15.8	15.8	15.5	17.0	16.7	18.2
Wife/spouse	18.6	17.1	19.8	18.3	18.3	18.0	19.7	35.5
Son	34.3	35.0	33.2	34.6	36.0	34.2	32.6	29.5
Daughter	28.0	27.5		28.0	27.7	27.1	26.8	0.0
Father	0.1	0.2	28.4	0.3	0.2	0.2	0.2	0.8
Mother	0.8	0.8	0.7	0.8	0.9	0.8	0.8	0.3
Brother	0.4	0.7	0.3	0.5	0.2	0.5	0.6	0.2
Sister	0.2	0.4	0.0	-	0.2	0.3	0.1	0.0
Spouse's daughter	0.1	0.1	0.1	0.1	-	0.2	0.1	0.0
Spouse's father	-	0.1	0.0	-	-	-	0.1	0.2
Spouse's mother	0.2	0.4	0.2	0.1	0.2	0.2	0.2	0.0
Spouse's brother	0.1	0.2	-	0.2	-	0.3	0.1	
Spouse's sister	0.1	0.2	0.1	-	-	0.1	0.2	0.0
Granddaughter		0.1	-	-	-	0.1	-	0.2
Brother's son	0.3	0.1	0.2	0.4	0.3	0.1	0.6	-
Brother's daughter	0.1	0.1	0.2	-	0.1	0.2	0.1	0.1
Sister's son	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1
Sister's daughter	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0
Spouse's broth's son	-	0.1	-	-	-	-	0.1	-
Spouse's sister's son		0.1	0.1	-	-	0.1	0.1	-
Spouse's sister's daughter	0.1	0.1	0.1	-	-	0.1	0.2	-
Father's brother	-	0.1	-	-	-	-	-	0.0
Father's sister		0.1	-	-	-	-	0.1	-
Other close relation	0.1	0.2	0.0	0.2	0.1	0.1	0.2	0.0
Spouse's son	0.1	-	0.3	-	-	-	0.3	-
Spouse's broth's daughter	-	-	0.0	-	-	-	0.1	-
Mother's brother	-	-	-	0.1	-	0.1	-	-
Mother's sister	-	-	-	0.1	-	-	0.1	-
Grandmother	-	-	-	-	0.1	0.1		0.1
Daughter-in-law	-	-	-	-	0.1	0.1	-	-
Totals	99.8	100	99.6	100.2	100.1	100.2	100.3	85.2

TABLE 4. FREQUENCY DISTRIBUTION FOR RELATION/COMPOSITION, GROSS LIVING HOUSEHOLD

RELATION	JUBBA VALLEY NO	JUBBA VALLEY %	URBAN NO	URBAN %	AG RIVERINE NO	AG RIVERINE %	AG NONRIVERINE NO	AG NONRIVERINE %	PASTORAL NO	PASTORAL %	LOWER JUBBA NO	LOWER JUBBA %	MIDDLE JUBBA NO	MIDDLE JUBBA %	GEDO NO	GEDO %
Household head			277	14.2	322	14.0	177	14.0	169	13.0	337	15.0	307	14.2	373	13.0
Wife/spouse			344	18.0	490	21.0	262	20.0	247	20.0	426	19.0	476	22.0	539	19.0
Son			677	35.0	759	32.1	438	34.0	434	35.0	784	34.0	669	31.0	995	35.0
Daughter			568	29.0	728	31.0	396	30.3	378	30.0	684	30.0	617	29.0	913	32.0
Father			3	0.2			3	0.2	2	0.2	4	0.2	3	0.1	1	0.0
Mother			14	0.7	15	0.6	9	0.7	10	0.8	15	0.7	15	0.7	22	0.8
Brother			11	0.6	6	0.3	7	0.5	2	0.2	10	0.4	11	0.5	7	0.2
Sister			7	0.4	1	0.0			2	0.2	6	0.3	1	0.0	5	0.2
Husband			9	0.5	13	0.5	2	0.2			5	0.2	13	0.6	8	0.3
Spouse's daughter			2	0.1	2	0.1	1	0.1			4	0.2	2	0.1	1	0.0
Spouse's father			2	0.1	1	0.0							2	0.1	1	0.0
Spouse's mother			7	0.4	4	0.2	1	0.1	2	0.2	4	0.2	4	0.2	6	0.2
Spouse's brother			4	0.2			2	0.2			5	0.2	1	0.0		
Spouse's sister			4	0.2	2	0.1					2	0.1	3	0.1	1	0.0
Granddaughter			2	0.1							1	0.1			1	0.0
Brother's son			2	0.1	5	0.2	4	0.3	4	0.3	2	0.1	10	0.5	5	0.2
Brother's daughter			1	0.1	4	0.2			1	0.1	3	0.1	2	0.1	12	0.0
Sister's son			4	0.2	3	0.1	1	0.1	1	0.1	4	0.2	2	0.1	3	0.1
Sister's daughter			1	0.1	1	0.0	1	0.1	1	0.1	2	0.1	2	0.1	1	0.0
Spouse's brother's son			1	0.1									1	0.0		
Spouse's sister's son			1	0.1	2	0.1					2	0.1	1	0.0		
Spouse's sister's daughter			2	0.1	2	0.1					1	0.0	1	0.0		
Father's brother			1	0.1											1	0.0
Father's sister			2	0.1									2	0.1		
Other close relation			3	0.2	1	0.1	2	0.2	1	0.1	2	0.1	4	0.2	1	0.0
Spouse's son					6	0.3							6	0.3		
Spouse's brother's daughter					1	0.0							1	0.0		
Mother's brother							1	0.1			1	0.0				
Mother's sister							1	0.1					3	0.1		
Grandmother									2	0.2	1	0.0			2	0.1
Daughter in law									1	0.1	1	0.0				

TABLE 5. NUMBER OF SHEEP AND GOATS GIVEN AS BRIDEWEALTH FOR FIRST MARRIAGE BY DECADES

DECADES	JUBBA VALLEY MEAN	JUBBA VALLEY N	URBAN MEAN	URBAN N	AG RIVERINE MEAN	AG RIVERINE N	AG NONRIVERINE MEAN	AG NONRIVERINE N	PASTORAL MEAN	PASTORAL N	LOWER JUBBA MEAN	LOWER JUBBA N	MIDDLE JUBBA MEAN	MIDDLE JUBBA N	GEDO MEAN	GEDO N
1980-88	5.7	56	6.8	5	5.4	32	7.3	2	8.1	15	1.9	11	2.0	10	8.0	35
1970-79	11.1	90	43.3	8	7.5	47	7.1	16	7.1	22	2.7	14	2.8	16	15.3	60
1960-69	9.9	88	10.3	14	10.7	39	10.4	19	10.4	23	3.5	16	6.1	19	13.2	53
1950-59	19.6	48	75.1	7	9.0	24	10.8	1	10.8	10	41.6	13	4.7	6	12.8	29
1940-49	18.3	19	58.1	3	10.4	8	–	–	4.3	7	70.7	3	1.8	4	10.8	12
1930-39	75.5	2	140.0	1	–	–	10.0	1	–	–	11.0	1	–	–	140.0	1
1920-29	10.0	1	–	–	–	–			–	–	–	–	–	–	–	–

TABLE 6. NUMBER OF TROPICAL LIVESTOCK UNITS GIVEN AS BRIDEWEALTH FOR SECOND MARRIAGE BY DECADE OF MARRAGE

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
DECADES	MEAN	N	%	MEAN	N	%	MEAN	N	%	MEAN	N	%	MEAN	N	%	MEAN	N	%	MEAN	N	%	MEAN	N	%
1981-88	1.3	120	30.0	0.4	21	30.0	1.0	56	31.0	0.4	21	29.0	1.5	24	30.1	0.5	30	26.8	1.7	41	28.1	1.4	49	33.0
1971-80	1.2	159	39.1	0.6	28	39.0	1.2	71	40.0	1.0	28	37.0	1.9	34	42.5	0.6	43	38.4	0.4	57	39.0	2.4	59	40.0
1961-70	1.0	84	20.6	0.2	18	26.0	1.0	33	18.4	0.7	13	18.0	2.1	18	22.1	0.9	25	22.3	0.8	25	17.1	1.1	34	23.0
1951-60	1.2	30	7.4	0.3	3	4.3	0.6	13	6.7	2.2	10	14.0	0.1	2	2.5	2.2	9	8.0	0.6	15	10.3	1.0	6	4.0
1941-50	1.0	9	2.2	0.5	1	1.4	0.2	6	3.1	-	-	-	2.8	2	2.5	0.5	3	2.7	0.8	5	3.4	1.6	1	0.7
1931-40	1.0	3	0.7	0.4	-	-	0.1	1	0.6	1.2	2	2.7	-	-	-	2.4	1	0.9	0.1	2	1.4	-	-	-

TABLE 7. AVERAGE MARRIAGE SET-UP COST FOR MALE FIRST MARRIAGE

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
DECADES	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N
1980-88	188.0	193	423.0	54	115.0	72	121.0	25	65.0	42	198.0	61	97.0	50	237.0	82
1970-79	88.0	304	155.0	89	65.0	102	52.0	48	62.0	63	98.0	107	45.0	78	100.0	119
1960-69	55.0	275	117.0	81	31.0	88	26.0	48	32.0	60	91.0	92	24.0	79	46.0	104
1950-59	28.0	143	69.0	31	16.0	58	19.0	26	24.0	28	26.0	48	12.0	48	48.0	47
1940-49	11.0	50	27.0	13	6.0	15	9.0	8	3.0	12	8.0	14	3.0	18	22.0	18
1930-39	33.0	9	71.0	4	3.0	2	0.0	1.0	10.0	2	0.0	2	3.0	4	97.0	3
1920-29	63.0	5	300	1	5.0	2	1.0	2	-	-	152.0	2	0.0	2	10.0	1

TABLE 8. AVERAGE LENGTH OF MARRIAGES IN YEARS THAT END IN DIVORCE

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
MALE Nth MARRIAGE	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N
1	3.3	174	1.5	48	3.8	60	7.0	38	7.7	30	7.0	64	6.6	61	5.3	50
2	2.1	103	1.6	20	5.6	47	4.1	20	3.2	16	2.8	25	7.0	47	5.8	31
3	2.3	35	4.8	4	2.4	17	6.5	4	3.1	8	4.8	9	4.9	15	4.4	11
4	5.1	10	8.0	2	5.8	5	3.8	4	-	-	1.0	1	4.5	8	14.0	1
5	6.5	2	3.0	1	-	-	10.0	1	-	-	-	-	6.5	2	-	-
6	2.5	2	-	-	-	-	-	-	5.0	1	-	-	5.0	1	-	-
7	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
FEMALE Nth MARRIAGE																
1	2.4	212	0.8	52	4.5	77	1.5	41	5.2	40	4.4	66	5.9	80	3.7	66
2	3.5	87	2.4	19	3.0	38	5.8	19	3.2	12	3.6	26	7.5	42	5.0	19
3	3.8	20	21.0	3	8.3	9	9.0	5	6.0	3	19.7	3	6.7	10	7.3	7
4	8.0	3	-	-	7.0	2	10.0	1	-	-	-	-	8.0	3	-	-
5	2.7	3	-	-	2.7	3	-	-	-	-	3.5	2	1.0	1	-	-
6	2.0	1	-	-	2.0	1	-	-	-	-	-	-	-	-	2.0	1
7	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
11	-	-	-	-	20.0	1	-	-			20.0	1	-	-	-	-

TABLE 9. AVERAGE LENGTH OF MARRIAGES IN YEARS THAT END IN DEATH

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
MALE Nth MARRIAGE	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N	MEAN YEAR	N
1	15.3	98	18.0	24	14.6	41	16.2	12	12.8	19	15.6	29	14.4	32	15.9	37
2	12.3	24	14.0	3	9.2	11	23.4	5	6.8	5	12.0	7	12.2	9	12.5	8
3	11.7	9	-	-	14.0	3	12.4	5	7.0	2	-	-	9.9	7	18.0	2
4	11.8	5	26.0	1	3.0	1	10.0	3	-	-	26.0	1	10.0	3	3.0	1
7	38.0	1	-	-	38.0	1	-	-	-	-	-	-	-	-	38.0	1
10	2.0	1	-	-	-	-	2.0	1.0	-	-	2.0	1.0	-	-	-	-
FEMALE Nth MARRIAGE																
1	14.7	106	17.8	25	14.3	43	15.8	13	11.5	24	15.3	31	13.2	36	15.6	39
2	15.6	24	18.0	3	13.5	11	19.7	7	8.0	2	14.3	6	15.0	9	17.0	9
3	6.0	3	-	-	6.0	3	13.0	1	-	-	-	-	7.0	2	4.0	1
4	7.0	1	-	-	-	-	7.0	1	-	-	-	-	7.0	1	-	-

TABLE 10. MARITAL STATUS FOR MALES 15 YEARS AND OLDER

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
MARITAL STATUS	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%
Single	19.4	554	34.5%	19.4	138	33.0%	19.0	190	35.1%	19.9	106	36.2%	19.4	124	35.1%	20.1	180	35.4%	19.4	144	30.6%	18.9	230	36.8%
Married	43.0	1004	62.6%	43.0	262	62.7%	41.7	340	62.7%	44.8	180	61.4%	43.4	220	62.3%	44.8	307	60.4%	43.5	314	66.7%	44.0	383	61.3%
Divorced	42.3	26	1.6%	43.0	5	1.0%	41.9	10	1.8%	45.5	4	1.4%	38.7	7	2.0%	40.8	12	2.4%	42.0	8	1.7%	45.7	6	1.0%
Remarried	38.8	5	0.3%	30.7	3	0.7%	46.0	1	0.2%	56.0	1	0.3%	-	-		38.8	3	0.6%	39.0	2	0.4%	-	-	
Widowed	61.1	15	0.9%	55.6	10	2.4%	66.0	1	0.2%	77.5	2	0.7%	70.0	2	0.6%	65.2	6	1.2%	68.7	3	0.6%	53.3	6	1.0%
																		0.0%						
TOTALS		1604	100.0%		418	99.8%		542	100.0%		293	100.0%		353	100.0%		508	100.0%		471	100.0%		625	100.0%

TABLE 11. FREQUENCY OF MARRIAGE WITHIN SAME VILLAGE

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
PRIOR RESIDENCE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Same village	1260.00	76.60	269.00	70.60	452.00	77.50	496.00	75.8	264.00	80.40	366.00	74.50	394.00	70.40	500.00	84.20
Different village	361.00	21.90	111.00	29.10	120.00	20.60	130.00	21.2	59.00	19.20	121.00	24.60	150.00	26.80	90.00	15.20
Missing	23.00	1.30	1.00	0.30	10.00	1.70	9.00	3.3	1.00	0.40	4.00	.80	16.00	2.90	3.00	0.50

TABLE 12.

FAMILY RELATION FOR FEMALES

RELATION	JUBBA VALLEY MEAN AGE	JUBBA VALLEY NO	JUBBA VALLEY %	URBAN MEAN AGE	URBAN NO	URBAN %	AG RIVERINE MEAN AGE	AG RIVERINE NO	AG RIVERINE %	AG NONRIVERINE MEAN AGE	AG NONRIVERINE NO	AG NONRIVERINE %	PASTORAL MEAN AGE	PASTORAL NO	PASTORAL %	LOWER JUBBA MEAN AGE	LOWER JUBBA NO	LOWER JUBBA %	MIDDLE JUBBA MEAN AGE	MIDDLE JUBBA NO	MIDDLE JUBBA %	GEDO MEAN AGE	GEDO NO	GEDO %
Household head	48.7	44	2.6	49.0	20	4.4	48.3	14	2.5	44.6	7	2.5				53.8	15	3.0	46.5	14	2.8	45.6	15	2.3
Wife/spouse	33.3	1156	70.0	34.2	280	61.1	32.1	400	72.7	33.4	206	72.3	34.4	199	72.9	34.3	344	68.3	34.1	352	71.1	31.9	460	69.2
Daughter	19.4	374	22.5	20.1	130	28.4	19.5	113	20.5	18.7	59	20.7				19.5	119	23.6	19.4	100	20.2	19.4	155	23.3
Mother	70.0	1	0.1	68.7	13	2.8	65.4	15	2.7	67.5	8	2.8	18.6	55	20.1	69.7	15	3.0	62.7	15	3.0	66.3	20	3.0
Sister	66.2	50	3.0	22.5	4	0.9	18.0	1	0.2				66.0	10	3.7	24.0	3	0.6	40.0	1	0.2	23.3	4	0.6
Spouse's mother	25.6	8	0.5	58.0	4	0.9	61.0	4	0.7	65.0	1	0.4	40.0	1	0.4	79.0	2	0.4	65.0	4	0.8	59.2	5	0.8
Spouse's sister	64.9	11	0.7	16.5	2	0.4	15.0	1	0.2										16.0	3	0.6			
Brother's daught	16.0	3	0.2	23.0	1	0.2	18.0	1	0.2							23.0	1	0.2	18.0	1	0.2			
Sister's daught	20.5	2	0.1	21.0	1	0.2							86.5	2	0.7	15.0	1	0.2				21.0	1	0.2
Spouse's niece*	18.0	2	0.1	15.0	1	0.2													15.0	1	0.2			
Father's sister	70.0	1	0.1	70.0	1	0.2													70.0	1	0.2			
Other close rel.	63.3	3	0.2	80.0	1	0.2	80.0	1	0.2				30.0	1	0.4				80.0	2	0.4	30.0	1	0.2
Mother's sister	60.0	1	0.1							60.0	1	0.4							60.0	1	0.2			
Grandmother	83.3	3	0.2										15.0	1	0.4	80.0	1	0.2				85.0	2	0.3
Daught's in law	18.0	1	0.1										18.0	1	0.4	18.0	1	0.2						

* meaning spouse's sister's daughter

TABLE 13.

MARITAL STATUS FOR FEMALES 15 YEARS AND OLDER

MARITAL STATUS	JUBBA VALLEY MEAN AGE	JUBBA VALLEY N	JUBBA VALLEY %	URBAN MEAN AGE	URBAN N	URBAN %	AG RIVERINE MEAN AGE	AG RIVERINE N	AG RIVERINE %	AG NONRIVERINE MEAN AGE	AG NONRIVERINE N	AG NONRIVERINE %	PASTORAL MEAN AGE	PASTORAL N	PASTORAL %	LOWER JUBBA MEAN AGE	LOWER JUBBA N	LOWER JUBBA %	MIDDLE JUBBA MEAN AGE	MIDDLE JUBBA N	MIDDLE JUBBA %	GEDO MEAN AGE	GEDO N	GEDO %
Single	18.1	285	17.1%	18.4	104	22.7%	18.5	91	15.4%	17.9	40	14.0%	17.3	49	15.0%	18.1	96	19.0%	19.1	69	13.9%	17.6	120	18.0%
Married	32.8	1236	74.3%	34.0	302	65.9%	31.7	451	76.2%	32.7	226	79.3%	33.4	257	78.5%	34	363	72.0%	33.2	381	77.0%	31.5	492	74.0%
Divorced	42.7	54	3.2%	39.1	22	4.8%	39.7	14	2.4%	39	8	2.8%	55.7	9	2.8%	42.1	23	4.6%	44.0	17	3.4%	42.2	14	2.1%
Remarried	39.3	18	1.1%	40.3	7	1.5%	35.9	9	1.5%	-	-	-	51	2	0.6%	39.3	3	0.6%	44.4	7	1.4%	34.8	8	1.2%
Widowed	50.3	70	4.2%	56.7	23	5.0%	59.3	27	4.6%	60.1	11	3.9%	71.6	8	2.5%	65.3	19	3.8%	55.9	20	4.0%	60.1	31	4.7%
Missing													65	1	0.3%	-	-	-	65	1	0.2%	-		
Totals		1663	100.0%		458	100.0%		592	100.0%		285	100.0%		326	100.0%		504	100.0%		495	100.0%		665	100.0%

TABLE 14.

NUMBER OF CATTLE GIVEN AS BRIDEWEALTH BY YEAR OF FIRST MARRIAGE

DECADES	JUBBA VALLEY MEAN	JUBBA VALLEY N	URBAN MEAN	URBAN N	AG RIVERINE MEAN	AG RIVERINE N	AG NONRIVERINE MEAN	AG NONRIVERINE N	PASTORAL ME	PASTORAL N	LOWER JUBBA MEAN	LOWER JUBBA N	MIDDLE JUBBA MEA	MIDDLE JUBBA N	GEDO MEAN	GEDO N
1980-88	2.0	62	2.2	9	1.9	25	2.2	11	1.9	21	1.8	11	2.1	14	2.0	37
1970-79	2.7	103	3.3	13	2.5	37	2.7	20	3.0	35	2.0	18	1.8	25	3.1	60
1960-69	2.6	100	3.3	19	2.5	41	2.6	17	2.4	25	2.5	25	2.3	26	2.8	49
1950-59	2.4	52	2.4	8	2.7	24	1.5	2	1.8	12	2.3	15	1.7	17	3.0	20
1940-49	3.6	14	11.0	2	1.8	4	1.5	2	3.6	5	2.0	3	4.0	3	4.1	8
1930-39	1.0	1	-	-	-	-	1.0	1	-	-	-	-	1.0	1	-	-
1920-29	3.0	2	-	-	-	-	3.0	2	-	-	1.0	1	5.0	1	-	-

TABLE 15. AVERAGE AMOUNT OF CASH GIVEN AS BRIDEWEALTH BY YEAR OF FIRST MARRIAGE

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
DECADES	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N
1981-88	10600.0	176	8600.0	45	8600.0	69	8700.0	25	11300.0	38	11000.0	53	9400.0	46	11000.0	77
1971-80	7100.0	268	7000.0	74	7000.0	92	6600.0	43	7300.0	57	5800.0	92	4100.0	68	9900.0	108
1961-70	6300.0	245	3700.0	75	3700.0	79	2100.0	41	3500.0	51	10900.0	83	2400.0	73	5200.0	89
1951-60	2000.0	129	1600.0	25	1600.0	59	1000.0	22	2000.0	24	1400.0	45	1300.0	45	3500.0	39
1941-50	2500.0	44	1100.0	12	1100.0	14	2600.0	6	1400.0	10	700.0	13	800.0	17	6100.0	14
1931-40	5300.0	7	300.0	4	300.0	2	-	-	7000.0	1	200.0	1	900.0	3	11300.0	3
1920-30	8100.0	4	15000.0	1	15000.0	2	200.0	1	-	-	1100.0	2	0.0	1	30000.0	1

TABLE 16. NUMBER OF CAMELS GIVEN AS BRIDEWEALTH FOR FIRST MARRIAGE BY DECADES

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
DECADES	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N
1980-88	2.2	27	2.0	3	1.7	6	3.0	1	2.3	17	2.7	7			2.0	20
1970-79	2.5	48	3.3	3	1.9	9	2.2	5	2.7	31	3.0	11	2.5	2	2.4	55
1960-69	3.3	57	4.3	6	2.3	16	6.7	11	2.1	23	2.6	8	1.3	6	3.6	43
1950-59	4.0	22	7.8	4	3.6	19	4.0	2	2.7	6	4.4	5	3.0	1	4.0	16
1940-49	3.1	16	3.5	4	5.0	3	1.7	3	2.7	2	2.0	4	2.0	4	4.3	8
1030-39	4.8	4	8.0	2	-	-	-	-	2.0	1	1.0	1	-	-	6.0	3
1920-29	11.0	1	-	-	11.0	1	-	-	-	-	-	-	-	-	11.0	1

TABLE 17. AVERAGE AGE OF MALE AT NTH MARRIAGE

	JUBBA VALLEY N=1622			URBAN N=380			AG RIVERINE N=574			AG NONRIVERINE N=284			PASTORAL N=269			LOWER JUBBA N=485			MIDDLE JUBBA N=546			GEDO N=591		
NUMBER MARRIAGE	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%
1	26	1019	62.1%	27	285	75.2%	25	321	56.2%	27	168	59.1%	26	172	64.3%	28	342	70.5%	26	295	54.0%	26	382	64.6%
2	36	417	26.1%	37	70	18.1%	35	169	29.2%	36	76	27.1%	36	71	26.0%	37	111	22.9%	36	156	29.0%	36	150	25.4%
3	41	127	7.9%	39	17	4.6%	42	60	10.1%	41	25	8.8%	40	17	6.4%	44	24	4.9%	40	59	11.0%	40	44	7.4%
4	46	40	2.7%	37	6	1.7%	4	17	3.0%	44	9	3.2%	46	4	2.0%	46	6	1.2%	47	21	3.8%	43	13	2.2%
5	45	12	0.8%	65	1	0.4%	46	5	1.0%	41	5	1.8%	42	1	0.5%	43	1	0.2%	46	11	2.0%	24	1	0.2%
6	40	2	0.2%	-	-	-	24	1	0.3%	-	-	-	57	1	0.4%	-	-	-	57	1	0.2%	50	1	0.2%
7	55	2	0.1%	-	-	-	50	1	0.2%	-	-	-	60	1	0.4%	-	-	-	60	1	0.2%	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	48	1	0.2%	-	-	-	-	-	-

N=NUMBER OF MARRIAGES

TABLE 18. AGE STRUCTURE OF HOUSEHOLD-HEADS

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
AGE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0-17	9	0.9%	1	0.4%	1	0.3%	7	3.8%	-	-	1	0.3%	7	2.2%	1	0.3%
18-25	81	7.8%	16	5.7%	46	12.8%	5	2.7%	14	6.7%	16	4.7%	25	7.9%	40	10.6%
26-35	224	21.6%	64	22.9%	78	21.7%	37	19.9%	45	21.5%	70	20.5%	60	19.0%	94	24.9%
36-45	274	26.5%	84	30.0%	85	23.6%	51	27.4%	54	25.8%	100	29.3%	79	25.0%	95	25.1%
46-55	240	23.2%	63	22.5%	80	22.2%	48	25.8%	49	23.4%	76	22.3%	76	24.1%	88	23.3%
56-65	138	13.3%	34	12.1%	48	13.3%	23	12.4%	33	15.8%	52	15.2%	45	14.2%	41	10.8%
66 & OVER	69	6.7%	18	6.4%	22	6.1%	15	8.1%	14	6.7%	26	7.6%	24	7.6%	19	5.0%
TOTAL	1035	100.0%	280	100.0%	360	100.0%	186	100.0%	209	100.0%	341	100.0%	316	100.0%	378	100.0%

TABLE 19. AVERAGE AGE OF FEMALE AT FEMALES NTH MARRIAGE

	JUBBA VALLEY N=1621			URBAN N=379			AG RIVERINE N=626			AG NONRIVERINE N=284			PASTORAL N=321			LOWER JUBBA N=485			MIDDLE JUBBA N=545			GEDO N=591		
NUMBER MARRIAGE	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%
1	18.0	1280	79.1%	18.5	312	82.3%	17.7	476	76.3%	17.6	218	77.6%	18.3	270	82.9%	18.3	393	81.1%	17.6	392	72.3%	16.0	491	83.8%
2	24.6	274	17.2%	23.8	57	15.0%	25.5	120	19.1%	23.5	51	18.5%	23.7	43	14.4%	24.2	75	15.6%	25.6	117	21.8%	23.5	82	14.1%
3	29.0	43	2.7%	31.6	8	2.1%	28.1	20	2.8%	30.6	9	3.2%	29.0	6	2.3%	28.7	10	2.3%	30.0	24	4.5%	30.0	9	1.5%
4	26.3	6	0.4%	21.5	2	0.6%	28.5	2	0.4%	29.0	2	0.7%	-	-	-	24.0	1	0.2%	28.7	4	0.7%	19.0	1	0.2%
5	39.0	7	0.4%	-	-	-	41.0	6	1.0%	-	-	-	-	-	-	31.0	3	0.6%	45.7	4	0.7%	-	-	-
6	32.0	-	0.1%	-	-	-	32.0	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	32.0	1	0.2%
7	31.0	-	0.1%	-	-	-	-	-	-	-	-	-	31.0	1	0.4%	-	-	-	-	-	-	31.0	1	0.2%
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	1	-	-	-	-	40.0	1	0.2%	-	-	-	-	-	-	40.0	-	0.2%	-	-	-	-	-	-
			100.0%			100.0%			100.0%			100.0%			100.0%			100.0%			100.0%			100.0%

TABLE 20. MEAN AGE DIFFERENCE BETWEEN HUSBANDS AND WIVES AT NTH MARRIAGE FOR FEMALES

	JUBBA VALLEY	URBAN	AG RIVERINE	AG NON RIVERINE	PASTORAL	LOWER JUBBA	MIDDLE JUBBA	GEDO
FEMALE Nth MARRIAGE	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF
1	11.2	10.2	10.7	12.8	11.9	11.0	11.7	10.9
2	11.0	10.2	11.7	12.6	9.1	12.2	10.7	10.2
3	10.2	13.6	13.0	2.1	13.3	13.2	9.6	8.6
4	8.3	14.5	4.0	6.5	-	8.0	5.3	21.0
5	11.1	-	10.0	-	-	17.7	6.3	
6	6.0	-	3.0	-	-	-	-	6.0
7	2.0	-	6.0	-	2.0	-	-	2.0
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	3.0	-	3.0	-	-	3.0	-	-

TABLE 21. MEAN AGE DIFFERENCE BETWEEN HUSBANDS AND WIVES AT NTH MARRIAGE FOR MALES

	JUBBA VALLEY	URBAN	AG RIVERINE	AG NON RIVERINE	PASTORAL	LOWER JUBBA	MIDDLE JUBBA	GEDO
FEMALE Nth MARRIAGE	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF	MEAN AGE DIF
1	8.1	8.5	7.3	9.3	7.9	9.1	8.0	7.4
2	14.8	15.0	13.4	16.8	15.9	15.1	14.0	15.5
3	18.5	19.0	19.3	16.5	20.5	21.0	15.9	20.6
4	20.9	14.0	23.2	16.6	23.8	24.3	19.7	21.2
5	19.4	30.0	17.0	18.0	28.0	16.0	19.7	-
6	23.5		10.0		37.0		37.0	10.0
7	32.5	-	20.0	-	45.0	-	45.0	20.0
8	-	-	-	-	-	-	-	-
9		-		-		-		-
10	24.0	-	24.0	-	-	24.0	-	-

TABLE 22. KORANIC LEVEL OF ACHIEVEMENT FOR FEMALES 15 YEARS AND OLDER

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
ACHIEVEMENT	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	NO	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%
None	32.8	1377	82.8	34.0	314	68.6	31.8	510	86.1	32.3	254	89.1	33.1	296	90.8	34.0	388	77.0	33.0	441	89.1	31.7	548	82.4
Khamis	29.1	140	8.4	29.0	68	14.8	26.0	39	6.6	26.8	15	5.3	35.5	18	5.5	30.4	48	9.5	30.4	29	5.9	27.3	63	9.5
Arbaco	23.2	40	2.4	22.0	19	4.1	20.1	12	2.0	32.2	5	1.8	26.2	4	1.2	25.7	21	4.2	26.3	4	0.8	18.9	15	2.3
Talado	22.0	6	0.4	22.7	4	0.9	21.0	1	0.1	-	-	-	20.0	1	0.3	22.7	4	0.8	20.5	2	0.4	-	-	-
Isnin	21.7	3	0.2	16.0	1	0.2	24.5	2	0.4	-	-	-	-	-	-	-	-	-	16.0	1	0.2	24.5	2	0.3
Axad	17.8	4	0.2	17.0	3	0.7	-	-	-	20.0	1	0.4	-	-	-	-	-	-	17.5	2	0.4	18.0	2	0.3
Sabti	21.5	2	0.1	-	-	-	22.0	1	0.2	21.0	1	0.4	-	-	-	26.0	7	1.4	-	-	-	21.5	2	0.3
Jumaac	25.5	68	4.1	26.0	43	9.4	22.6	16	2.7	29.0	2	0.7	26.7	7	2.1	20.0	1	0.2	18.6	5	1.0	26.2	28	4.2
				26.0	5	1.1	37.1	10	1.7	22.0	5	1.8	-	-	-	-	-	-	38.6	8	1.6	23.6	5	0.8
Unknown/missing				20.0	1	0.2	70.0	1	0.2	50.0	2	0.7	-	-	-	-	-	-	56.7	3	0.6	-	-	-

TABLE 23. KORANIC LEVEL OF ACHIEVEMENT - MALES
INCLUDING PERCENT, NUMBER AND MEAN AGE OF MALES HAVING ATTAINED EACH LEVEL OF ACHIEVEMENT

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA		
ACHIEVEMENT	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%	MEAN AGE	N	%
None	35.5	503	31.4	37.7	73	17.5	34.7	172	31.7	37.3	107	36.6	34.0	148	41.9	36.9	138	27.2
Khamis	34.0	294	18.3	34.7	65	15.6	32.1	124	22.9	34.4	65	22.2	38.3	43	12.2	36.0	70	13.8
Arbaco	35.0	130	8.1	31.4	25	6.0	34.2	61	11.3	40.0	22	7.5	34.7	22	6.2	37.8	32	6.3
Talado	33.7	52	3.2	29.3	15	3.6	34.2	17	3.1	33.8	13	4.4	42.3	7	2	35.0	18	3.5
Isnin	34.0	25	1.6	29.1	8	1.9	34.5	10	1.8	36.3	4	1.4	36.0	4	1.1	38.4	8	1.6
Axad	32.2	12	0.7	22.8	5	1.2	-	-	-	20.0	3	1.0	53.0	4	1.1	24	1	0.2
Sabti	18.3	3	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jumaac	35.3	574	35.8	36.4	220	52.8	34.1	154	28.4	[illegible]	1	0.3	34.3	124	35.1	35.9	234	46.1
Less than 1 yr	30.1	111	0.5	29.0	4	1	20.0	1	0.2	[illegible]	76	25.9	30	1	0.4	31.5	6	1.2
Unknown/missing	45.3	5	0.2	38.0	2	0.5	60.0	1	0.2	37.5	2	0.7	-	-	-	36.0	1	0.2

TABLE 24. NUMBER AND PERCENT OF JUBBA VALLEY HOUSEHOLDS HAVING EACH SPECIES OF LIVESTOCK

	JUBBA VALLEY		URBAN		AG RIVERINE		AG NONRIVERINE		PASTORAL		LOWER JUBBA		MIDDLE JUBBA		GEDO	
LIVESTOCK TYPE	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Camels	263	25.7	20	7.1	66	18.6	19	10.8	158	76.0	61	17.7	28	9.3	174	46.3
Cattle	515	50.3	70	24.5	176	50.1	113	62.5	153	73.6	161	46.7	122	404	232	61.7
Goats	480	46.9	70	24.5	192	54.1	69	36.6	152	73.1	121	35.1	80	26.5	279	74.2
Sheep	300	29.3	32	11.3	132	37.2	39	21.6	97	53.4	54	15.7	37	12.3	209	55.6

TABLE 25. AVERAGE NUMBER OF LIVESTOCK PER HOUSEHOLD FOR % OF HOUSEHOLDS HAVING EACH LIVESTOCK SPECIES

	JUBBA VALLEY N=1028		URBAN N=282		AG RIVERINE N=360		AG NONRIVERINE N=176		PASTORAL N=210		LOWER JUBBA N=345		MIDDLE JUBBA N=307		GEDO N=376	
LIVESTOCK TYPE	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN	% WITH TYPE	MEAN
CATTLE	50.0	17.7	24.0	15.7	52.0	9.5	63.0	15.4	79.0	29.5	46.0	15.4	40.0	21.6	61.0	17.1
CAMELS	26.0	17.6	7.0	25.5	20.0	7.9	11.0	9.9	72.0	25.2	18.0	28.3	9.0	16.0	46.0	21.5
GOATS	46.0	26.0	25.0	24.0	51.0	25.0	38.0	15.0	73.0	39.0	35.0	15.0	27.0	15.0	78.0	35.0
SHEEP	29.0	16.0	12.0	29.0	46.0	14.0	22.0	13.0	49.0	16.0	16.0	7.0	12.0	7.0	55.0	20.0

N=NUMBER OF HOUSEHOLDS PER ANALYSIS SECTOR

TABLE 26. NUMBER OF LIVESTOCK FOR HOUSEHOLD HAVING LIVESTOCK

NUMBER LIVESTOCK	JUBBA VALLEY % HAVING TYPE	JUBBA VALLEY RANGE	JUBBA VALLEY MEAN	JUBBA VALLEY MEDIAN	URBAN % HAVING TYPE	URBAN RANGE	URBAN MEAN	URBAN MEDIAN	AG RIVERINE % HAVING TYPE	AG RIVERINE RANGE	AG RIVERINE MEAN	AG RIVERINE MEDIAN	AG NON-RIVERINE % HAVING TYPE	AG NON-RIVERINE RANGE	AG NON-RIVERINE MEAN	AG NON-RIVERINE MEDIAN
Goats	46	1/501	26	12	23	1/250	24	20	54	1/300	24	12	38	1/50	15	6
Sheep	29	1/250	16	8	12	1/25	29	10	37	1/50	13.4	7	22	1/100	13	5
Chickens	51				45	1/50	11	8	65	1/100	9.6	6	63	1/200	11	7
Donkeys	3				2	1/2	1	1	4	1/2	2	1	2	1/2	1.3	1
Burden donkeys	8	1/5	1	1	2.7	1/1	1	1	20	1/4	1.7	1	10	1/2	1	1
Non-lactating cows	43	1/50	9	5	24	0/50	7.7	2	50	1/33	4.1	2	53	1/70	8	5
Lactating cows	42	1/50	9	5	24	0/33	3.6	2	50	1/11	1.9	1	62	1/70	7	4
Bulls	23	1/20	24	2	24	0/9	1	0	47	0/5	0.7	0	62	20/6	1	1
Castrated males	5	1/20	3	2	24	0/3	1	0	47	0/20	0.2	0	3	0/5	2	0
Immature females	37	1/70	3	2	24	0/10	2	2	35	1/8	1.5	1	46	1/10	3	2
Immature males	30	1/30	3	2	24	0/20	1.4	1	30	1/5	1	1	39	1/30	2	2
Draft & burden cat					29	0/2				0/6	0.1	0				

NUMBER LIVESTOCK	PASTORAL % HAVING TYPE	PASTORAL RANGE	PASTORAL MEAN	PASTORAL MEDIAN	LOWER JUBBA % HAVING TYPE	LOWER JUBBA RANGE	LOWER JUBBA MEAN	LOWER JUBBA MEDIAN	MIDDLE JUBBA % HAVING TYPE	MIDDLE JUBBA RANGE	MIDDLE JUBBA MEAN	MIDDLE JUBBA MEDIAN	GEDO % HAVING TYPE	GEDO RANGE	GEDO MEAN	GEDO MEDIAN
Goats	73	1/501	39	30	35	1/100	15	10	27	1/501	15	4	74	1/300	35	20
Sheep	49	1/50	16	10	16	1/28	7	5	12	1/40	7	4	55	1/250	20	10
Chickens	23	1/30	7	6	42	1/50	9	8	73	1/50	9	6	91	1/200	12	8
Donkeys	3	1/2	1.4	1	3	1/9	2	1	3	1/7	1	1	3	1/2	2	1
Burden donkeys	2	1/5	2.8	2.5	3	1/2	1	1	4	1/3	1	1	20	1/5	2	1
Non-lactating cows	79	0/40	6	4	38	1/60	8	5	35	1/100	11	5	53	1/50	9	5
Lactating cows	79	0/100	13	7	39	1/30	4	2	34	1/40	6	4	51	1/40	4	2
Bulls	79	0/20	1.8	1	21	1/9	2	1	19	1/13	3	2	27	1/20	3	2
Castrated males	79	0/15	0.6	0	4	1/20	4	2	6	1/8	2	1	6	1/15	3	2
Immature females	79	0/70	5	3	34	1/20	3	2		1/70	5	2	45	1/28	3	2
Immature males	79	0/19	2.7	2	27	1/30	3	2	24	1/16	3	2	38	1/20	16	10
Draft & burden cat	78	0/4	0	0												

TABLE 27.

PERCENT OF HOUSEHOLDS HAVING SOME FRUIT TREES BY TREE TYPE

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NON-RIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
TREE TYPE	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN	% WITH TYPE	MEAN	MEDIAN
Mango	13.0	8.0	4.0	7.0	12.0	8.0	28.0	8.2	4.0	9.0	3.0	3.0	0.0	-	-	5.0	14.0	5.0	27.0	6.4	4.0	8.0	10.0	4.0
Papaya	4.0	20.0	10.0	3.0	16.0	15.0	9.0	15.2	10.0	2.0	74.3	20.0	0.0	-	-	1.0	58.0	15.0	6.2	14.0	10.0	4.0	18.0	20.0
Banana	3.0	38.0	15.0	2.0	63.0	70.0	8.0	28.3	15.0	1.1	105.0	105.0	0.0	-	-	1.0	81.0	58.0	7.5	24.0	15.0	1.2	76.0	100.0
Lime	5.0	4.0	2.0	3.0	9.0	5.0	10.0	2.0	1.0	4.0	2.4	1.0	0.0	-	-	1.0	1.0	1.0	7.2	3.0	1.0	6.0	6.1	3.0
Grapefruit	0.6	5.0	3.0	1.0	7.0	4.0	1.0	1.5	1.5	0.0	-	-	0.0	-	-	0.0	-	-	1.0	2.3	2.0	0.5	2.5	2.5
Tmarind	0.6	8.0	4.0	0.0	-	-	1.0	1.5	1.5	1.1	3.0	3.0	0.0	-	-	0.9	14.0	10.0	1.0	1.5	1.5	0.0	-	-
Guava	0.8	4.0	5.0	0.0	-	-	2.0	3.8	4.5	0.0	-	-	0.0	-	-	0.6	3.0	3.0	2.0	4.0	4.0	0.0	-	-
Other fruit	3.0	14.0	3.0	1.0	11.0	11.0	8.0	16.0	3.0	2.3	5.2	2.0	0.0	-	-	3.0	36.0	36.0	5.0	8.0	8.0	1.9	9.0	10.0

TABLE 28.

OCCUPATION FOR MALES 15 YEARS AND OLDER

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
TYPE OF WORK	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%
No work	43.2	50	3.1	37.8	32	7.7	45.0	6	1.2	57.9	8	2.7	53.8	4	1.4	42.6	20	3.9	45.9	13	2.8	47.7	17	2.7
Farming	36.4	779	48.6	39.8	75	18.0	35.1	404	80.6	37.3	191	65.2	37.2	78	26.5	35.3	202	39.8	37.5	289	61.4	33.9	288	46.1
Herding	33.0	345	21.5	29.0	1	0.2	29.4	36	7.6	29.9	50	17.1	33.9	194	66.0	35.2	97	19.1	33.1	72	15.3	31.6	176	28.2
Trading	42.6	41	2.6	43.7	37	8.9	27.0	2	0.4				37.5	2	0.7	50.3	15	3.0	42.6	7	1.5	36.6	19	3.0
Housework	27.0	12	0.7	26.7	6	1.4	18.0	3	0.6	27.5	2	0.7	35.0	1	0.3	21.0	1	0.2	21.0	3	0.6	30.0	8	1.3
Hunting/Gath.	38.7	6	0.4	38.5	2	0.5										38.7	6	1.2	40.0	1	0.2			
Crafts	41.8	5	0.3	39.3	4	0.1	52.0	1	0.2							46.0	2	0.4	29.3	7	1.5	38.5	2	0.3
Teaching	33.5	25	1.6	33.7	6	1.4	27.4	8	1.6	42.0	6	2.0	32.8	5	1.7	32.8	6	1.2	36.3	13	2.8	36.3	12	1.9
Private business	39.4	44	2.7	38.8	39	9.4	37.0	2	0.4	32.0	1	0.3	57.5	2	0.7	[illegible]	21	4.1	27.6	8	1.7	40.3	10	1.6
Driver/Mechanic	29.4	35	2.2	30.7	26	6.4	24.4	5	1.0	26.7	3	1.0				.2	25	4.9	40.5	32	6.8	39.0	2	0.3
Civil servant	38.8	140	8.7	38.6	110	26.4	37.4	9	1.8	41.4	17	5.8	38.7	3	1.0	38.9	58	11.4	38.0	5	1.1	37.4	50	8.0
Wage labor	35.4	13	0.8	37.3	7	1.7	35.6	3	0.6	24.0	1	0.3	35.0	2	0.7	32.1	7	1.4	31.5	4	0.8	45.0	1	0.2
Koranic student	17.4	33	2.1	17.6	10	2.4	16.1	13	2.6	18.6	8	2.7	20.0	2	0.7	16.4	7	1.4	17.3	3	0.6	17.7	23	3.7
Gov't student	18.4	60	3.7	18.2	51	12.2	20.3	7	1.4	17.0	2	0.7				17.6	34	6.7	19.8	13	2.8	19.1	13	2.1
Wage labor/other				40.8	9	2.2				32.0	4	1.4				41.7	6	1.2	26.0	1	0.2	39.7	3	0.5
Sheik/Trad heal.	19.0	2	0.1	17.0	1	0.2							21.0	1	0.3	17.0	1	0.2				21.0	1	0.2
Unknown	26.0	1		26.0	1	0.2																		
Medical worker				30.0	2	0.4										25.0	1.00	0.2						

TABLE 29.

OCCUPATION FOR FEMALES 15 YEARS AND OLDER

	JUBBA VALLEY			URBAN			AG RIVERINE			AG NONRIVERINE			PASTORAL			LOWER JUBBA			MIDDLE JUBBA			GEDO		
TYPE OF WORK	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%	MEAN AGE	NO	%
No work	55.4	73	4.4	51.3	24	5.2	56.6	21	3.8	52.5	11	3.9	60.3	14	5.1	68.1	15	0.3	54.6	24	4.8	50.3	34	5.1
Farming	32.2	369	22.2	31.6	19	4.1	31.4	183	33.3	31.8	109	38.2	35.6	37	13.6	33.5	92	18.3	33.1	182	36.8	29.0	95	14.3
Herding	27.6	126	7.6				30.2	27	4.9	26.2	23	8.1	27.5	69	25.3	27.5	16	3.2	27.6	26	5.3	27.5	84	12.6
Trading	38.3	12	0.7	45.8	6	1.3	16.0	1	0.2	35.0	3	1.1	40.0	1	0.4	42.6	5	1.0				35.3	7	1.1
Housework	31.1	1004	60.3	32.0	348	76.0	29.5	310	56.4	31.2	133	46.7	32.1	149	54.6	32.2	336	66.7	31.6	242	48.9	30.0	426	64.1
Hunt/gathering	25.0	2	0.1													25.0	2	0.4						
Crafts	24.2	5	0.3	37.5	2	0.4	15.3	3	0.5							27.0	1	0.2	15.3	3	0.6	48.0	1	0.2
Teacher	24.3	4	0.2	24.3	4	0.9										25.7	3	0.6	20.0	1	0.2			
Private business	29.3	8	0.5	35.0	3	0.7				37.3	3	1.1	23.5	2	0.7	27.5	2	0.4	30.0	5	1.0	29.0	1	0.2
Driver/mech.																								
Civil servant	30.3	15	0.9	30.7	14	3.1	24.0	1	0.2							28.0	5	1.0	27.5	2	0.4	32.4	8	1.2
Wage labor/proj.	17.0	2	0.1	17.0	1	0.2	17.0	1	0.2										17.0	2	0.4			
Wage labor/other																								
Koranic student	17.9	7	0.4	18.3	4	0.9	17.0	2	0.4	18.0	1	0.4				19.0	3	0.6	35.0	1	0.2	18.0	1	0.2
Gov't student	17.5	33	2.0	17.6	31	6.8	15.0	1	0.2	16.0	1	0.4				17.7	23	4.6	60.0	1	0.2	17.0	7	1.1
Sheik/Trad heal.	30.0	2	0.1																					
Unknown	60.0	1	0.1							60.0	1	0.4												
Not applicable	80.0	1	0.1										80.0	1	0.4							54.0	3	0.5

TABLE 30.

NUTRIENT COMPOSITION OF SELECTED FOODS

(Expressed per 100 grams edible portion)

FOOD	MOISTURE	ENERGY		PROTEIN	FAT	CARBO-HYDRATE	IRON	CALCIUM	THIAMIN	RIBO-FLAVIN	NICOTIN AMIDE	VITAMIN A VALUE R.E.
	%	MJ	kcal	g	g	g	mgs	mgs	mgs	mgs	mgs	mgs
CEREALS												
Maize meal, 96% extraction	12	1.52	362	9.5	4.0	72	2.5	12	0.3	0.13	1.5	Tr
Maize meal, refined about 60% extraction	12	1.49	354	8.0	1.5	77	2.0	9	0.05	0.03	0.6	Tr
Millet, finger, meal	13	1.41	336	5.6	1.4	77	5.0	316	0.15	0.07	0.8	Tr
Rice, highly milled	12	1.48	352	7.0	0.5	80	1.0	5	0.06	0.03	1.0	Tr
Sorghum flour	12	1.48	353	10.0	2.5	73	4.0	20	0.4	0.10	3.0	Tr
Wheat, bread white	38	1.02	243	8.0	1.5	53						Tr
STARCHY ROOTS, TUBERS AND FRUITS												
Cassava, fresh	60	0.64	153	0.7	0.2	37	1.0	25	0.07	0.03	0.7	Tr
Plantain, cooked	80	0.32	77	1.3	Tr	18	0.3	4	0.02	0.02	0.24	18
Potato sweet	70	0.48	114	1.5	0.3	26	1.0	25	0.10	0.04	0.7	30
Yam, fresh	73	0.44	104	2.0	0.2	24	1.2	10	0.1	0.03	0.4	6
Yam, flour	18	1.33	317	3.5	0.3	75	10.0	20	0.15	0.1	1.0	Tr
GRAIN LEGUMES AND OILSEEDS												
Cowpea, dry	10	1.43	340	22	1.5	60	5.0	90	0.9	0.15	2.0	6
Sesame seed	5	2.49	592	20	50.0	16	10.0	1500	1.0	0.25	5.0	Tr
VEGETABLES												
Leaves, dark green *e.g.*, sweet potato tops	85	0.20	48	5.0	0.7	5	4.0	250	0.1	0.3	1.5	1000
Tomato	94	0.08	20	1.0	Tr	4	0.4	5	0.06	0.04	0.7	75
ANIMAL PRODUCTS												
Beef, cooked	68	0.72	172	23.0	8.0	Tr	2.8	16	0.06	0.20	7.0	Tr
Chicken, boiled	61	0.85	[illegible]	26.0	10.0	0	2.1	11	0.05	0.06	8.0	Tr
Egg	74	0.66	158	13.0	11.5	0.5	2.8	55	0.12	0.35	0.1	300
Liver, ox, fried	48	1.19	284	30.0	16.0	4	21.0	9	0.30	3.00	13.0	6000
Milk, cow's, whole	87	0.28	66	3.4	3.7	5.0	0.08	120	0.04	0.15	0.08	45
Catfish, steamed	74	0.50	118	20.0	3.7	0	0.6	14	-	-	-	-
FRUITS												
Avocado pear	80	0.51	121	1.4	11.3	6.1	1.4	19	0.05	0.15	2.0	88
Banana	77	0.37	88	1.5	0.1	20.6	1.4	9	0.03	0.03	6.0	20
Citrus, orange and tangerine	86	0.20	49	0.8	0.3	12.3	1.1	38	0.08	0.05	0.2	33
Mango	83	0.25	60	0.6	0.2	15.8	1.2	24	0.03	0.05	0.4	533
Watermelon	94	0.10	23	0.4	Tr	5.0	0.3	5	0.02	0.02	0.2	68
Pawpaw, papaya	91	0.13	32	0.4	0.1	8.3	0.6	21	0.03	0.03	0.4	158

R.E.= retinol equivalents Tr= trace – = not determined

Figures taken from: Food Composition Table for Use in Africa, FAO/U.S. Department of Health, Education and Welfare

Tables of representative values of foods commonly used in tropical countries, B.S. Platt, H.M.S.C., London.

Composition of foods, McCance, R.A. and Widdowson, E.M., H.M.C.O., London

This short list of common commodities is included for use in practical activities where food tables are required. However, food tables for use in specific regions are published and should be used if possible.

TABLE 31.

RECOMMENDED INTAKES OF NUTRIENTS (DIETARY ALLOWANCES)

	BODY WEIGHT kg	ENERGY[1] kcal	PROTEIN[1,2] grams	VITAMIN A[3,4] micrograms	VITAMIN D[5,6] micrograms	ASCORBIC ACID[5] milligrams	CALCIUM[7] grams	IRON[5,8] milligrams
Children								
1	7.3	820	14	300	10.0	20	0.5-0.6	5-10
1 - 3	13.4	1360	16	250	10.0	20	0.4-0.5	5-10
4 - 6	20.2	1830	20	300	10.0	20	0.4-0.5	5-10
7 - 9	28.1	2190	25	400	2.5	20	0.4-0.5	5-10
Male adolescents								
10-12	36.9	2600	30	575	2.5	20	0.6-0.7	5-10
13-15	51.3	2900	37	725	2.5	30	0.6-0.7	9-18
16-19	62.9	3070	38	750	2.5	30	0.5-0.6	5- 9
Female adolescents								
10-12	38.0	2350	20	575	2.5	20	0.6-0.7	5-10
13-15	49.9	2490	31	725	2.5	30	0.6-0.7	12-24
16-19	54.4	2310	30	750	2.5	30	0.5-0.6	14-28
Adult man (moderately active)	65.0	3000	37	750	2.5	30	0.4-0.5	5- 9
Adult woman (moderately active)	55.0	2200	29	750	2.5	30	0.4-0.5	14-28
Pregnancy (later half)		+350	38	750	10.0	50	1.0-1.2	9
Lactation (first 6 months)		+550	46	1200	10.0	50	1.0-1.2	9

1 *Energy and Protein Requirements, Report of a Joint FAO/WHO Expert Group, FAO, Rome, 1972.*

2 *As egg of milk protein.*

3 *Requirements of Vitamin A, Thiamine, Riboflavin and Niacin. Report of a Joint FAO/WHO Expert Group, FAO, Rome, 1965.*

4 *As retinol.*

5 *Requirements of Asorbic Acid, Vitamin D, Vitamin B12, Folate and Iron, Report of a Joint FAO/WHO Report Group, FAO, Rome, 1970.*

6 *As cholecalciferol,*

7 *Calcium Requirements, Report of a FAO/WHO Expert Group, FAO, Rome, 1961.*

8 *On each line the lower value applies when over 25 percent of calories in the diet come from the animal foods, and the higher value when animal foods represent less than 10 percent of calories.*

9 *For women whose iron throughout life has been at the level recommended in this table, the daily intake of iron during pregnancy and lactation should be the same as that recommended for non-pregnant, non-lactating women of childbearing age. For women whose iron status is not satisfactory at the beginning of pregnancy, the requirement is increased, and in the extreme situation of women with no iron stores, the requirement can probably not meet without supplementation.*

An official orthography for the Somali language was only developed in 1972, prior to a mass national literacy campaign in 1974. As a result, Somali terms and place names used in reports and on maps show a wide range of spellings, reflecting transcription by different European and Western nationals writing on Somalia. A case in point is Shabeelle. No fewer than 10 different spellings of this river can be found in official writings on the area—the Italian version is Uebi Scebelli, while there are many English and German variations, including Shabelli, Shebelli, Shabelle, Shebeli, Shabele. Some reports contain two or three different spellings for the same place or geographical feature.

To the greatest extent possible, JESS attempted to use the official rules of orthography for all Somali terms appearing in its reports. The team used national speakers to pronounce terms that were then transliterated. This was not always easy as nationals from different regions have varying dialectical pronunciations for the same word. In the interest of standardizing key words and place names, JESS hopes other writers on Somalia will follow a similar procedure, so uninitiated readers will know when they are reading about the same place or seeing the same term.

For vowels, a general rule is that "a," "e," and "o" are pronounced like short vowels in English, and "u" sounds like "oo," as in the word you, but without the preceding "y" sound. When any vowel is doubled, it is simply voiced for a longer period of time. The Somali "i" is pronounced like a short English vowel when it appears in the middle of a word, but like a long "e" in English when doubled or at the end of a word. For instance, the town of Jilib, is pronounced as it sounds in English, while the word dhiil (a type of milk container) is pronounced more like the English word deal than dill. The word beel, which means subdistrict, does not rhyme with the peel, but is pronounced like the English word bell, though the short "e" is held longer.

For consonants, the Somali "x" represents a harsh, aspirated "h," whereas the "h" is equivalent to an unaspirated "h" in English. The name Hassan in Somali is spelled Xassan. The Somali "dh" is a slightly shortened "d" and does not resemble the English "th" or the Arabic "dh." The Somali sound for "kh" is between the English sounds for "k" and "h" pronounced together. Finally, the sound represented by "c" in Somali does not exist in English, but can be approximated by a glottal "a" when it appears at the beginning of a word and a short glottal stop in the middle of a word. This sound is also sometimes represented by an apostrophe. It is close to the "c" or "ayn" in Arabic.

The following glossary of standard Somali terms and place names used in JESS reports represents the closest approximation the team could make to Somali pronunciation and orthography. Words in parentheses are alternate spellings that are commonly seen, but which JESS feels are non-standard. The spelling of Jubba is an obvious example—by far, the most commonly encountered spelling of the word has only one "b," but based on the most common Somali pronunciation, the double "b" spelling is considered standard. Words appearing in square brackets indicate another, different Somali or foreign name for the same place. For example, the most common Somali name for the capital not Muqdisho, Mogadishu, or Mogadiscio, but Xamar (pronounced "hamar").

Place Names

Afgooye
Afmadow
Arbay Cabdi
Baardheere (Bardera, Bardere, Bardhere)
Badhaadhe
Banta
Baraawe (Brava, Barawe)
Baydhabo (Baidoa)
Beledul Kariim
Bidi
Birbiriso
Bu'aale [mistakenly identified on some maps as Dujuuma]
Buulo Maamow
Buur Fuule
Buurdhuubo (Burdubo)
Cabdulle Kakane
Canjeel
Cusbooley
Deex—grazing area between lower Jubba River and the coast
Demo
Dhacar—grazing area in lower Jubba, west of the river

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Dhesheeg Radiile
Dhesheeg Waamo (Deshek Uamo)
Dhoobey—grazing area east of lower Middle Jubba
Dujuuma
Faafxadhuun
Fanoole
Fuuma
Gaduudey
Garbahaarey
Golweyn
Gomeeni Yare
Goob Weyn
Gurmeyso
Hakaka
Haraawe
Hiloshiid
Hombooy
Honqorre
Hurufle
Iskandariya [Alessandria]
Jabbi
Jamaame [Margherita]
Jilib (Gelib)
Jowarri—grazing area east of upper Middle Jubba and bay
Kalaanje
Kaytooy
Kismaayo (Kismayo, Chisimaio, Kismayu)
Kumbareera
Kumtiire
Kuudka
Libaanga
Libooye
Luuq (Luq, Luk, Lugh, Lugh Ferrandi, Lugh Ganane)
Madiina
Mana Moofa
Manaane
Mardha
Mareerey
Maykoreebe
Mogambo
Mokomane
Moofa
Muqdisho (Mogadishu, Mogadisho, Mogadiscio) [Xamar]
Nafta Quur
Nasiib Buundo
Nyiireey
Qalaaliyo
Qoraxey
Saakow (Saacow, Sakow)
Sarenley
Sarsaar
Shabeelle
Shangaani
Tansaaniya
Turdho
Wandiid—grazing area east of Saakow; east of Banaada
Webi Jubba (Uebi Juba) [Ganaane] —Jubba River
Xagar Buulo
Yontooy

Birds, Fish, Insects, and Reptiles

ayax - locust or grasshopper
bocol - snail
cayayaan - insect
dabaqalooc - scorpion
digaag - chicken
digiiran - guinea fowl
dooro - chicken
gendi - tsetse fly
guumeeys - owl
kalluun - fish
mallay - fish
mallay madow - catfish
mas - snake
mas sunle - poisonous snake
qalooley - marabou stork
qooley - dove
qudhaanjo - ant
ranyar - Quelea
shillin - tick
shimbiir - bird
ukun - egg
yaxaas - crocodile

Colors

buluug - blue
cad - white
cagaar - green
gaduud - red
jaalle - yellow
madow - black

Crops

babaay - papaya
bambeelmo - grapefruit
bariis - rice
basal - onion
bocor - squash or pumpkin
burcad - ghee or butter
cambe - mango

caano geel - camel's milk
caano lo' - cow's milk
caano mac or dhay - fresh cow's milk
or sweet camel's milk
caano suusac - sour camel's milk
digir - cowpea
galley - maize
garoor - sour cow's milk
haruur - sorghum
katiito - squash or pumpkin
khudaar - vegetables
liimo - lime or lemon
malab - honey
masego - sorghum
moos - banana
qare - watermelon
qasab - sugarcane
qumbe - coconut
salbuko - mung bean
sisin - sesame
subag - ghee or butter
tubaako - tobacco
yaanyo - tomato

Foods

cambuulo - boiled maize or beans
canjeero - crepe-like pancake
moofo - unleavened maize bread
soor - maize or sorghum meal porridge

Grazing Areas

Deex - between lower Jubba River
and the coast
Dhacar - lower Jubba, west of the river
Wandiid - east of Saakow; east of Banaada
Jowarri - area east of upper
Middle Jubba and bay
Dhoobey - area east of lower Middle Jubba

Houses

aqal - portable nomad hut
baraako - rectangular with tin roof
cariish - rectangular wattle or mud and wattle
hoori - portable nomad hut
mundul - round wattle or mud and wattle
sar - cement or cement-brick house

Mammals

ari - sheep and goats
baciid - oryx
balanga - waterbuck
cawl - gazelle
danyeer - baboon
doofaar - warthog
dugaag - wild
ey - dog
geel - camel
gomoh - bush pig
harimacad - cheetah
ido - sheep
jeer - hippo
kashiito - porcupine
libaax - lion
lo' - cattle
maroodi - elephant
mukulaal - cat
riyo - goats
sagaaro - dikdik
shabeel - leopard
warabe - hyena
xayawaan - animal

Measures and Storage

bakaar - grain storage pit
boosto - about 1/24 of a hectare
darab - about 1/4 of a hectare
foosto - oil drum
ga'an - hand of bananas
gacan - hand of bananas
kintaal - quintal or about 100 kilograms
kartoon - box
raar - stilt storage
shood - 1/4 of a suus or .62 to .75 kilograms
suus - 2.5 to 3.0 kilograms
ta'ab - about 1/8 of a hectare
tacab - about 1/8 of a hectare
teneg - large ghee tin

Physical Features

adable - dryland
biyo - water
buur - hill
ceel - well
ciid - soil
daad - flood
dagax - stone
dhesheeg (deshek, desheek, dhasheeg)
- depression
doonk - inland rainfed soil
dooy - clay soil
gol - forest
gosha - of the forest
haro - lake
hilo - watering place
jiimo - riverbank
kayn - forest
kunyo - dryland
roob - rain
saaxo - shallow pan

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shiid - stone
tog (tug, toog) - seasonal stream
war - manmade pond
webi - river
webiga daantiisa - riverbank

Plants*

abuur - seed
baar - doum palm
caleen - leaf
caws - grass
dacar - aloe
dhacaan - sap
geed - plant or tree
iniinyo - seed
qolof - bark
tiin - cactus
ubax - flower
xiddid - roots

Politics

beel - subdistrict
degmo - district
dooro - elect
gobol - region
guddi - committee
guddoomiye - chairman
madaxweyne - president
nabadoon - peacemaker
sheikh - Islamic religious leader
shifta - bandit
tuulo - village
xaafid - neighborhood

Seasons

gu' - big rains (April to June)
xagaa - dry season (June to Sept)
deyr - small rains (October to November)
jiilaal - dry season (December to February)

For other specific plant and tree names, see *Environmental Studies*, Volume II of this report.

Averaged Monthly Prices for Livestock at Markets Surveyed in Jubba Valley

	NOV 86	DEC 86	JAN 87	FEB 87	MAR 87	APR 87	MAY 87	JUNE 87	JULY 87	AUG 87	SEPT 87	OCT 87	NOV 87	DEC 87	JAN 88	FEB 88	MAR 88
BAARDHEERE																	
CAMEL BULL BA	20,000			12,000	21,300	16,160			26,000	9,000			22,267	12,000	21,956	22,100	
CAMEL NON LACT BA				9,140	13,865	14,800	15,000	19,000	20,000	8,500	12,000	17,750	8,849	8,700	13,802	10,701	
CAMEL YNG FEM BA	16,000	18,620	26,000	4,600	18,000	7,733	14,000			10,000	8,000		9,000		10,692	10,352	
CATTLE BULL BA	6,000		6,600	7,124	8,400	3,805		5,250		7,867	12,500	11,467	10,013	7,320	6,076		
STEER BA					8,067	7,957	9,100	7,200	7,750	7,000	4,300	9,750			3,963	2,833	
CATTLE MALE BA	6,000		6,600	7,124	8,230	5,881	9,100	6,225	7,750	7,434	8,400	10,609	10,013	7,320	5,020	2,833	
NON LACTATING BA					9,333		11,500	9,000		12,500					13,700	12,000	10,701
LACTATING BA																	33,455
MALE GOAT BA	1,800	750	1,300	1,500	2,100	2,278	2,900	2,967	2,750	3,000	3,500	3,300	3,036				
LACTATING GOAT BA	2,500		3,000	2,200	2,750	1,550			2,800	3,500	2,650	2,000	3,100	1,600			
NON-LACT GOAT BA	3,100	1,120			1,400					1,800							
MALE KID BA								2,100	1,600	2,000	2,400	2,400		1,200			
FEMALE KID BA								2,700									
CAMEL BULL KI		21,646	35,800	20,050			22,649		25,196		32,510				43,869	41,512	
CAMEL NON-LACT KI		17,050		18,968	14,490	20,379	25,585	19,191	19,381	19,134		23,373	25,191		32,300		
CAMEL MALE KI		19,957	22,550	16,097	16,938	21,883	23,763	24,566	20,694	18,969	28,131	27,596	37,113	41,415			
CATTLE MALE KI		8,000	14,810	5,480	5,453	8,733	11,322	12,672	10,745	11,213	10,300	13,467	14,783	16,798	11,369	19,523	
NON-LACT KI		7,423		7,555		6,750	9,460	8,285	7,194		8,153	11,969	9,537		6,977		
CAMEL BULL JL	1,200		17,275	9,382	9,895		15,362	5,020					23,500			18,600	
NON-LACT JL			13,000	13,452	9,500	10,050	13,582								16,060		
CATTLE MALE JL	8,500	7,351	6,410	6,753	6,760	6,575		5,500	7,481	7,667	9,425	8,450	7,775	6,080	7,654	7,753	
NON LACT COW JL	5,003	4,164	5,288	6,908	7,510	6,590	6,380			6,157	7,399	8,801	8,866	6,980	5,113	7,116	

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Averaged Monthly Prices for Selected Commodities at Markets Surveyed in Jubba Valley

TOWN	ITEM	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AVG PR
BA	MAIZE		20	23.5	27	28	29	27	23	17	17	20	30	23.5	34.3	47.5	20		25.74
BA	SORGHUM		17	16.3	19	23	16	21	19	15	12.5	15	15.5	19.5	44	34	17		20.25
BA	SESAME		40	0	0	80	90	75	80	90	77.5	65	55	40	77.5	65.5	87		61.5
BA	RICE		41	44	44	44	40	42	52	55	54.5	52	60	50	75	77.5	63		52.9
BA	PASTA LOCAL		67.5	78	79	80	120	100	70	70	80	80	80	70	85	77.5	79		81.06
BA	PASTA IMPORT		90	110	210	100	160	160	120	120	115	120	120	110	150	150	133		131.2
BA	TEA		N/A	N/A	N/A	640	650	650	750	780									433.75
BA	SUGAR LOCAL		68	62	60	78	80	80	88	90	90	80	100	160	150	120	218		101.6
BA	SUGAR IMPORT		N/A	73	75	80	85	84	90	92	90	92	100	160	150	120	218		100.6
BA	FLOUR		40	40	40	36	35	45	40	20	22	25	35	30	40	43	46		35.8
BA	COFFEE		N/A	250	220	210	220	200	320	350	315	320	400	400	325	420	383		288.86
BA	BREAD		N/A	10	5	5	7	5	5	5	7	6.7	10	5	5	5.7	4.3		5.71
BA	SALT		10	20	20	20	20	80	18.7	18.7	26.7	36.5	30	83	80	93	71		41.84
BA	CHARCOAL 50KG		N/A	167	150	150	190	200	150	160	160	150	210	220	180				160.5
BA	BEEF		80	80	60	80	80	80	80	120	100	115	120	110	100	100	130		97
BA	BEEF BONED		100	100	100	100	100	100	120	200	200	200	200	180	200	135	175		130
BA	CAMEL		80	80	80	80	80	80	80	120	120	115	120	120	120	110	140		101.7
BA	CAMEL BONED		100	100	100	100	100	100	120	200	200	200	200	200	200	135	160		147.7
BA	GOAT		100			120	160	160	160	200	200	250	250	235	200	180	225		187.7
BA	GOAT LIV/KID			160	200	200	200	200	200	180	180	225	300	300	200	203	275		215.9
BA	FRESH MILK		40	50	57.5	160	150	95	40	60	62.5	70	90	38	70	68	100		76.7
BA	SOUR MILK		18	32	50	100	80	45	22	30	37.5	60	60	19	70	49.3	96		51.25
BA	SOUR MILK CAMEL		35	45	52.5	150	140	80	32.5	60	45	60	80	32.5	65	63.75	85		68.4
JL	SALT		16	16	16	27	27	26.5	17.5	20	20	27	40	53	53	50	47		30.4
JL	RICE LOCAL		38.3	40	50	36.5	41	40	40	49	50	55	55	55	57.5	60	55		48.15
JL	RICE IMPORT		40	45	50						60			72	80	82.5	85		64.3
JL	COFFEE		250	220	260	300	300	275	375	400	400	400	400	400	400	450	425		350.3
JL	PASTA LOCAL	78	80	90												80	72		64.4
JL	PASTA IMPORT	100	100	120	125	120	130	125	120	120	120	110	112.5	115	140	143	140		122.7
JL	MAIZE	12	17.3	19	20.5	20	20.5	18.5	21	25	20	18.5	19	20	23.5	31	25		21.25
JL	SESAME	50	43.2	62.3	45	57	47	50.5	51.5	60	67	60	53	48	60	67	64		55.7
JL	SORGHUM	27	27	27	28		27	27	24	27									26.7
JL	SUGAR		60	60	60	65	80	80	80	88	93	88	86	85	109	120	160		87.8
JL	FLOUR		45	40	40	40	40	40	40	39	38	37	39	40	40	40	50		40.5
JL	CAMEL BONED	120	115	155	160	160	150	195	180	240	200	200	200	200	200	200	175		182
JL	CAMEL	100	95	80	80	80	80	110	120	120	100	110	115	120	120	120	110		104
JL	GOAT	200	155	160	160	140	120	160	250	225	200	225	212	200	200	250	300		197.1
JL	GOAT LIVER/KIDN	200	155	200	200	200	200	225	300	250	300	300	300	300	300	300	350		258.6

TOWN	ITEM	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AVG PR
JL	BEEF BONED	120	115	155	160	160	150	195	180	240	200	200	200	200	200	200	175		182
JL	BEEF	100	93	80	80	80	80	110	120	120	100	110	115	120	120	120	110		103.86
JL	FRESH MILK	50	43	42	45	60	83	100	63	45	40	40	48	55	60	55	65		56.3
JL	SOUR MILK CAMEL	40	35	33	37	50	73	100	70	55	60	30	38	45	30	45	65		51.1
JL	SOUR MILK	20	16	20	25	27	39	39	28	25	20	19	23	27	11	30	25		24.9
BU	SUGAR							85	93	96	90	99	108	117	120	160	150	200	119.8
BU	SOUR MILK CAMEL							30	28	30	30	48	66	83	80	80	77	87	58.1
BU	FRESH MILK							40	35	40	40	62	84	107	127	107	107	107	77.8
BU	SOUR MILK							20	23	25	25	29	33	37	44	40	51	53	34.5
BU	PASTA							150	130	120						160	155	150	143
BU	RICE							50	55	60				50	50	80	80	80	63.1
BU	CAMEL							155	172	180	200	221	242	265	255	208	203	200	209.2
BU	CAMEL BONED							170	193	200	240	263	286	310	305	240	245	245	245.2
KI	FLOUR		34	36	40	35	28	38	39	40	26	29	36	40	55	28	44		36.5
KI	SUGAR		63	78	78	69	72	77	82	87	82	93	88	103	120	90	225		93.8
KI	SALT		11	13	20	17	13	11	15	18	13	17	19	20	15	34	53		19.3
KI	COFFEE		220	270	230	265	300	360	380	400	400	363	371	400	410	405	400		344.9
KI	CHARCOAL 50KG		350	200	150	200	250	350	400	500	350	400	200	350	200	200	200		286.7
KI	BEEF		80	80	80	80	80	110	140	80	80	80	80	80	110	120	120		87.5
KI	BEEF BONED		120	160	120	120	120	155	200	200	200	200	200	200	275	200	200		178
KI	CAMEL		80	80	80	80	80	100	140	88	80	80	80	82	110	115	120		93
KI	CAMEL BONED		152	146	140	135	130	173	200	169	200	200	200	213	275	200	200		182.2
KI	FRESH MILK		58	50	60	60	68	98	78	57	35	37	40	45	58	60	68		58.1
KI	SOUR MILK CAMEL		34	30	42	43	65	73	61	48	25	29	33	35	43	50	71		45.5
KI	SOUR MILK		26	20	35	30	40	50	48	47	15	30	30	24	21	30	36		32.1
KI	PASTA		83	100	130	110	100	120	112	105	102	94	99	97	107	60	120		103.1
KI	RICE		37	40	35	38	45	40	41	42	38	51	54	56	70	45	70		48.8
KI	GOAT MEAT		200	200	190	195	200	250	300	300	300	300	300	325	308	300	300		264.5
KI	GOAT LIVER/K		200	250	240	245	250	300	350	400	300	350	310	300	325	350	350		301.3
KI	SORGHUM			22	27	33	27	30	33	37	38	39	20	46	52	52	53		36.36
KI	MAIZE		17	18	22	27	23	24	25	27	23	21	19	25	28	27	32		23.87
KI	SESAME			57	59	57	54	52	53	70	68	66	64	60	67	67	67		61.5
KI	TEA			200				210		200		190		200	300				216.7

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Cultural Heritage Survey of Proposed Baardheere Reservoir

prepared by

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ARD subcontracted with the University of Georgia to acquire the services of Steven Brandt, Thomas Gresham, Robert Benson, Nanny Carder, and James Ellison for an intensive survey of cultural heritage sites in the proposed Baardheere Reservoir on the upper Jubba River basin. The survey results are based primarily on fieldwork carried out during September and October of 1986 and 1987.

Archaeology is a labor-intensive discipline which often involves complex logistics and the assistance of many people. Such was the case with this project, with many people in many roles contributing to its success. We would like to thank all the field personnel, expatriate and Somali, who put in long, sometimes grueling hours. We are also very grateful for the tremendous technical, logistical, and moral support provided to us in the United States and in Muqdisho by personnel from the Agency for International Development (AID), Associates in Rural Development, Inc. (ARD), JESS, Ministry of National Planning and Jubba Valley Development (MNPJVD), the Somali Academy of Arts and Sciences, the Mennonite Mission at Hilo Mareer, and the Agricultural Extension facility north of Buurdhuubo. We would, in particular, like to single out Robert (Gus) Tillman of ARD and Wes Fisher of AID for their invaluable assistance. Most of the data analysis and editing was performed by S. A. Brandt, while T. H. Gresham did the bulk of the report writing. Robert Benson analyzed and wrote the pottery section, Nanny Carder composed the section on rock art, and James Ellison prepared the segment on site distribution in the central section. Melanie Brandt was responsible for the artifact illustrations, Nanny Carder drew the rock art, and Gisela Gresham produced the maps.

I. EXECUTIVE SUMMARY

This report presents the results of an intensive archaeological survey of cultural heritage sites in the proposed Baardheere Reservoir, upper Jubba River basin, southern Somalia (Figure 1 at the front of this volume). The survey, conducted over a 42-day period during September and October 1987, represents one component of the JESS project. The main objectives of the survey were to locate and describe archaeological and historical sites in the proposed reservoir basin and formulate a plan for minimizing damage and/or loss of archaeological data resulting from reservoir construction and impoundment.

The survey team consisted of co-directors Dr. Steven A. Brandt and Thomas H. Gresham, seven additional expatriate archaeologists, and eight Somali counterparts. Fourteen more Somalis filled various support roles in the field. The nine expatriates also spent 10 days in Muqdisho analyzing artifacts and recording data.

In 1986, a brief archaeological reconnaissance of the 420-square-kilometer study area (Brandt 1986a) identified three major physiographic zones:

- a southern section, characterized by narrow gorges extending from the dam site north to just below Buurdhuubo, a distance of about 80 kilometers;
- a generally flat, open central section proposed as the main reservoir and extending some 33 linear kilometers from just south of Buurdhuubo north to Durole; and
- the northern section, 80 linear kilometers of narrow gorges and open terrain stretching from a few kilometers above Durole to Luuq.

Based upon knowledge gained from the 1986 reconnaissance, the 1987 survey personnel were divided into three crews. Two crews surveyed the northern and southern sections, one on each side of the river, and the third crew surveyed the central section. Crews in the remote southern and northern sections used camels for transportation, while vehicles were used in the central section. All surveys were conducted on foot. The authors estimate that about 90 percent of the southern section was examined. In the central section, a five-percent systematic stratified survey, coupled with a survey of all major togga (*wadis*) resulted in 15-percent coverage. In the northern section, several strategies were employed to provide an estimated 50 percent coverage.

The survey identified 686 sites, comprised of six major types.

First is *open-air lithic scatters* (*i.e.*, surface scatters of stone artifacts)—the most common form of site, with 394 distributed throughout the reservoir area. Most lithic scatters were classified as dating to the Middle Stone Age (MSA) (ca. 150,000 to 40-30,000 before present [B.P.]) and/or Later Stone Age (LSA) (ca. 40,000 to 5,000 B.P.). Based on typological and morphological analyses of the artifacts types, two subdivisions of both the MSA and LSA were established.

Second is *open-air ceramic scatters*, with 100 sites scattered throughout the reservoir area and usually found in direct association with stone artifacts of varying ages. In most cases, the lithics and ceramics are not contemporary, as most of the ceramics appear to be relatively recent in age (perhaps only the last few hundred years). However, it is possible that some sites represent LSA and/or Pastoral Neolithic encampments dating to the last 5,000 years.

The third site type is *caves and rockshelters*, restricted entirely to the southern gorge section, where 23 inhabitable caves and shelters were recorded. Artifacts were observed in five of the caves and rock art in nine. Caves varied in width from 3 to 20 meters and several were more than 20 meters deep.

Fourth is *rock art*, with 10 of the 11 sites occurring in the southern section and one in the north. Nine of the sites are caves where monochromatic and polychromatic paintings of highly stylized patterns of dots and a few line drawings adorn the walls. The paintings are in a style unique to Somalia and possibly to all of Africa. Two sites, one in the north and the other in the south, consist of scratches and engravings on boulders. All the rock art remains undated.

The fifth site type is *cairns*, or rockpiles, scattered throughout the reservoir but most common in the north, where 78 percent of the 160 sites were recorded. Cairns usually occurred singly but were also found in pairs or small groups. They varied in

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size and quality of construction. While some may be graves, their origins and functions remain essentially unknown.

The sixth type, *cemeteries*, was also found throughout the reservoir but was more numerous in the northern section, where 64 percent of the 195 cemeteries were recorded. The vast majority are relatively recent Islamic cemeteries, but some appear to be non-Islamic.

Based on the results of this survey, it is recommended that a three-phase program of archaeological research be implemented. This report constitutes completion of the first phase of such a program (site location and description). The second phase should be geared primarily toward determining the significance of sites, with research divided into two parts. The first part, continued survey and site documentation, should include:

- survey for other caves and rockshelters in the southern section;
- brief survey of unexamined portions of the northern section;
- systematic collection of newly discovered sites; and
- comprehensive documentation of the rock art.

The second part of this research should include the following test excavations:

- test pits in most caves and rockshelters;
- test pits in a sample of open-air sites;
- a sample of rock cairns;
- a sample of non-Islamic graves;
- test pits in non-site, alluviated areas to test for presence of buried sites; and
- geomorphological investigations to retrieve paleoenvironmental and geomorphological data.

The third phase should involve full-scale excavations of sites found to be archaeologically significant by Phase II investigations.

II. INTRODUCTION

The main objectives of this archaeological survey, part of JESS Phase II (data recovery), were to:

- conduct as comprehensive an archaeological survey of the proposed Baardheere Reservoir as possible given funding and time constraints;
- locate and describe archaeological sites important to an understanding of Somalia's past cultural heritage; and
- formulate a plan for minimizing loss of archaeological data resulting from constructing the dam and flooding the reservoir.

The survey was conducted in two stages. The first was a brief archaeological reconnaissance from 15 to 25 September 1986, with the expressed purpose of developing a work plan for a second, more comprehensive survey (Brandt 1986a). The second stage of fieldwork, from 3 September to 17 October 1987, built on the objectives and methods of the reconnaissance. The team, which at times numbered 29 people, surveyed the proposed reservoir by foot, using either camel trains or vehicles for logistical support.

The survey resulted in the discovery of almost 700 prehistoric and/or historic sites, probably spanning the last 150,000 years of hominid occupation of upper Jubba River Valley. This data base provides a sound foundation upon which to devise a plan for salvaging archaeological data prior to construction of the Baardheere Reservoir. Following discussion of the survey results, this report will outline a three-phase plan of cultural resource management for the proposed Baardheere Reservoir.

A. The Prehistory of Somalia: An Outline

The Stone Age archaeological record of Sub-Saharan Africa is divided conventionally into four techno/cultural stages or "ages." The Early, Middle, and Later Stone Ages correspond generally to stages in the evolution of hunting and gathering. The "Neolithic," or New Stone Age, is associated with development of food-producing systems (subsistence farming and pastoralism).

The earliest known archaeological sites in Somalia are in the northwestern part of the country, where investigators have discovered Early Stone Age "Acheulian" stone implements (Clark 1954). The Acheulian Complex of eastern Africa ranges from ca. 1.6 million years ago to more than 125,000 years ago and is characterized by large bifacial, ovate-shaped stone tools known as handaxes and cleavers, as well as other stone implements. Acheulian tools were used for a variety of purposes related to early forms of hunting and gathering practiced by *Homo erectus* and archaic *Homo sapiens*. Surprisingly, archaeologists have not yet discovered Acheulian sites in central and southern Somalia. The reason(s) for this is unknown.

The earliest evidence for prehistoric occupation of southern Somalia dates to the MSA (125,000 to ca. 40,000 years B.P.) when archaic forms of *Homo sapiens* and/or anatomically modern humans manufactured stone tools from pre-shaped cores known as Levallois and/or disc cores. The characteristic tools of the hunter/gatherers of the MSA (*e.g.*, bifacial projectile points, scrapers, knives, awls, burins, and other implements) were generally smaller than Acheulian artifacts and probably hafted onto other implements, such as wooden or bone spears.

Clark (1982) maintains that the MSA of Somalia can be divided into three temporal stages, reflecting changes over time in:

- the frequency of certain artifact types;
- frequency in the use of prepared core techniques; and
- a reduction in the size of artifacts.

Unfortunately, most MSA sites in Somalia are unsystematically collected surface scatters, and therefore cannot provide definitive evidence for such suggested temporal divisions. Furthermore, virtually nothing is known of MSA subsistence and settlement patterns (Brandt and Gresham in press).

Current evidence suggests that by ca. 30,000 years ago MSA technology was replaced in many parts of Sub-Saharan Africa by a LSA technology based upon the production of long, narrow "blades." These blades, struck from specially prepared prismatic- and pyramidal-shaped blade cores, were shaped into a wide range of tools—including very small, purposely blunted (or "backed") and often geometrically-shaped "microliths." These and

other stone tools, such as points, scrapers, burins, and awls, were fitted into bone and wooden arrows, spears, and other devices. Various bone tools and ornaments also became common (as did pottery) toward the end of this period.

Most LSA sites in southern Somalia, like the rest of the country, are surface sites. However, recent excavations in the Buur Heybe/Hakaba region have provided new data on LSA adaptations to changing later Pleistocene and Holocene environmental conditions, as well as changes in hunter/gatherer social organization and ideology (Brandt in press).

During the early- to mid-Holocene, ca. 8,000 to 5,000 years ago, some Northeast African hunter/gatherer populations began to herd domesticated cattle, sheep, and/or goats, as well as cultivate domesticated cereals and other plants. Scholars have argued from linguistic and indirect archaeological data for introduction of pastoralism and/or horticulture into Somalia by 3,000-4,000 years ago (Brandt and Carder 1987). However, direct archaeological evidence for establishment of such food-producing "Neolithic" systems in Somalia is meager and restricted to the recent discovery of rare domesticated cattle from excavations at Buur Heybe, imprecisely dated to between 8,000-3,000 years ago (*ibid*). In addition to domesticates, eastern African Neolithic traditions are also characterized by LSA-like microlithic stone artifact assemblages and pottery.

Rock art provides another data set for understanding the development of the Pastoral Neolithic in the Horn of Africa (Carder 1988). The majority of Somali rock art is "pastoral," *i.e.*, domestic cattle, sheep, and goats are the primary motifs. The earliest rock art in Somalia is from the north and is characterized by naturalistic portrayals of humpless cattle (*Bos taurus*). The later forms of rock art, again essentially restricted to northern Somalia, are more stylized depictions of humped cattle (*Bos indicus*) and camels. The rock art of Somalia is dominated by schematic motifs thought to denote tribal and other symbols.

B. Previous Archaeological Research in the Study Area

A literature search revealed little previous archaeological research in upper Jubba River Valley. In 1913, the Stefanini-Paoli Geological and Zoological Expedition to Somalia explored sections of the Jubba, subsequently discovering surface stone artifact scatters from Salagle to Luuq (Puccioni 1919). Further surface scatters were discovered at Luuq by the 1935 Graziosi-Puccioni Expedition (Graziosi 1940). British military personnel reported additional Stone Age sites at Baardheere and Luuq during the Second World War (Clark 1954). However, none of these sites were systematically surveyed or excavated, and their precise locations were not recorded.

More recently, M. Mussi (1982, 1984) reported the discovery of stone cairns north of Baardheere (but outside the project area). She subsequently excavated two cairns but found little underneath (Mussi 1984). In 1985, Coltorti and Mussi (1987) discovered several LSA surface scatters on some hills east of Luuq. At the site of Buur Medow 1, Mussi (1987) surface-collected all artifacts from an area of 36 square meters, in addition to excavating five square meters down to bedrock (ca. 20 centimeters below surface). Organic preservation was very poor. However, she did recover over 3,000 LSA chert artifacts, including endscrapers, microliths, perforators, notches, and denticulates. Mussi tentatively hypothesized that the site was occupied during the early Holocene humid phase, when LSA hunter/gatherers were making greater use of expanded riverine forest resources.

C. Results of the 1986 Reconnaissance Survey

In September 1986, S. A. Brandt (1986a) led a preliminary 10-day cultural heritage reconnaissance of the upper Jubba River Valley inundation zone (Baardheere Dam site to Luuq). This study had two specific objectives:

- to obtain a preliminary impression of the nature, quality, and quantity of archaeological evidence in the inundation zone; and
- to determine a plan of operation and logistical requirements for conducting a two-month intensive survey in 1987.

Results of the survey were used to develop a more comprehensive survey plan for assessing historical or archaeological sites threatened by construction of the Baardheere Reservoir.

The reconnaissance involved a vehicle and foot survey of the 160-kilometer-long reservoir by three professional archaeologists—Steven Brandt, Thomas Gresham, and Peter Robertshaw. The team

discovered over 100 sites, representing five classes of archaeological and historic sites:

- surface scatters of MSA and/or LSA artifacts and rare potsherds;
- stone artifacts recovered *in situ* from a geological trench;
- possible "pastoral camp sites" characterized by dense concentrations of pottery, bone, shell, and rare or no stone artifacts;
- rock piles/cairns; and
- modern graves, tombs, and mosques.

The most common sites were lithic surface scatters, with rock piles second.

The reconnaissance recognized three physiographic zones in the reservoir area—southern, central, and northern (described in detail below). The northern and southern zones were largely inaccessible by any kind of vehicle, and could only be surveyed by camel or donkey train. The extent of the proposed survey area (then estimated at 550 square kilometers), the large number of projected sites, and the limited time and personnel available led Brandt (1986a) to propose a combination of survey methods. The planned survey procedure for the northern and southern sections would be an essentially opportunistic one, with survey crews attempting to cover as much exposed ground surface as possible within a set number of days. The vast central section was to be surveyed by two methods: 100-percent coverage of all togga, and stratified random sampling of the entire area. As detailed in the following chapter, the 1987 Phase II survey was largely successful in implementing the recommended procedures of the 1986 reconnaissance.

D. Description of Project Area

The size, configuration, and accessibility of terrain within the project area played a large part in the formulation of survey strategy. The reservoir area consists of three major physiographic zones (Figure 2).

1. Southern Section

The southern section is a relatively narrow gorge (Figure 3). The proposed reservoir would average about 500 meters in width. In this section, the river meanders within a narrow floodplain bound by the limestone walls of the gorge, forming a chain of alternating bottomlands and steep walls two to four kilometers long. The bottomland usually has a maximum width of 200 meters. Numerous drainages of various sizes feed into the Jubba River gorge. Most of these togga have formed narrow, steep, V-shaped gorges which rise abruptly in elevation near the river. A few of the larger drainages contain narrow floodplains and terraces. We have defined the southern section as beginning at the dam site and extending to about 4 kilometers south of Buurdhuubo (at the first major tog south of Buurdhuubo, on the western side of the river)—a distance of 80 river kilometers. Based on rough transpositions of the proposed reservoir boundary from 1:100,000 topographic maps to 1:30,000 aerial photographs, we calculate that the southern section contains 73.8 square kilometers at estimated high pool (148 meters above sea level [masl]). If the river, considered to average 150 meters wide, is deducted from this figure, the southern section is calculated to contain 61.8 square kilometers of land area. Although no attempt was made to obtain a precise profile of the southern section, Figure 4 represents the survey team's best estimation of the valley profile.

In general, the valley is composed of a sharply defined first levee, a silty alluvial plain that either gently or abruptly rises, and a rocky terrace or talus slope at the foot of the limestone wall of the gorge. This description and the survey team's understanding of the geomorphology of the valley is based almost entirely on visual inspection and not on geomorphological investigations. Most archaeological sites occur on both colluvium and alluvium. This alluvium is probably ancient (Pleistocene) compared to the Holocene alluvium on the lower active floodplain and levee.

Current land use on the two sides of the valley differs. The east side has a higher human population density and many permanent settlements. Most of the eastern bottom lands, which are composed of recently deposited reddish silts, are at least partially under cultivation. In contrast, there are very few permanent settlements and little cultivation on the west side. The reasons for these differences in land use remain unclear but may have to do with geomorphology, hydrology, and/or access to urban centers and markets. A high water mark, presumably from the 1987 summer flood, is visible on trees in the western bottoms, perhaps suggesting one reason why the west side is underutilized.

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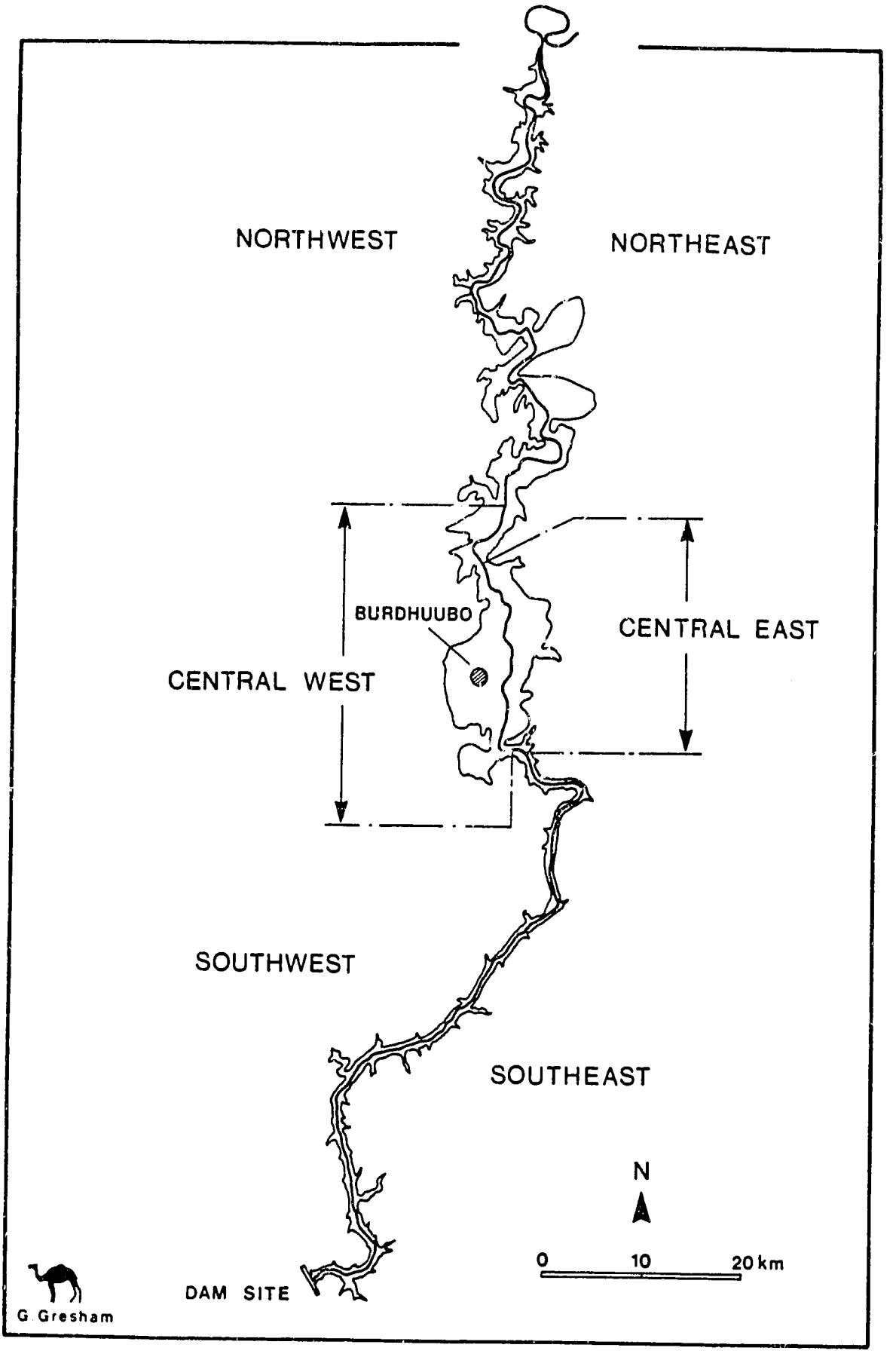

Figure 2. Physiographic Zones in Project Area

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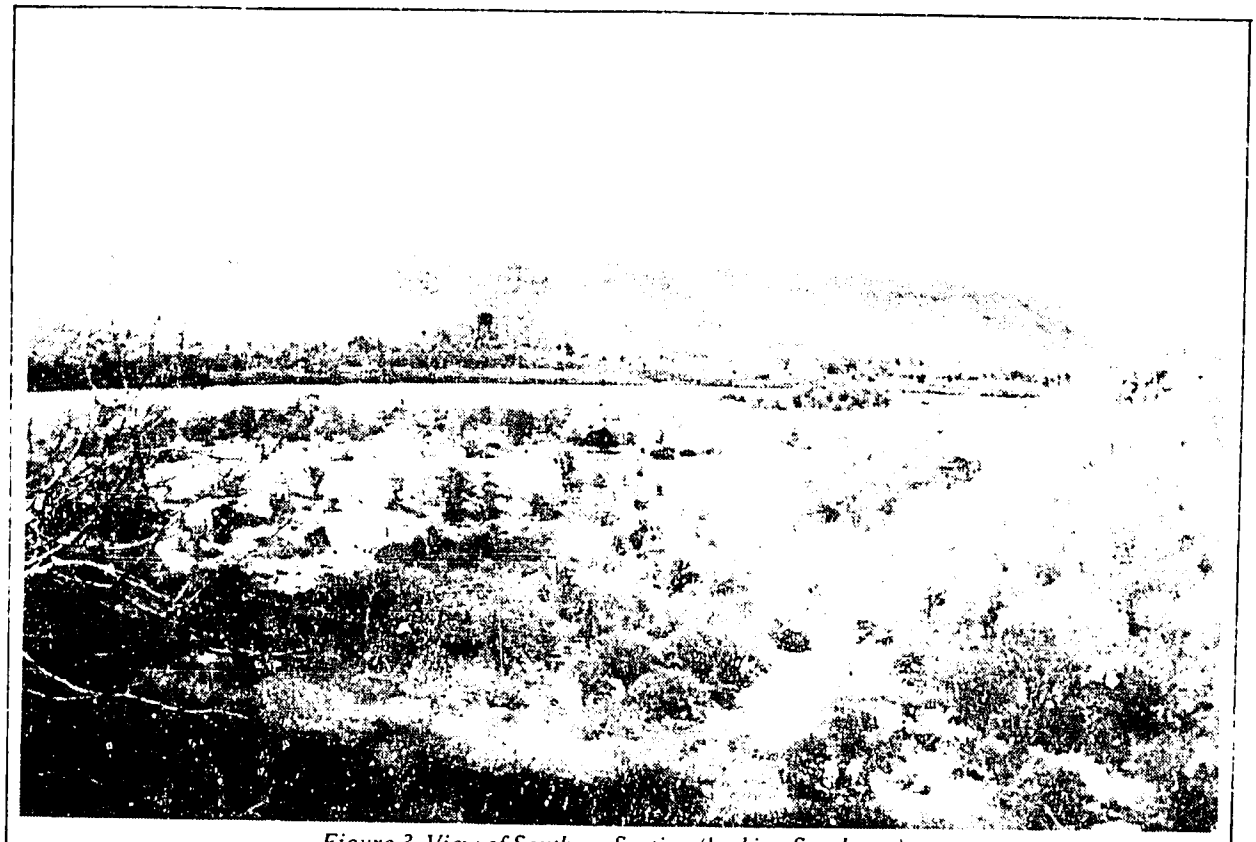

Figure 3. View of Southern Section (looking Southeast)

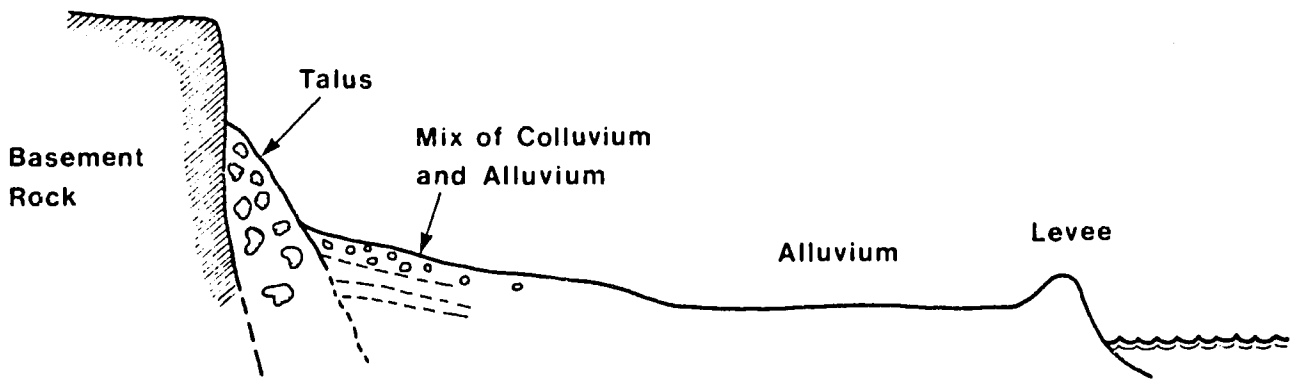

Figure 4. Sketch Profile of Southern Section

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2. Central Section

The central section is the widest and largest section of the proposed reservoir (Figure 5), composed of broad, flat plains dissected by 26 entrenched but shallow togga. The reservoir boundary in much of this section is not well-defined, as the proposed high water mark (148 masl) spans very gently sloping terrain. The northern terminus of the central section has been arbitrarily delineated at a point where surrounding uplands constrict to form a narrower valley. Using this definition, the central section contains 30 kilometers of river and about 168 square kilometers of land. If the river has an average width of 150 meters and is deducted from this figure, the central section encompasses 163.5 square kilometers of land use. About 60 percent of the terrain occurs on the west side of the river.

The central section has a maximum width of 20 kilometers and a relatively wide floodplain, much of which is farmed. There are four villages in the central section, the largest of which is Buurdhuubo. The recent massive influx of refugees into these villages, which together occupy approximately 12 square kilometers, has resulted in severe degradation and deforestation of the surrounding plains and hills. Whereas the northern and southern sections of the river have very few tracks and are basically inaccessible by four-wheel drive vehicles, the central section has an extensive network of roads as well as an auto ferry, allowing for access to both sides of the river.

3. Northern Section

The river valley and numerous large togga comprise the northern section, which is not as broad as the central section, but wider than the southern section. This section encompasses a greater variety of landforms and profiles, including flat floodplains, gently sloping plains, distinct terraces, and occasional talus slopes. The proposed reservoir pool extends five to six kilometers up several of the larger togga. The northern terminus of the reservoir (and the section) is the bridge at Luuq. However, the configuration of the reservoir at this end remains unclear as the area is very flat. A one-meter difference in reservoir elevation could alter the reservoir area by tens of square kilometers. The southern terminus is arbitrarily defined as the point where surrounding uplands of the central section constrict to form a narrower valley. The western side of the northern section begins eight river kilometers above the starting point on the east side. As we have projected the reservoir pool, the northern section contains 178.2 square kilometers—of which about 11.4 square kilometers is river—leaving approximately 166.8 square kilometers of land area.

Figure 5. View of Central Section (looking East)

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III. METHODS

A. General Survey Strategy

Personnel were divided into three teams, as proposed in the 1986 reconnaissance report. The eastern and western teams were responsible for surveying their respective sides of the river from the dam site north to Luuq. The central team examined all togga in the flat central section for buried sites and conducted a transect survey. Due to the inaccessibility of the terrain, the east and west teams conducted the survey on foot, using camels as pack animals. Field personnel for each team were as follows:

West Team

Tom Gresham (Southeastern Archaeological Services), Project Supervisor

Gisela Gresham (Southeastern Archaeological Services), archaeologist

Abdisalan Mohammed Ali (JESS), counterpart

Abdulaahi Abdi Sheik, cook

Abdulqadir Abdirahman Abdi, locally hired camel driver

Hussein, locally hired camp assistant for southern section

Hassan Idris Ismael, locally hired camp assistant, northern section

Yassin Ahmed Jama, Baardheere policeman

East Team

Nanny Carder (University of Georgia), archaeologist

Curtis W. Marean (University of California), archaeologist

Abdikadir Ahmed Abdi (JESS), counterpart

Abdulkadir Sheik Mohamed –"Golden", (JESS) cook

Abdinoor Ali Muhammed, locally hired camel driver

Omar Mayow Ali, locally hired camp assistant

Noor Jamow Huedo, Baardheere policeman

Central Team

Steven Brandt (University of Georgia), Project Director

Rob Benson (University of Georgia), archaeologist

Jim Ellison (University of Georgia), archaeologist

Wendy Rogers (University of Lancaster), archaeologist

Sandy Whitney (University of Georgia), archaeologist

Osman (JESS), counterpart, tog survey

Abdikariin Hasan Nuur (JESS), counterpart, transect survey

Hussein Hasan Nuur, locally hired cook

Abdulle Hussein Gure (JESS), driver

Abdulwahab (JESS), driver

The survey was conducted in two phases, the first of which was carried out from 3 to 21 September. After two weeks of advance preparation, including a trip to Baardheere, the survey teams departed Muqdisho on 3 September for the JESS Field House in Baardheere. At Baardheere, the team members discussed survey strategy and field tested the survey forms for two days to help ensure uniformity in survey technique and methodology. Once in the field, uniformity between the two teams surveying the southern and northern sections was further enhanced by adherence to a similar time frame and occasional communication between the teams. The crews examining the central section camped together and compared their field methods daily. On 6 September, the eastern and western teams began their surveys of the southern section by camel caravan, while the central team drove to Buurdhuubo to begin examination of the major togga. On 22 September, the field teams drove back from Buurdhuubo to Muqdisho, and seven days later,returned to Buurdhuubo to begin the second half of field survey. This involved the survey of the northern section by the east and west camel teams and a transect survey of the vast open plains in the central section by the central team. Field research concluded on 29 September, when all three teams returned to Muqdisho to begin laboratory analysis of the artifacts.

On average, 15 people, divided into three to five work crews, surveyed on any given day. Approximately 210 person-days were spent surveying, while approximately 120 person-days were engaged in logistical matters such as assembling food and equipment and driving to the project area. The labor-intensive nature of archaeology and inaccessibility of much of the project area contributed to the logistical complexity of the project. Nevertheless, no major obstacles arose and the field teams were able to complete their work on schedule.

B. Southern Section

The southern section, the narrowest and smallest of the three sections, was surveyed with nearly 100-percent coverage of nonalluviated portions of the main gorge. About 30 percent of the side togga were surveyed. The three surveyors on each team followed existing, often braided paths, which nearly always traversed ground higher than where sites were found to occur. The river levee and recently alluviated bottomlands were initially surveyed, but when it became apparent that the overlying layer of silt had been deposited during the 1987 flood, these areas were abandoned. Survey then concentrated on the generally narrow talus slopes and/or terraces that formed the high ground between bottomlands and the gorge wall. This gently sloping, rocky zone usually had sparse enough vegetation to allow a thorough searching. The southernmost side togga were surveyed, but when it was realized that the togga were generally steep-walled and lacked terraces and sediment floors suitable for open-air sites, only a few of the larger togga were examined.

Because the limestone gorge walls of the southern section were susceptible to karstic activity, they were surveyed for caves and rockshelters. Unfortunately, this was difficult because thick vegetation on the talus slope obscured the view of much of the gorge walls. When potential caves were detected from the trail, the talus slope was climbed so that the surrounding section of gorge wall could be inspected. Because of the climb, the thick vegetation, and ruggedness of the talus slope/gorge wall interface, this close inspection was time-consuming. Local inhabitants were also asked the locations of caves and rockshelters. However, while most were keenly aware of their environment, for some reason (perhaps translation problems), they were not always reliable in locating caves.

C. Central Section

Two survey strategies were employed in the central section. Since the togga were judged to be "high probability areas" during the 1986 reconnaissance survey, where buried stratified sites could be found exposed in the tog walls, the central teams surveyed intensively all 26 major togga within this broad, flat section. The tog crews were composed of three persons: one American and two Somalis. One crew member walked in the tog examining one tog wall and bed, while the other two would walk above the tog about 10 and 20 meters from the edge. The other side of the tog was surveyed the same way on the return to the starting point.

The second survey strategy involved a systematic sample survey using transects. Lines oriented due east-west at 150-meter intervals were penciled on aerial photographs (1:30,000) across the entire central section. Although original plans called for surveying a 10-percent sample of the transect lines, time limitations restricted the survey to a five-percent transect sample of the entire central section. This involved surveying east-west transects 30 meters wide, spaced 600 meters apart. A three-person crew, one American and two Somalis, walked each transect, 10 meters from each other. Compasses were used to maintain transect bearings. While this usually resulted in accurate plotting of sites on the aerial photos, heavy vegetation and changing land use (from when the photograph was taken) occasionally resulted in some loss of precision. During the transect survey, three vehicles were used to drop off and pick up the crews.

D. Northern Section

This large, broad section was intended to be surveyed at near 100-percent coverage (except for recently alluviated areas) in a manner similar to that employed in the southern section. However, when the boundaries were transcribed onto the aerial photographs, the survey teams realized the section was too large to maintain the southern section survey strategy. Instead, survey focused on high probability areas throughout the section. Experience in the southern section and initial total coverage of the northern section allowed surveyors to identify land forms and areas where sites commonly occurred. These were principally terraces along the river and major togga and the base of the hills that bound the proposed reservoir pool. Some large areas, totaling about 50 square kilometers, were not surveyed at

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all. These included two lobes on the east side that contain broad, flat tog valleys, flat alluvial plains on both sides of the river just below Luuq, and the areas below Luuq occupied by three refugee villages. As with the southern section, most of the recently alluviated floodplains adjacent to the river were not surveyed. The northern 20 kilometers of the section exhibited high river banks that were not subject to frequent flooding and these were surveyed. Finally, some low-probability areas, *i.e.*, broad flat expanses, were sampled by transect survey.

E. Data Recording

All surveyors used 1:30,000 aerial photographs (prepared by Air Survey and Development, GMbH [ASD], Frankfurt) with prepared site forms and daily log books to record environmental data, survey conditions, and site data. Reservoir boundaries were transcribed onto the aerial photographs by sketching the proposed reservoir elevation (148 meters) as interpolated from a set of 1:20,000 geological maps of the reservoir area (Technital S.p.a. 1977). In broad, flat areas, the original contour mapping and the team's interpolation (between the 150- and 145-meter contour intervals) are probably subject to error that could amount to several tens of square kilometers. The configuration and extent of the reservoir at the northern terminus is particularly unclear.

The aerial photographs, with the project area delineated, were the sole means of plotting locations of archaeological sites, artifact occurrences, some land use information, environmental data, and areas surveyed. Because the most common type of site—a surface scatter of artifacts—can vary considerably in extent and density of material, defying grouping into spatially discreet sites, the following definition of an archaeological site was formulated:

- a surface scatter of at least 10 artifacts that attained a density of five artifacts within a two-pace radius;
- a cave or rockshelter with any artifacts or one that, lacking evidence of artifacts, was judged as having the potential to contain artifacts (*e.g.*, a sediment-covered floor);
- any location revealing rock art;
- graves and cemeteries; or
- rock cairns.

An artifact "occurrence" was defined as a:

- surface scatter of artifacts with a density of less than five artifacts within a two-pace radius; or
- surface scatter of less than 10 artifacts regardless of the density.

A four-page site form structured for computer coding (Appendix A1) was completed for each site with the exception of the northern part of the northern section, where the numerous rock cairns and cemeteries were only briefly described in notebooks (location, landform, number of graves). Most of the information on the site form was self-explanatory to the surveyors. However, some variables, such as topography (Variable 7), were discussed at length because of the difficulty in maintaining consistency in recognition of these landforms. Categories defined by Trump (1987) were used for vegetation. The sketch map on Page 1 of the form provided details of the site shape and context and aided in site relocation. The fundamental goal of artifact collection was to obtain the most information with the least amount of artifacts. Weight limits on the camel trains and limited lab analysis time dictated a limit to collection sizes. Therefore, the following artifact-collecting strategies were employed:

- total collection—on very small sites with few (ca. 30 or less) artifacts, all artifacts were collected;
- random collection—on very large and/or dense artifact scatters, only a representative sample of tools, cores, and raw material types were collected;
- most identifiable tools, sherds—on large and/or dense artifact scatters, most tools and sherds, along with a representative sample of cores, debris, and samples of raw material were collected;
- all identifiable tools, sherds—on small sites, the entire site was examined and all observed tools and sherds were collected, along with a representative sample of cores, debris, and raw material types;
- density sample—on sites with less than 100-percent collection of artifacts, three meter diameter circle was laid out near the center of the site, where artifact density was judged to be average. Every artifact in that circle

was collected and bagged separately from the other collections (*i.e.*, random, most identifiable , or all identifiable) from the site.

The collection technique was labeled on the plastic bags in which the artifacts were placed and on the site form. The double bagging of most collections prevented any tearing and loss of artifacts during the remainder of the survey. Most sites were measured by pacing, or, in some cases, by visual estimation. Many of the cemeteries and larger, more complex sites were sketched onto sheets of graph paper. Sites and views of the general environment were photographed with color slide film.

F. Artifact Analysis

Although preliminary analysis was begun in the field, the bulk of the artifact analysis took place over a 10-day period in Muqdisho following completion of all fieldwork. The first task undertaken was the formulation of a feasible analysis scheme and analysis form. Even with the restricted sampling scheme, there were far too many artifacts to conduct a detailed attribute analysis given the time constraints. Therefore, an abbreviated, quantitative, descriptive, and typological analysis was conducted. Artifacts were quantified by count and weight for lithics and ceramics (see the artifact analysis form, Appendix A2). Descriptive attributes of the assemblage as a whole were somewhat subjective and included amount and degree of patination, degree of abrasion, type of alteration, and type of raw material. Since chert was by far the most dominant raw material, it was sorted by color, noting which color was the most frequent.

Typologically, the stone artifacts were sorted into eight classes—shaped tools, unshaped tools, cores, flakes, angular waste, blades, Levallois flakes, and Levallois points. The shaped tools and cores were then classified by type (Appendix C3). This is essentially the typology developed by Merrick (1975) and Nelson (1973) for MSA and LSA assemblages in eastern Africa.

The ceramics were sorted into decorated body, decorated and undecorated rims, lugs and handles, and undecorated body sherds. All decorated sherds and undecorated rim sherds were then subjected to an attribute analysis using a site pottery analysis form (Appendix A3). This included, whenever possible, the analysis of sherd decorative motifs and patterns, vessel/rim form and frequency, thickness, firing color, extent of weathering, and a subjective assessment of age. Notes were also made on other aspects of the pottery, including temper.

G. Data Analysis

As soon as the site forms were completed, they were entered in the field and in Muqdisho on a Datavue "Spark" laptop computer, using the Reflex data base program. Following entry of all site forms, data was printed out and scanned for data entry errors or missing information. Corrected files were saved to disk and copied onto another disk. To insure safety of the data, the forms and disks were each hand-carried by three different people back to the University of Georgia.

At the University of Georgia, the artifact analysis forms were entered into a Reflex file using IBM-compatible microcomputers, while the site form files were transferred from the laptop to an AT-compatible computer. Although some preliminary analyses of the site data was conducted with the laptop while in Somalia, the bulk of data analysis was undertaken at the University of Georgia.

H. Artifact Curation

The artifacts recovered by this project are presently stored at the Somali Academy of Arts and Sciences under the curatorship of Axmed Duale Jama. It is expected that eventually they will be curated permanently at the Somali National Museum.

IV. RESULTS

A. Overview

The Phase II survey recorded 686 archaeological sites, including the two sites discovered during the 1986 reconnaissance survey (Figure 6 and Appendix B). Since most of the central section was only 5-percent sampled, and portions of the northern section were not surveyed, the total number of sites in the reservoir area is undoubtedly much higher.

The sites can be divided into six classes, each of which is described below. Table 1 presents the distribution of the sites by class and survey section.

*Table 1. Distribution of Sites by Class and Survey Section**

TOTAL	SW	SE	CW	CE	NW	NE	TOTAL
Sites	81	60	98	83	209	155	686
Open-air lithic	45	31	87	59	93	73	394
(with no ceramics)	32	23	76	50	90	51	322
Open-air ceramic	13	8	15	19	19	26	100
(with no lithics)	0	0	4	10	10	4	18
Caves and Rockshelters	15	8	0	0	0	0	23
Rock Art	3	7	0	0	0	1	11
Cairns	12	11	7	6	48	78	162
Cemeteries	25	21	12	12	66	59	195

Many sites are composed of more than one class.

Site frequency is more meaningful when the site totals for each section are adjusted for the amount of area surveyed. Using estimates of 90-percent coverage for the southern section, 15-percent for the central section, and 50-percent for the northern section, the number of sites per 100 km^2 can be computed as shown in Table 2.

These data show a greater density of sites (particularly open-air artifact scatters) in the central section than in the northern or southern sections. However, artifact occurrences were far more numerous in the southern and northern sections, as shown below:

NUMBER OF ARTIFACT OCCURRENCES	
Southwest	54
Southeast	38
Central West	16
Central East	6
Northwest	158
Northeast	37

If these artifact occurrences are added to the site totals, the differences moderate considerably, although site density still remains highest in the central section. The sum of sites and occurrences totals 388 per 100 km^2 in the southern section, 837 per 100 km^2 in the central section, and 758 per 100 km^2 in the northern section. We initially hypothesized that the greater site density of the central section may not be an accurate indicator of relative intensity of land use, since central section sites appeared subjectively to be small with few artifacts. However, as will be shown later, the size of artifact scatters in the central section is comparable or even larger than sites in the northern or southern section.

Table 2. Sites per 100 km^2 by Class and Survey Section

	SOUTHERN SECTION	CENTRAL SECTION	NORTHERN SECTION
Area Surveyed	55.6 km^2	24.5 km^2	83.3 km^2
Open-air lithic	135	600	206
(with no ceramics)	97	518	169
Open-air ceramic	38	135	49
(with no lithics)	0	53	37
Caves and Rockshelters	41	0	0
Rock Art	18	0	1
Cairns	38	53	151
Cemeteries	83	98	152
Total Sites	254	739	437

Artifact frequencies are more difficult to compare due to different collection techniques employed. However, sites in the central section do appear to have fewer artifacts than those in the northern and southern sections. Of the central section's surface artifact scatters, 55 (34 percent) were of such low density that they could be 100-percent collected. In sharp contrast, only two sites (0.6 percent) in the northern and southern sections were completely collected. Thus, compared to the other sections, the central section has a much greater density of sites—some of which are large, but on average, they contain fewer artifacts.

Caves, rockshelters, and rock art sites are almost entirely limited to the southern section. This is due largely to the geological nature of the landscape, as the southern section is composed of limestone gorge walls which are conducive to karstic activity. For

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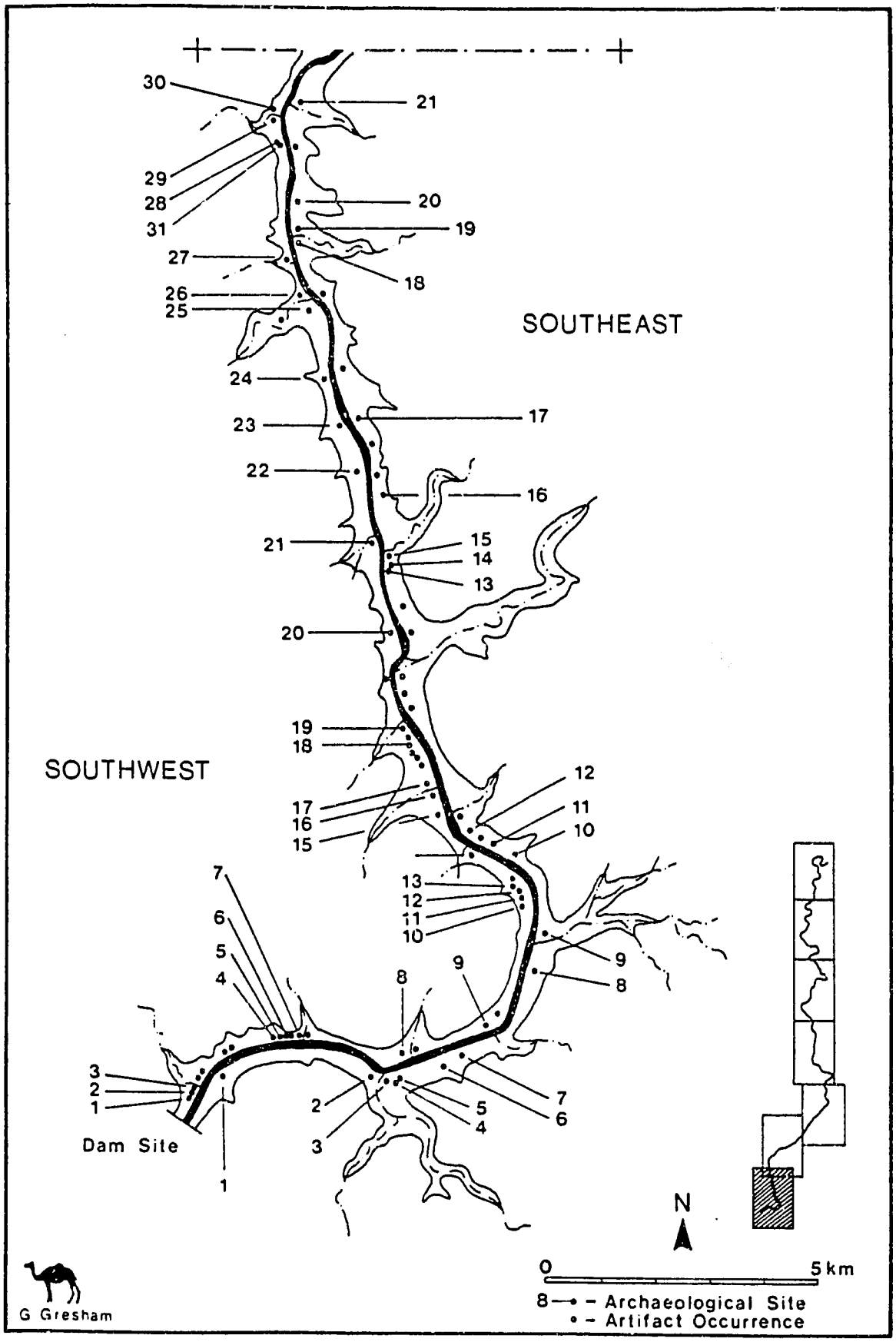
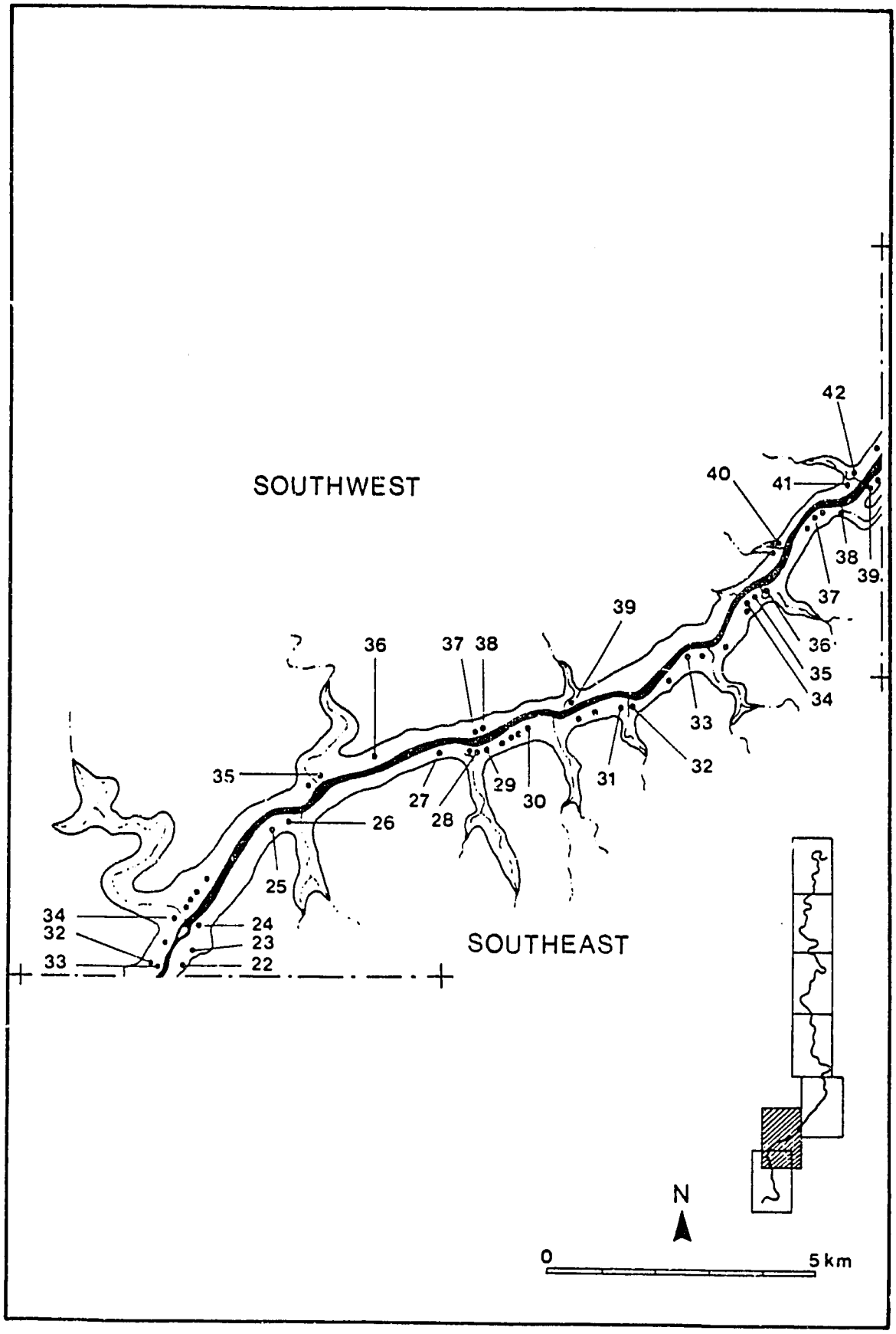


Figure 6. Location of Archaeological Sites (pp. 14-20)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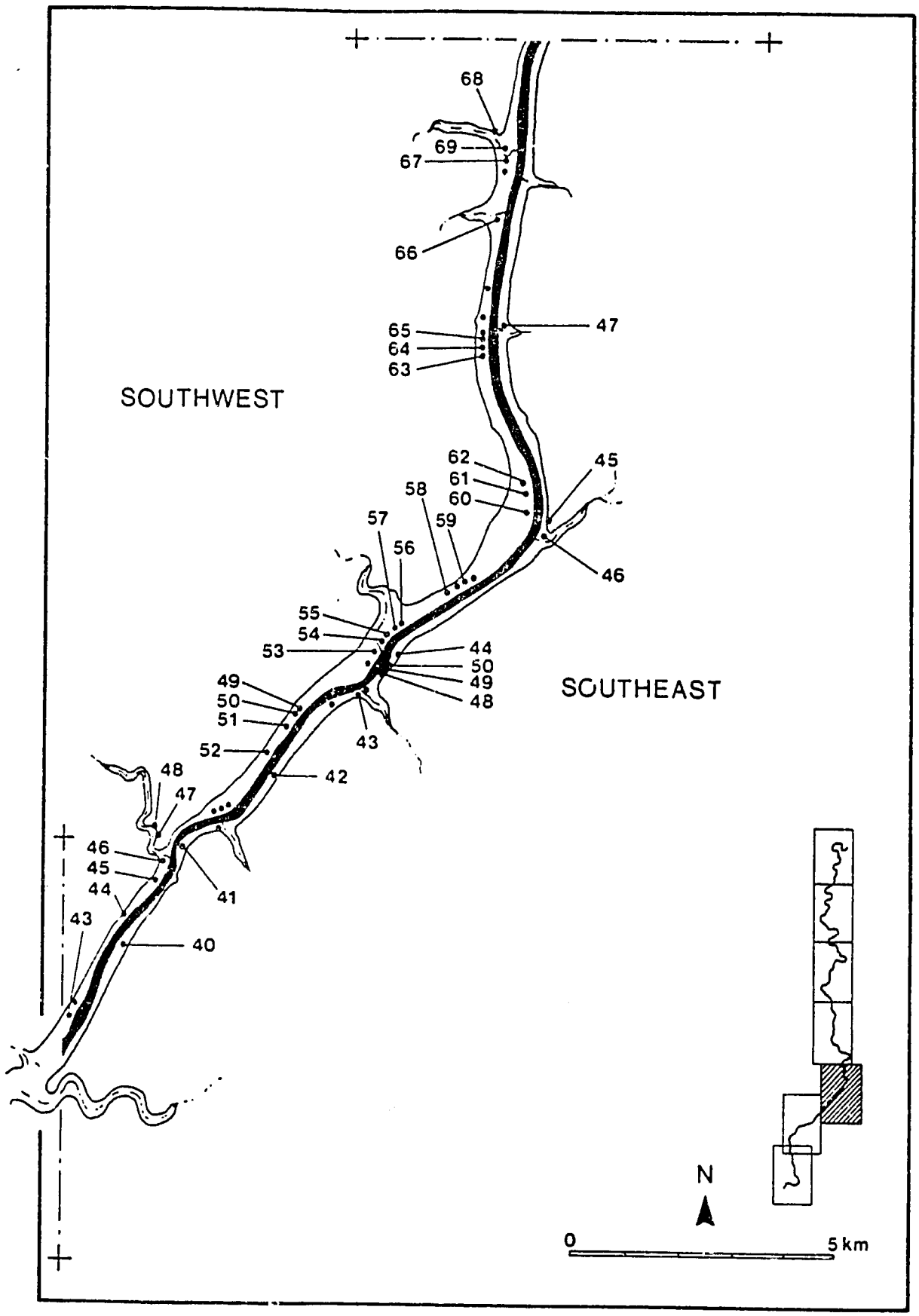
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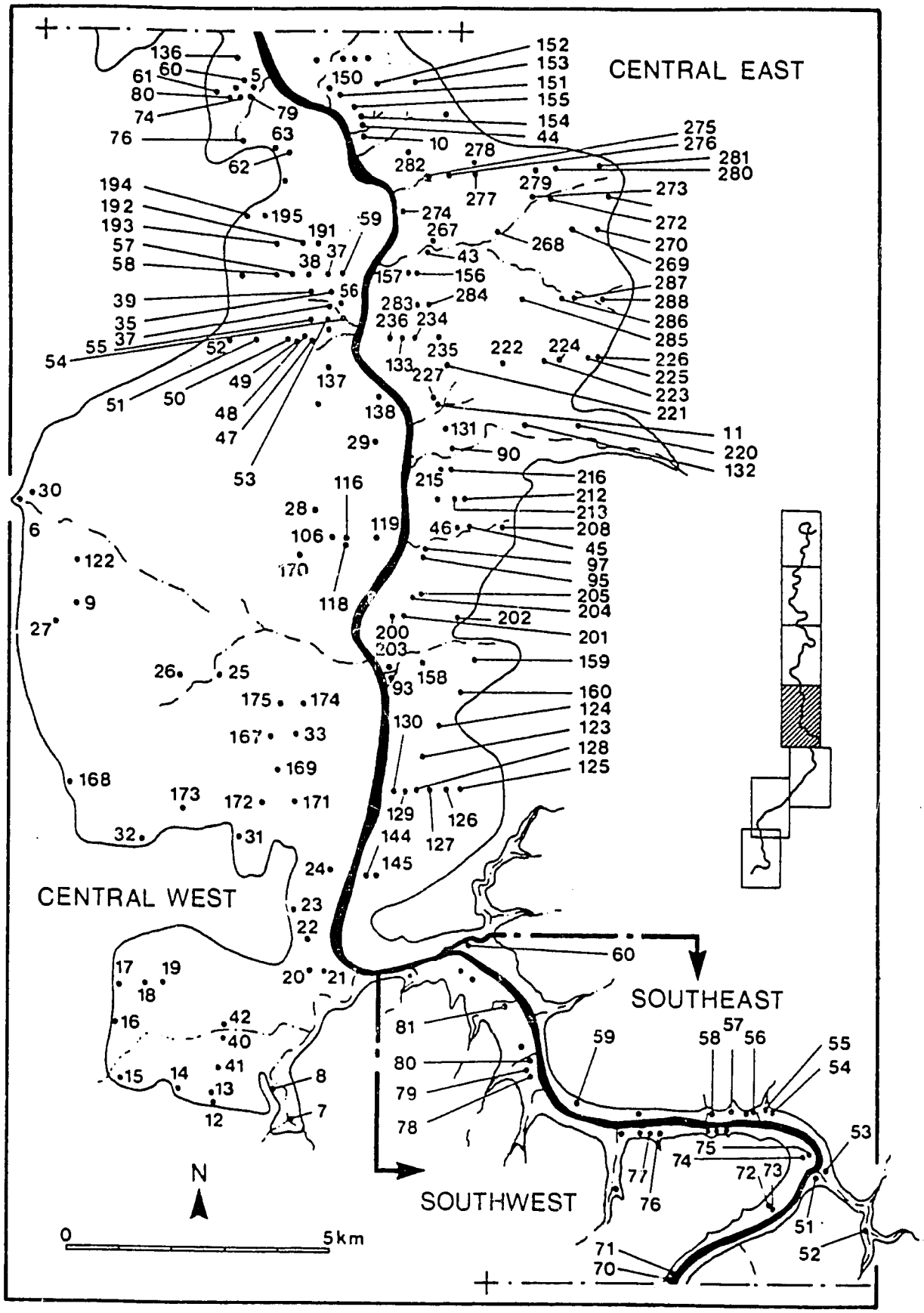

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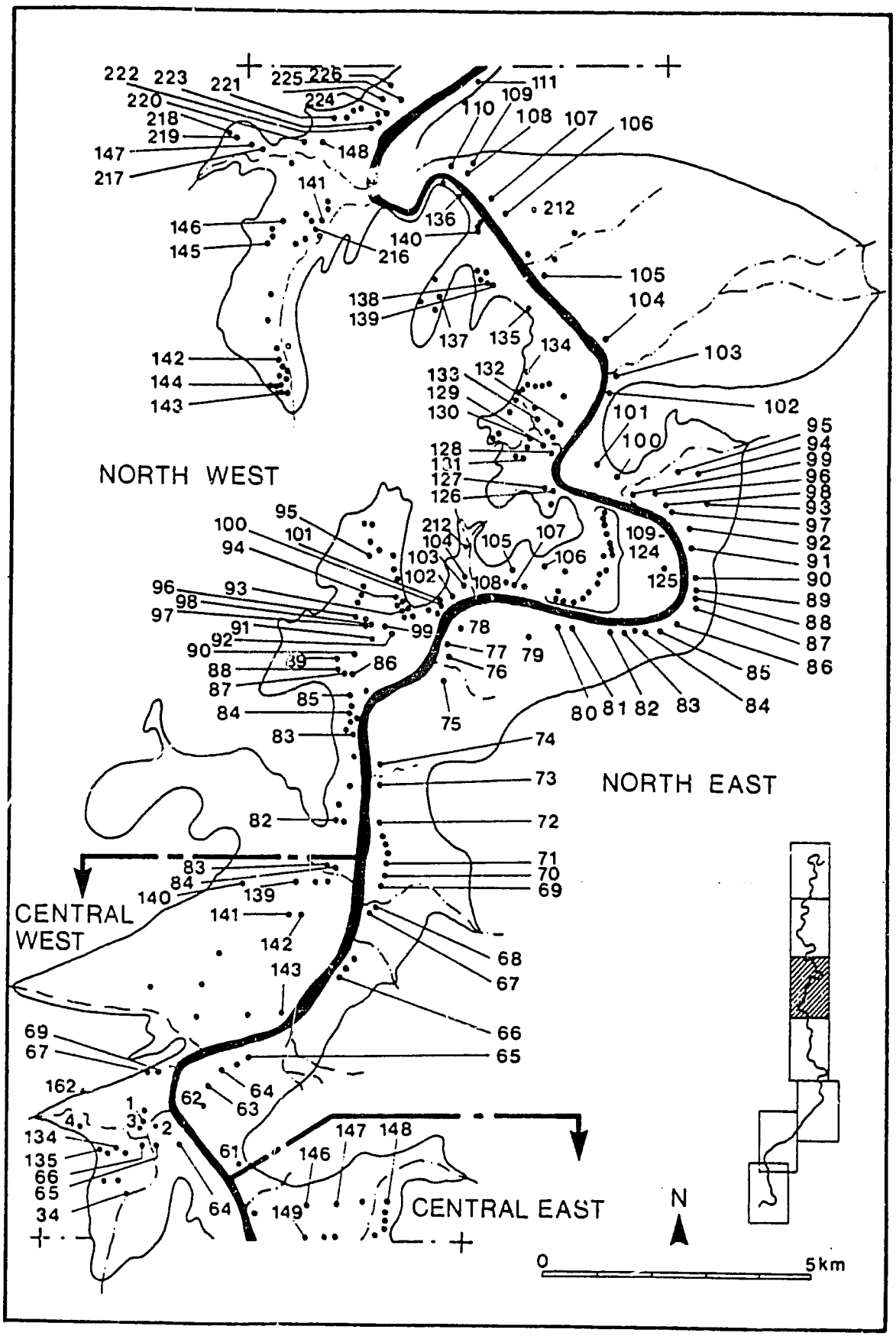

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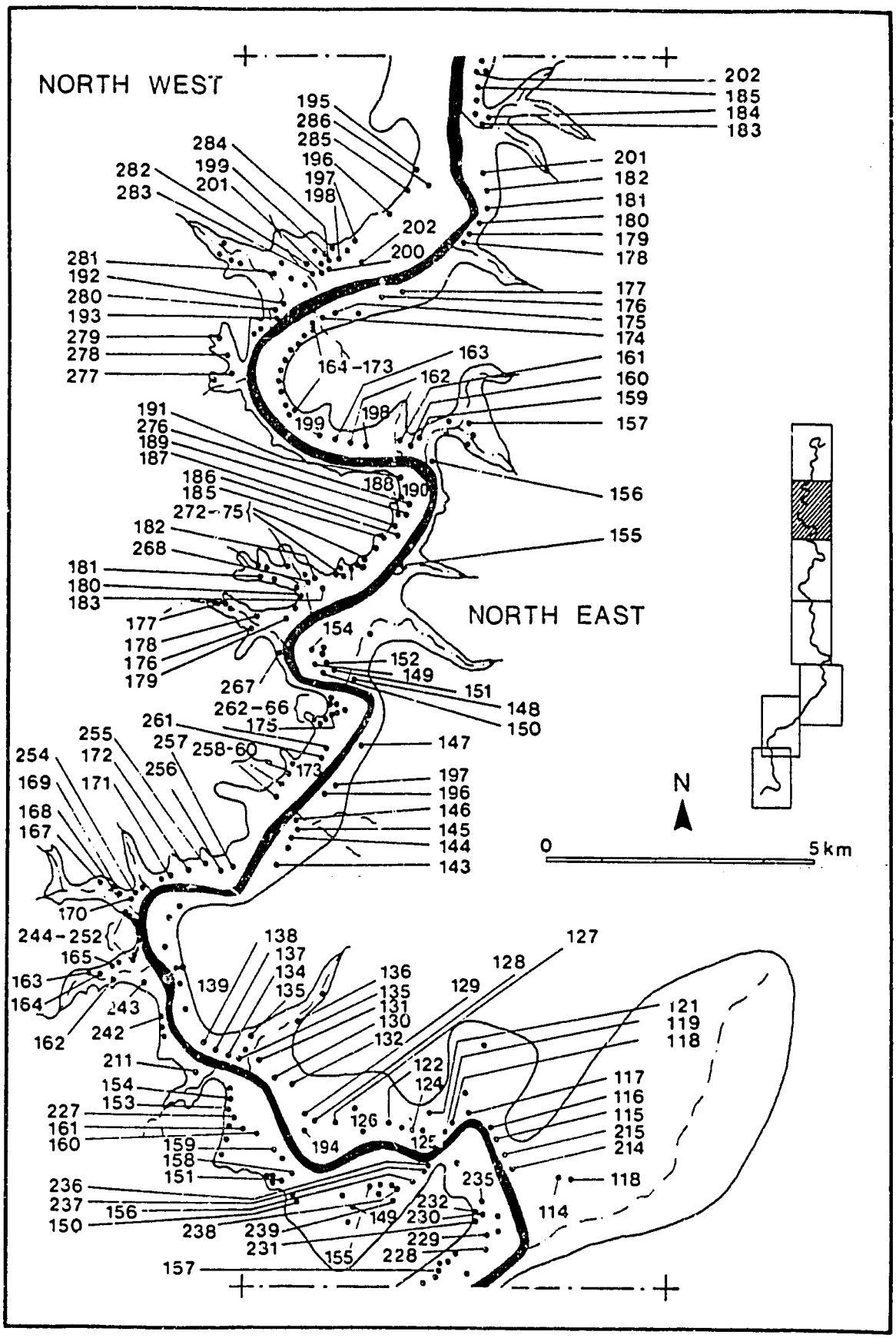

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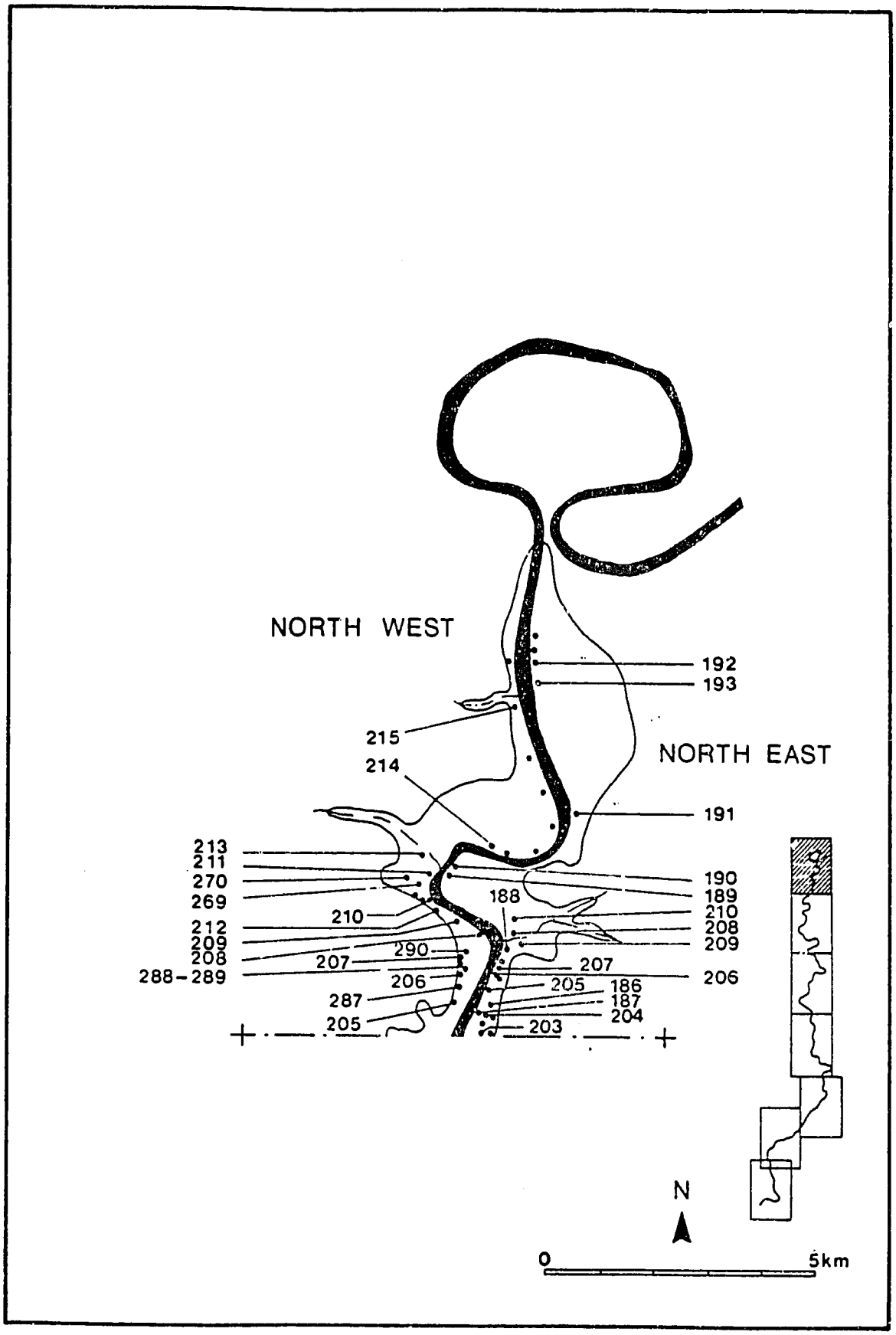
NORTH WEST
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reasons as yet unknown, the relative frequency of rock cairns increases substantially from south to north while the relative frequency of cemeteries increases only slightly.

The survey collected 12,798 stone artifacts and pottery sherds. The total sample of artifacts was sorted into technological and typological classes. Although the vast majority of stone artifacts was composed of lithic debris, the analysts did identify 1,437 shaped stone tools and 1,756 cores.

B. Open-Air Lithic Sites

As is the case with most regional surveys where the majority of sites date to the Stone Age, open-air lithic scatters are the most common class of site, occurring in every section of the reservoir. Occasionally, ceramics, rock cairns, and cemeteries occur with the lithic scatters. However, it is likely that many, if not most, of these site classes are not contemporary with the lithic scatters.

1. Stone Ages and Techno-Stages

Most of the 394 open-air lithic sites can be classified into two broad, technologically-defined, and temporally-delimited cultural stages: Middle Stone Age (MSA) and Later Stone Age (LSA). Technological criteria include the technique used to reduce a block of raw material to a tool and the type of tool produced. Using these and other subjective criteria, each was further subdivided into three techno-stages. As shown in Table 3, one, two, or three techno-stages could be represented at a single site.

Table 3. Number of Open-Air Lithic Sites by Techno-Stage and Section

	SW	SE	CW	CE	NW	NE	ALL	%
Big MSA	1	2	2	3	10	6	24	6.1
Little MSA	2	5	10	3	34	9	64	16.2
Undif. MSA	4	1	14	16	20	14	69	17.5
Blade LSA	5	3	5	3	4	1	21	5.3
Micro LSA	1	3	6	3	1	4	18	4.6
Undif. LSA	2	2	10	3	1	0	18	4.6
Undif. Lithic	5	2	10	10	8	9	44	11.2
Big MSA/ Little LSA	0	0	0	0	1	0	1	0.3
Big MSA/ Blade LSA	0	0	1	1	0	2	4	1.0
Big MSA/ Micro LSA	0	1	1	0	1	0	3	0.8
Big MSA/ Undif. LSA	1	0	0	0	0	1	2	0.5
Little MSA/ Blade LSA	6	0	11	5	5	8	35	8.9
Little MSA/ Micro LSA	0	1	3	2	2	11	19	4.8
Little MSA/ Undif. LSA	6	5	5	3	4	3	26	6.6
Undif. MSA/ Blade LSA	2	0	4	0	4	0	11	2.8
Undif. MSA/ Micro LSA	1	2	0	3	0	1	7	1.8
Undif. MSA/ Undif. LSA	2	3	3	2	3	2	15	3.8
Blade LSA/ Micro LSA	4	0	0	1	1	0	6	1.5
Big MSA/ Blade LSA/ Micro LSA	3	0	0	0	0	0	3	0.8
Little MSA/ Blade LSA/ Micro LSA	1	2	0	0	0	1	4	1.0
ALL	48	32	85	99	99	72	394	100

Big MSA

Big MSA techno-stage is characterized by the greater size of cores and tools, and a high percentage of tools (Table 4). The survey teams first recognized such large MSA assemblages while surveying the northern section. Several sites in the central and southern sections were later identified during laboratory analysis of the artifacts as containing Big MSA assemblages.

Twenty-four (6.1 percent) open-air lithic sites are represented solely by Big MSA assemblages. They also occur in conjunction with other techno-stages at 13 sites. Big MSA sites are most common in the northern section, occurring in 21 (12.3 percent) of the open-air lithic sites. In contrast, only eight open-air lithic sites in the southern section (10 percent) and eight sites (5.6 percent) in the central section encompass Big MSA assemblages (Table 5). At present, it is unclear what, if any, correlation this techno-stage may have with such variables as time, site function, or availability of raw material.

Little MSA

The relatively small size of artifacts (particularly cores), the high percentage of Levallois cores, and a low number of tools are characteristic features of the Little MSA techno-stage (Table 4). This techno-stage was recognized in the field, but only formally defined during analysis. The tool-per-site count equals half that of Big MSA. Furthermore, when the greater size of Little MSA sites is taken into account, the tool count (per standard unit of size) is less than one quarter that for Big MSA. The absolute number of Levallois cores is much higher

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Table 4. Comparison of Key MSA Techno-Stage Attributes

	BIG MSA	LITTLE MSA	UNDIFFERENTIATED MSA
Total No. of Sites	24	64	69
Average Site Size (m^2)	4,692	12,350	8,605
Tools			
Total	99	153	213
Per Site	4.13	2.39	3.09
Per 1,000 m^2 of Site Area	0.88	0.19	0.36
Levallois Cores			
Total	51	246	151
Per Site	2.13	3.84	2.19
Per 1,000 m^2	0.45	0.31	0.25
As % of Cores	58	72	56
Avg. Weight of Artifact	17.6 g	6.7 g	6.3 g

in Little MSA sites than Big MSA sites. The per-site number of Little MSA artifacts is nearly twice that of Big MSA. However, the number of artifacts by standard unit of area is less in Little MSA than Big MSA sites (Table 4). Unfortunately, variable collecting strategies diminish the reliability of artifact counts as a reliable characteristic of the techno-stages. The most reliable variable appears to be size as reflected in the average artifact weight. As Table 4 reveals, there is a major difference in number of tools and weight of artifacts between Big MSA and Little MSA sites.

Table 5. Distribution of Sites with MSA Assemblages

	Southern Section		Central Section		Northern Section	
	n	%*	n	%*	n	%*
Big MSA	8	10	8	6	21	12
Little MSA	29	36	42	29	78	46
Undif. MSA	16	20	42	29	44	26
All MSA	53	66	92	64	142	83

**percent of open-air lithic sites in Section.*

Little MSA is the only techno-stage represented in 64 (16 percent) of the open-air lithic sites. It occurs in conjunction with other techno-stages in 85 sites. Thus, Little MSA occurs in 38 percent of all open-air lithic sites within the reservoir area. This techno-stage is most common in the northern section where it occurs in 78 (46 percent) of the sites. Little MSA occurs in 29 (36 percent) sites in the southern section, and 42 (29 percent) sites in the central section.

Undifferentiated MSA

Many of the sites in the reservoir area contained Levallois cores and other tools which did not exhibit Big MSA or Little MSA characteristics, but fell somewhere in the middle (Table 5). Such assemblages were classed as Undifferentiated MSA. Undifferentiated MSA is the only techno-stage present at 69 sites. It occurs in conjunction with other techno-stages in 102 sites. This stage occurs in 16 (20 percent) sites in the southern section, 42 (29 percent) sites in the central section, and 44 (26 percent) sites in the northern section.

Backed blades, geometric microliths, and small blade cores are the characteristic artifacts of the LSA. Two subsets of the LSA can be distinguished based on the relative size of the backed blades. Assemblages containing microliths less than 1.0 centimeter in width are classed as "Micro LSA," while those with microlith 1.0 centimeter or greater in width are termed "Blade LSA." Undifferentiated LSA includes those assemblages containing only blade cores or other nondistinctive LSA artifacts.

LSA sites occur with the greatest frequency in the southern section, where 70 percent of the open-air lithic sites contain one or more of the LSA techno-stages (Table 6). The relative frequency of LSA sites decreases significantly in the central and northern sections.

Table 6. Distribution of Sites with LSA Assemblages

	Southern Section		Central Section		Northern Section	
	n	%*	n	%*	n	%*
Blade LSA	27	34	29	20	24	14
Micro LSA	19	24	19	13	22	13
Undif. LSA	21	26		18	14	8
All LSA	56	70	73	51	46	27

**percent of open-air lithic sites in Section.*

2. Artifact Assemblage Composition and Condition

Appendix C1 presents a complete listing, by site, of assemblage condition and raw material composition. Appendix C2 divides the artifacts into specific classes, and Appendix C3 provides a list of tool and core types for each site. Appendix C4 presents counts of tools and cores by techno-stages. Table 7 displays the 80 specific-shaped stone tool and core

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types condensed into 25 broader typological categories for sites identified to one specific techno-stage component. The artifacts listed in Table 7 constitute 59 percent of tools and cores recovered from all sites and provide a summary statement of the core and tool types associated with each techno-stage.

The survey teams found relatively few bifacial, unifacial, parti-bifacial, and distally retouched points in the reservoir area (Figure 7; for Figures 7-12, see pages 26-32). Points comprise three percent of the shaped stone tools and are limited exclusively to MSA sites. They are most numerous in Big MSA assemblages and least numerous at Undifferentiated MSA sites.

Side scrapers (Figure 7) are the most common category of shaped tool, accounting for 24 percent of the total sample. Side scrapers comprise between 26 and 40 percent of the tools from MSA sites and 7 to 13 percent of shaped tools at LSA sites. Big MSA assemblages contain a much higher percentage of side scrapers compared to Little MSA or Undifferentiated MSA assemblages.

End scrapers (Figure 8) occur in both MSA and LSA assemblages but are more frequent in the LSA, especially the Blade LSA, where they comprise 13 percent of all tools. Few patterns are readily apparent in the frequency of other scraper types (Figures 7 and 8). However, transverse and circular scrapers are found in higher frequencies at MSA sites, whereas steep scrapers are more common in LSA assemblages.

Burins (Figure 9) are present in higher frequencies at LSA sites, although none are associated with

Table 7. Tools and Core Categories by Techno-stage

(using sites with only one techno-stage component)

TOOLS	BIG MSA		LITTLE MSA		UNDIFF MSA		BLADE LSA		MICRO LSA		UNDIFF. LSA		UNDIFF.		TOTAL
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N
Points	10	4	6	4	7	3				3	2	26			
Side Scrapers	40	40	39	26	70	28	9	13	10	15	11	13	25	20	204
End Scrapers	5	5	6	4	22	9	9	13	5	7	6	7	9	7	62
End & Side Scrapers	3	3	6	4	12	5			2	3	1	1	5	4	29
Transverse Scrap.	3	3	10	7	12	5			1	1	4	5	6	5	36
Inverse Scrap.			6	4	4	2	1	1			1	1	1	1	13
Circular Scrap.	2	2	13	8	13	5	1	1	1	1	4	5	5	4	39
Steep Scrap.	1	1	6	4	20	8	4	6	6	9	4	5	15	12	56
Scraper Frags.	2	2	6	4	6	3	3	5			1	1	7	6	25
Burins	1	1	5	4	1	0.4			8	12	4	5	2	2	21
Perforators	6	6	17	11	30	12	4	6	4	6	25	30	15	12	101
Backed Blades	2	2	10	7	9	4	23	34	21	31	7	9	6	5	78
Truncated Blades			1	1					2	3					3
Cresents							7	10	2	3	2	2			11
Outil esquille			2	1	2	1	3	5	2	3	3	4	2		14
Composite tool	8	8	11	7	19	8	3	5			4	5	18	2	63
Platformed graver	1	1			3	1			1	1	1	1	1	14	7
Misc. Frags.	17	17	7	5	12	6	1	1	2	3	3	4	6	1	48
Total	101	-	151	-	245	-	68	-	67	-	82	-	127	5	841
Cores															
Blade	9	10	25	7	29	11	41	46	31	63	17	27	17	23	169
Flake	11	13	31	9	50	18	10	11	8	16	20	32	30	40	160
Multiple plat.	7	8	19	6	23	8	16	18	5	10	13	21	8	11	91
Bipolar			2	1											2
Levallois	51	58	246	72	151	56	8	9	4	8	10	13	5	7	475
Discoid	1	1	6	2	4	1	1	1					4	5	16
Frags.	9	10	13	4	15	6	13	15	1	2	3	3	10	14	64
TOTAL	88	-	342	-	272	-	89	-	49	-	63	-	74	-	977

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Blade LSA sites. "Perforators," a category which includes both becs and perforators (Figure 9), are the second most common shaped tool, comprising 12 percent of all shaped tools from the reservoir. They are particularly abundant at Undifferentiated LSA sites, where they constitute 30 percent of all tools, more than twice the percentage of any other tool type. "Platformed gravers" (Figure 9), a new tool type first identified during this survey, are found in both MSA and LSA assemblages.

Although a few rare backed blades are present in MSA assemblages, the vast majority of microliths (Figure 10) are restricted to LSA sites, where they form more than 30 percent of all shaped tools. Geometric microliths (crescents, triangles, and trapezes) are found exclusively at LSA sites, but in small frequencies. *Outils esquilles* occur in MSA and LSA assemblages, but are more frequent in the latter. Composite tools, on the other hand, are more common at MSA sites. Figure 10 also illustrates two unshaped tools (modified and "utilized" artifacts), a category recovered from most sites.

Not surprisingly, Levallois cores (Figure 11) constitute the highest frequency of core types at MSA sites. This is especially true of Little MSA sites, where they comprise 72 percent of all cores. Discoidal cores (Figure 11) occur in low numbers and are restricted almost entirely to MSA assemblages. Blade cores (Figure 12) also occur in low frequencies at some MSA sites (7 to 11 percent) but constitute the dominant core type at LSA sites.

Table 8 summarizes the physical condition of assemblages by techno-stage. The bulk of artifact abrasion probably results from trampling by domestic stock. However, on the whole, most assemblages, especially those recovered in the southern section, are not heavily abraded and have probably not been subjected to redeposition or other disturbances. Only 7 to 13 percent of the MSA assemblages and 4 to 5 percent of LSA assemblages were judged to be heavily abraded.

MSA assemblages are more heavily patinated than LSA sites, possibly indicating that they have been exposed on the surface for greater lengths of time, producing a thicker, heavier patina.

Chert is the predominant raw material throughout the reservoir, accounting for almost 94 percent of all lithics (Table 9). Raw material use is very consistent, with the greatest variation occurring in the southeastern section, where quartz is a relatively

Table 8. Condition and Dominant Chert Type of Assemblages by Techno-Stage

	BIG MSA (n=28)	LITTLE MSA (n=73)	UNDIF. MSA (n=70)	BLADE MSA (n=26)	MICRO LSA (n=26)	UNDIF. LSA (n=20)	UNDIF. LSA (n=21)
Abrasion							
None	0	0	0	4	0	0	0
Light	50	48	36	70	65	35	50
Medium	43	45	51	23	15	60	38
Heavy	7	7	13	4	4	5	12
Amount Patination							
0-25%	43	42	29	31	59	6	33
26-50%	18	22	25	42	32	31	33
51-75%	18	26	31	19	4	31	12
76-100%	21	10	14	8	4	31	16
Degree Patination							
Light	54	40	27	62	68	26	42
Moderate	31	45	52	34	32	63	40
Heavy	15	15	21	4	0	11	17
Dominant Chert Type							
Undiff.	75	54	69	79	75	56	62
Light	12	45	28	21	25	44	36
Finebrown	12	1	2				
Brown	3						

high 9.1 percent of all stone artifacts. Other materials include basalt, limestone, and siltstone. Although it was noted in the field and laboratory that chert came in many colors and several textures, the latter two variables occur as gradients, making chert difficult to differentiate. The four color categories utilized in the analysis, and presented in Table 8, are very generalized and thus not very informative.

The vast majority of chert utilized in the reservoir area was derived from rounded pebbles and cobbles. Several pebble/cobble beds that were extensively used as raw material sources were noted in the northern section. These beds, which are several hundred meters long, contain chert and quartz cobbles, both of which were utilized. Two chert sour-

Table 9. Raw Material Use By Section

	CHERT		QUARTZ		OTHER		TOTAL	
	n	%	n	%	n	%	n	%
SW	2,002	93.1	113	5.3	36	1.6	2,151	100
SE	1,193	88.0	124	9.1	39	2.9	1,356	100
CW	2,650	94.9	126	4.5	16	0.6	2,792	100
CE	1,623	94.9	81	4.7	6	0.4	1,710	100
NW	1,548	94.7	78	4.8	9	0.5	1,635	100
NE	1,320	95.5	58	4.2	4	0.3	1,382	100
TOTAL	10,336	93.7	580	5.3	110	1.0	11,026	

RENDERINGS OF LITHIC SPECIMENS COLLECTED IN SURVEY AREA
(Figures 7 - 12)

Figure 7. Points and Scrapers

A. bifacial point (NW1150)

B. bifacial point (NW 111)

C. bifacial point (NW 153)

D. bifacial point (SW 29)

E. unifacial Levallois point (SW 7)

F. side scraper (NW 112)

G. side scraper (NE 104)

H. convergent scraper (NW 141)

I. convergent scraper (CW 79)

Figure 8. Scrapers

A. end and side scraper (CW 30)

B. end and side scraper (CW 114)

C. end and side scraper (CW 6)

D. denticulate scraper (SW 53)

E. side scraper with burin (SW 54)

F. side scraper with multiple burin (SW 67)

G. double side scraper and perforator (CE 101)

H. transverse scraper (NE 114)

I. circular scraper (NW 111)

J. end scraper (NE 118)

K. end scraper (NE 181)

Figure 9. Gravers, Perforators, and Burins

A. platformed graver (CW 114)

B. platformed graver (CW 175)

C. perforator (SW 4)

D. perforator (NW 143)

E. burin on double backed blade (SW 45)

F. burin (CW 104)

G. burin (NE 90)

Figure 10. Backed Blades, Microliths, and Unshaped Tools

A. large crescent (CE 149)

B. crescent (CE 149)

C. crescent (SW 19)

D. triangle (NE 143)

E. triangle (NW 125)

F. curved backed blade (NE 120)

G. curved backed blade (NE 131)

H. curved backed blade (NW 125)

I. straight backed blade (NW 125)

J. straight backed blade (SW 69)

K. straight backed blade (NW 125)

L. double straight backed blade (NW 125)

M. partially backed blade (NW 125)

N. unshaped tool (NW 125)

O. unshaped tool (NW 125)

Figure 11. Levallois/Discoidal Cores and Flakes

A. Levallois core (NW 140)

B. Levallois core (CW 8)

C. Levallois core (NW 160)

D. Discoidal core (NE 129)

E. Levallois core (NE 141)

F. Levallois flake (NW 201)

G. Levallois point (NE 175)

Figure 12. Cores and Blades

A. multiple platform core (SE 51)

B. double platform core (NW 125)

C. opposed platform blade core (NW 125)

D. pyramidal blade core (NW 195)

E. single platform blade core (NE 114)

F. opposed platform blade core (NW 128)

G-I. blades (NW 125)

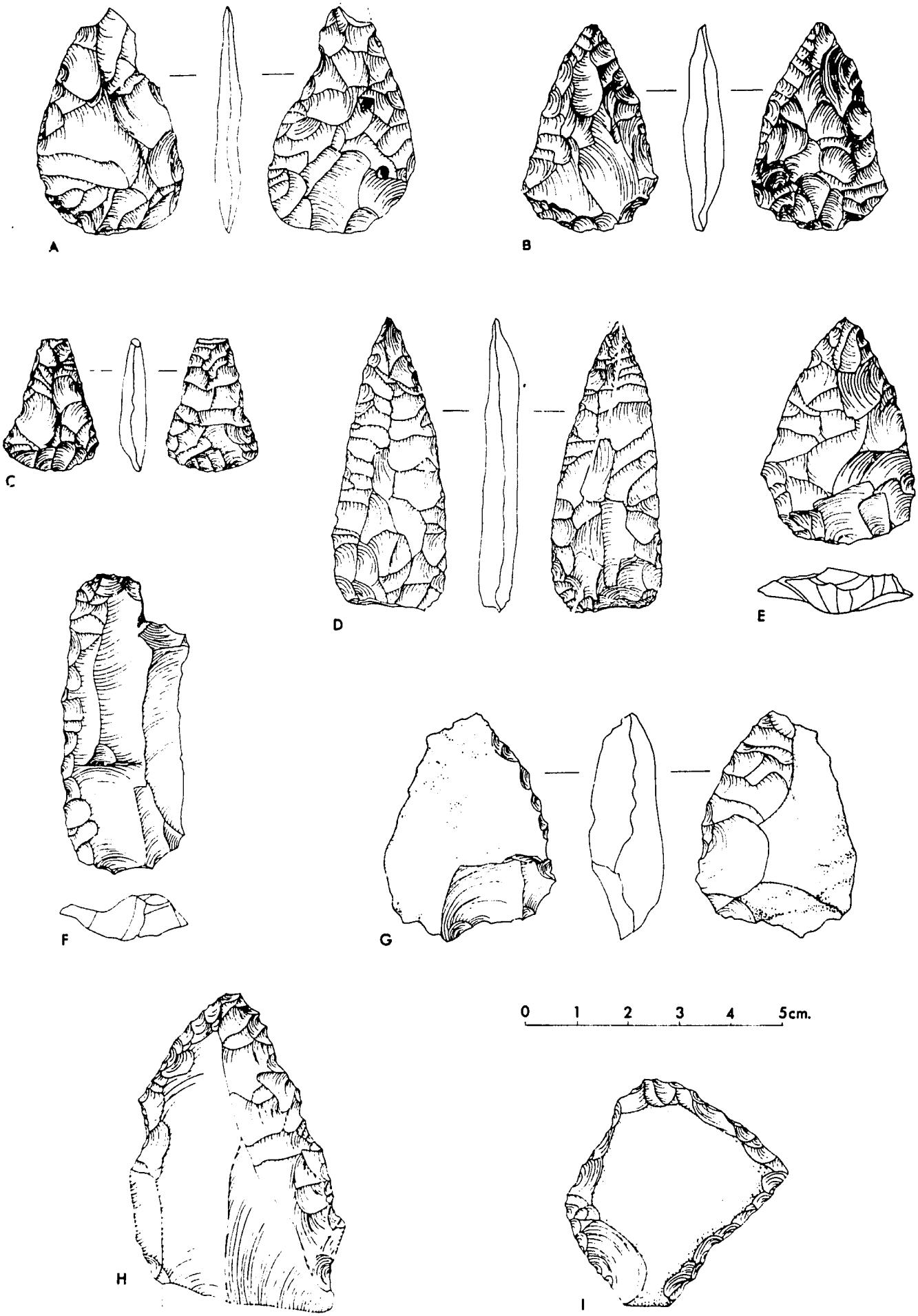

Figure 7. Points and Scrapers

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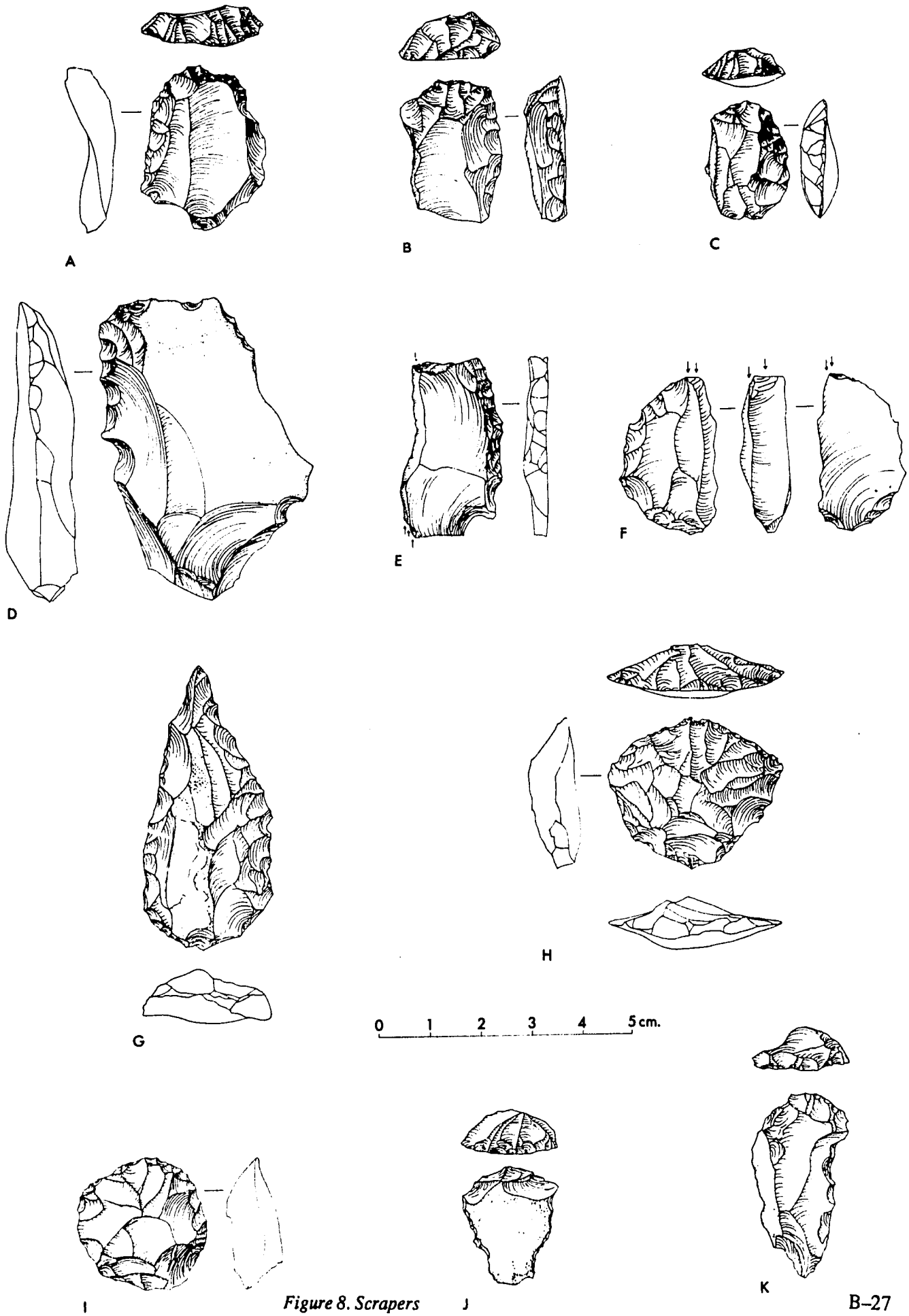

Figure 8. Scrapers

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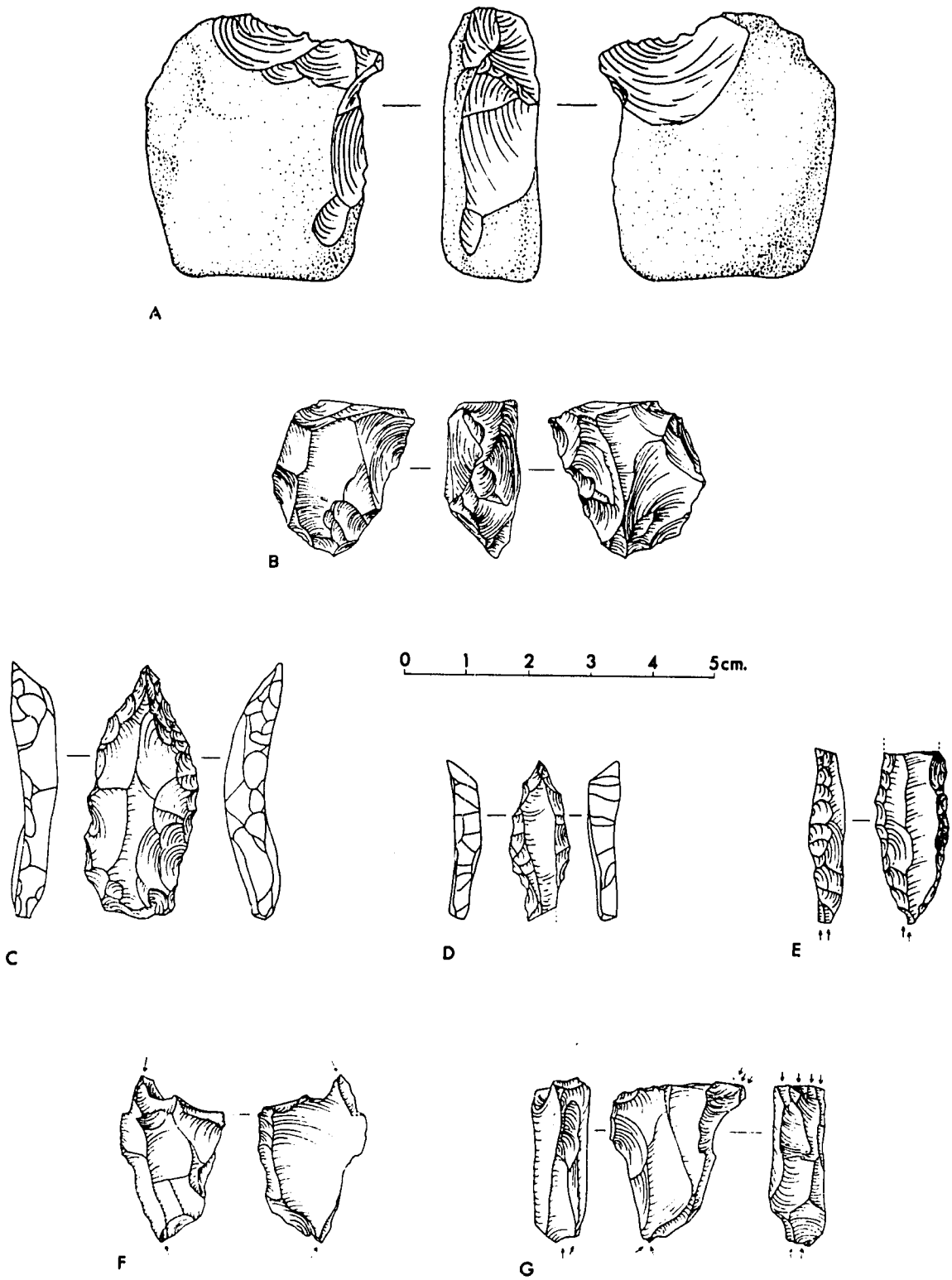

Figure 9. Gravers, Perforators, and Burins

Figure 10. Backed Blades, Microliths, and Unshaped Tools

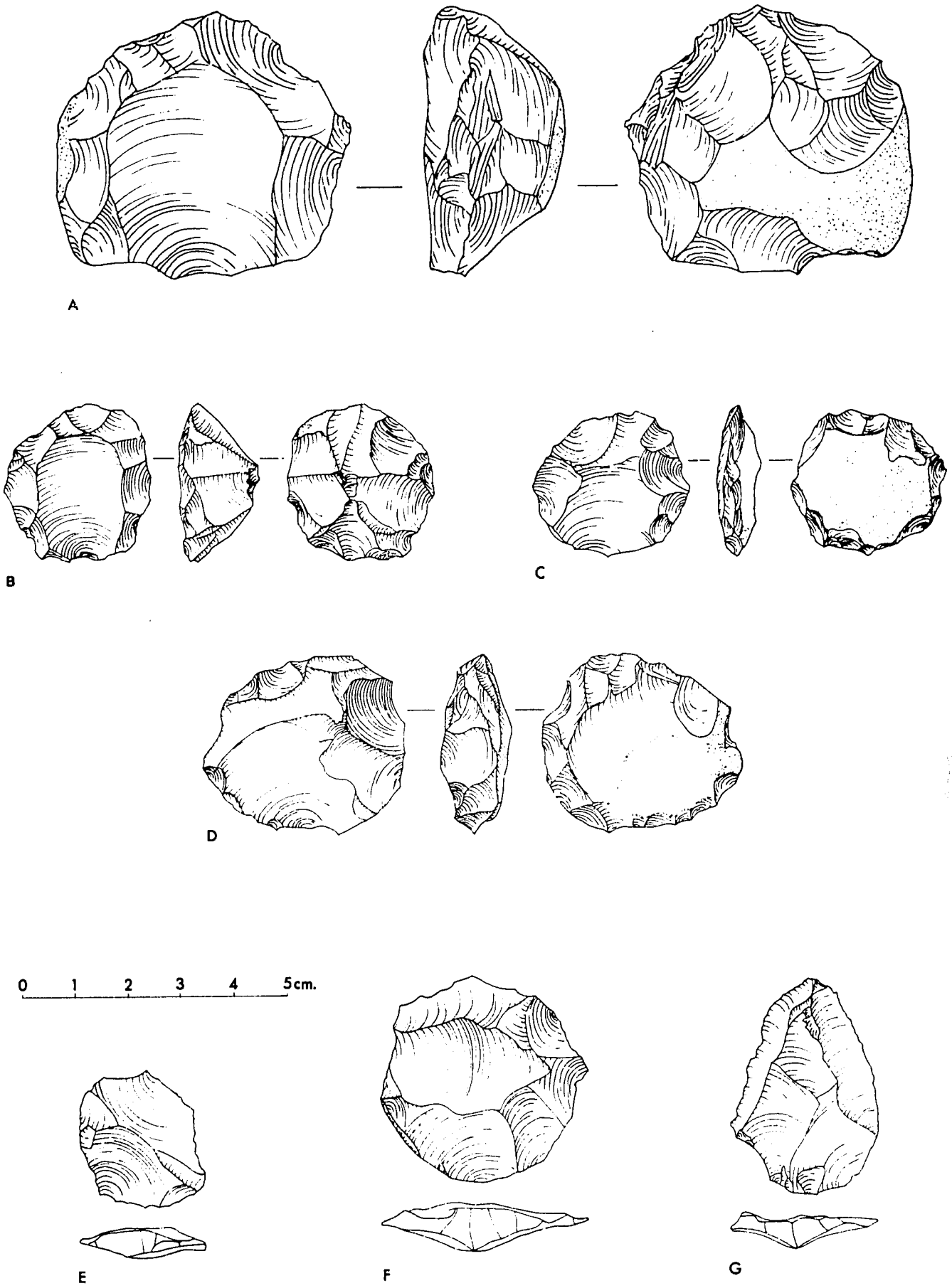

Figure 11. Levallois/Discoidal Cores and Flakes

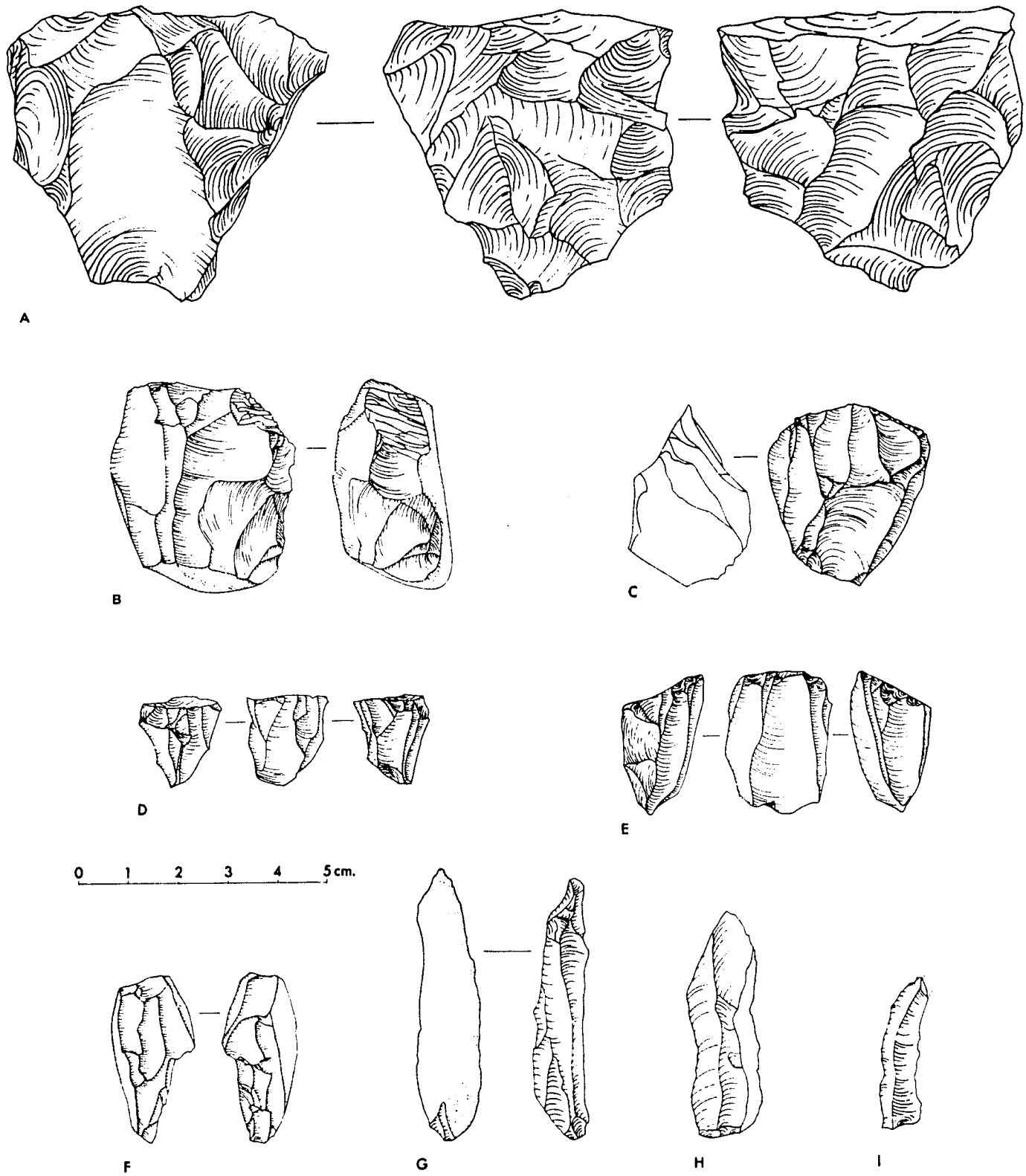

Figure 12. Cores and Blades

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ces, in and adjacent to a large tog in the southern part of the central section, were also noted.

3. Spatial Variability

In addition to observing variability in the artifact composition of assemblages, there was considerable variability in factors related to the spatial distribution of sites at the micro- to macro-regional scale, *e.g.*, site size, artifact density, soil type and color, landforms, distance to water, etc. In this section, the spatial variability of open-air lithic sites will be described in brief. An examination of two of these factors (artifact density and distance to nearest water source) will illustrate ways in which the survey data can provide more detailed future analyses.

Open-air lithic sites were distributed over all landform types surveyed (Table 10). The geomorphology of the river valley is not well-known and it is not known what some of the landforms, such as "terraces," "hillslopes," and "foot of hills," represent geologically. Hillslopes were identified as talus slopes composed of boulders with some soil. Foot of hills represented the intersection of the talus slope with a terrace or other alluvial formation, and were composed of soil with some rock. Terraces were level to gently sloping formations composed, at least in the southern sections, of alluvial sediments.

Throughout the southern section, sites occur most frequently where the rocky scree of the talus slope ends and alluvial/colluvial soils begin (Figure 13). The preponderance of sites on these landforms could be a result of other site locations having been scoured away or buried by alluvial forces. Another aspect of site location in the southern section, particularly evident on the western side, is that sites tend to occur adjacent to and most often on the south side of togga.

In the central section, 131 sites (90 percent of all sites) are located on the flat plains. While most of these sites occur within two kilometers of the river, some are located as far as 7.5 kilometers away, at the very edge of the project area. In the southern section, the vast majority of open-air lithic sites occur on hill slopes and foot of hills. On the western side, the sites sometimes extend onto or are entirely confined to "terraces" that adjoin the hill slopes.

The greatest variability in site location and associated landform is in the northern section (Table 10). The number of sites on terraces, bottoms, and levees increases substantially in this section and, with only one exception, all sites immediately adjacent to the river occur in the northern section. In the broad tog valleys of the north, sites occur up to five kilometers from the river.

The size of open-air lithic sites varies tremendously in all sections and with all techno-stages (Tables 11 and 12). Sites situated on the western side of the southern section average 3.7 times larger than those on the eastern side. A similar ratio is observed in the central section, where western sites are 4.7 times larger than those in the east. However, in the northern section, eastern sites averaged nearly twice the size of sites on the western side. Furthermore, the hypothesis that sites in the relatively narrow, constricted southern section should be smaller than those in the expansive central and northern sections is apparently not supported by the data (Table 11).

Table 10. Distribution of Open-Air Lithic Sites by Landform

Landform (code*)	SW	SE	CW	CE	NW	NE	TOTAL	%
Hill Top (1)		1	1	1	2	2	7	1.8
Hill Slope (2)	28	20	9	2	25	26	110	27.9
Foot of Hill (3)	10	9	1		17	3	40	10.2
Terrace (7 or 9)	7		1		44	26	78	19.8
Plains (4)			75	56	10	15	156	39.6
Bottoms (8)	1					1	2	0.5
Levee (5 or 6)					1		1	0.2
Total	45	31	87	59	99	73	394	100.0

**last digit of value coded for "Topography" in Appendix B1*

Table 11. Size of Open-Air Lithic Sites by Section (m^2)

		SW	SE	CW	CE	NW	NE	Total
N	48	32	85	58	99	72	394	
Min.	12	6	1	1	1	100	1	
Max.	128,000	9,000	180,000	44,800	134,400	100,000	180,000	
Mean	4,631	1,262	16,175	3,414	3,758	6,123	5,909	
S.D.	16,047	1,748	29,561	8,906	12,383	16,211	16,995	

The average size of all MSA sites is very similar to that of all LSA sites (Table 12). Although mean site size differs greatly between the subdivisions of the MSA and LSA, the reason(s) for these differences is not readily apparent. While mean size of MSA and LSA sites is similar, the maximum site size varies considerably, with the largest MSA site being about three times the size of the largest LSA site (134,400 square meters vs. 44,800 square meters). The largest site encountered is a multi-component site in the west central section that is 180,000 square meters (18 hectares).

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Table 12. Size of Open-Air Lithic Sites by Techo-Stage (m^2)

	All MSA	All LSA	Big MSA	Little MSA	Blade LSA	Micro LSA
N	262	63	24	64	21	18
Min.	1	12	4	4	16	48
Max.	134,400	44,800	27,000	134,400	44,800	22,500
Mean	7,565	7,468	4,692	12,350	10,217	5,562
S.D.	16,096	10,441	5,946	23,804	11,863	5,817

C. Site Distribution in the Central Section: A Case Study

The following study is a linear regression analysis of site spatial patterning in the central section. Various authors (*e.g.*, Ambrose 1984; Brandt in press; Dyson-Hudson and Smith 1978) have hypothesized that Stone Age settlement patterns were governed largely by the predictability and density of natural resources such as water, wild edible plants, and animals. In this pilot study, site location and occupation density (the latter of which is measured by artifact density) is examined in relation to distance to water—in this case, either the Jubba River or a tog.

The archaeological survey of the broad, flat central section, which is dissected by 26 major togga, produced 280 sites using a systematic and stratified sampling scheme. Of these, 87 are Stone Age sites for which a standardized density sample was taken. The density sample, a three meter diameter circle from which surveyors collected all artifacts, allows cross-site comparison of artifact density. For purposes of this pilot study, artifact density was assumed to reflect the intensity and duration of occupation, although other factors are undoubtedly also involved. The distance of a site from the nearest water source (H_2ODIST) is the independent variable, while the number of lithics found in a density sample (NLITH) is the dependent variable (Appendix D, Table 1).

The mean distance of sites to water is 389 meters, while the median distance is 250 meters (Appendix D, Table 2). The Kurtosis index for the distribution of H_2ODIST is 2.85, indicating a leptokurtic (or peaked) curve caused by an excessively large num-

Figure 13. Typical Open-Air Lithic Site

ber of cases clustered about the mean. H_2ODIST has a skewness index of 1.81, which is positively skewed (*i.e.*, to the right). This indicates that most distances are less than 389 meters, and that outlying values are affecting the mean. The unevenness of the distribution is also reflected in the exceptionally large coefficient of variation.

The density samples also vary dramatically, with a mean number of lithic artifacts of 13.7, and a median of 10. The 1,191 lithics from all density samples produce a highly leptokurtic curve, with a Kurtosis index of 32.3. A skewness index of 4.78 exists, again describing a positively skewed distribution with outliers exerting a pull of the mean above the median. A high coefficient of variation exists for NLITH as well.

NLITH and H_2ODIST were subjected to a simple linear regression using the Statistical Analysis System (SAS) microcomputer program and complete data set of 87 sites. The authors hoped the results would confirm any existing relationship between the variables, and indicate the statistical strength of the relationship. The estimate of the relationship is:

lithics=15.016+(-0.0034)*(the distance to water)+Ei
R^2=0.015

Results indicate that the level of explanation with this estimate is very low (Appendix D, Table 3). Only 1.5 percent of the variation in artifact density can be explained by variation in the distance of sites from the nearest water source. A "t test" of the parameters of the estimated relationship rejects a null hypothesis of a good estimate and shows distance to water to be a poor predictor of site density (Beta does not differ significantly from zero). To check the regression analysis, the residuals (differences of actual lithic numbers with those predicted with the estimation) were examined. The residuals were mapped at their respective sites to check for a spatial autocorrelation (systematic error by space). Virtually none exists. However, there are twice as many overestimations as underestimations for numbers of lithics. This means that the underestim-ations (greater numbers of lithics) are exerting a greater pull per site on the regression line (*i.e.*, there are a few very large positive residuals). We see the beginnings of this in examining the measures of central tendency above.

Appendix D, Figure 1 shows the linear relationship predicted in the linear model. A Durbin-Watson test shows no autocorrelation of the residuals with respect to water distance in this model. However, a look at the actual values plotted shows an absence of linearity, or for that matter, any relationship (Appendix D, Figure 2). Thus, to summarize the regression procedure, occupation density does not appear functionally dependent on distance to water.

The negative results of the regression analysis may be explained by a variety of phenomena. First, it is conceivable that the uncharacteristic outlying values of NLITH are obstructing a possible linearity. However, when the one value of zero lithics and the one value of 115 (more than twice the next largest value) are removed, only 0.6 percent of the variance in site density can be attributed to distance to water. If a non-linear relationship was present, a logarithmic transformation of the data should be considered. Yet an examination of the plotted data shows no signs of this. Therefore, the overwhelming unanimity of the quantitative tests is that no simple relationship exists.

Since the sites used in this study date typologically to the MSA and LSA, and may therefore span more than 100,000 years of time, it is possible that:

- all prehistoric water sources may simply not be observable today; or, conversely,
- present-day water sources were prehistorically not present; or
- the ecosystems may have changed dramatically over time.

Gasse *et al.* (1980) and Van Campo *et al.* (1982) note that late Quaternary paleoenvironments of the Horn have fluctuated markedly, with periods of aridity followed by phases of increased humidity. This could have affected markedly when and where Stone Age people camped near fluvial regimes.

Furthermore, specific site ages are lacking, since only about 10 percent of the central section has been surveyed. Thus, the sample may be inadequate for making sound inferences about spatial relationships. Finally, only one independent variable–the distance to water–was examined. Most likely there is a complex combination of variables working together to influence prehistoric settlement patterns along the upper Jubba River basin. Distance to water source may have been relatively unimportant to the prehistoric inhabitants of upper Jubba Valley.

In conclusion, the simple linear regression performed here has failed to confirm a hypothesized relationship between artifact density and site distance from water. Nevertheless, this initial pilot study of the central section does demonstrate how data generated by the archaeological survey can be explored further in an attempt to gain a better understanding of prehistoric human settlement strategies in the upper Jubba River basin. Additional studies and interpretations of the spatial distribution of open-air lithic sites, as well as other types of sites in the basin, must await detailed analyses of other key variables.

D. Open-Air Ceramic Sites

The archaeological survey also resulted in the discovery of 1,772 sherds from 100 open-air sites (Table 13). The frequency of ceramic-bearing sites increases from south to north, with the lowest number of sites in the Southeast Section (9) and the highest in the Northeast (43). Twenty sites are represented exclusively by pottery scatters, while the remaining sites also contain either MSA (at 31 sites), MSA and LSA (20), LSA (13), or undefined (16) lithic components. In addition to lithics, 25 pottery sites are associated with stone cairns and/or Islamic graves.

Table 13. Distribution and Makeup of Pottery Sites by Section

	SW	SE	CW	CE	NW	NE	TOTAL
# Sites	16	9	15	17	20	23	100
# Pot-sherds	87	41	484	555	232	373	1772
Avg. sherds/site	5.4	4.6	32.3	32.6	11.6	16.2	
Total weight	307	202	1691	-	1329	1793	
Avg. wt/sherd	3.5	4.9	3.5	-	5.7	4.8	
Sherd Type (N)							
Decorated body	44	26	175	264	108	165	782
Decorated rim	9	5	44	45	33	46	182
Plain rim/handle	1	1	11	13	6	4	36
Plain body	33	9	254	233	76	156	761
Imported	-	-	-	-	9	2	11
# Sites with Other Components							
MSA	6	3	4	3	6	9	31
MSA/LSA	3	4	2	5	2	4	20
LSA	3	1	2	3	2	2	13
Unspecified	4	1	1	4	2	4	16
Pottery only	-	-	5	3	8	4	20
Cairns/graves	7	2	1	1	4	10	25

While the northern section has the most ceramic sites, central sites have the most potsherds, accounting for 57 percent of all sherds recovered (Appendix E1). However, the central sherds are the smallest by weight, averaging less than four grams per sherd. The majority of the pottery is decorated body sherds (44 percent), followed closely by plain body sherds (43 percent). Decorated and plain rim sherds account for 12 percent of the sample, while imported non-earthenware (and probably modern) ceramics form less than one percent of the sample and are restricted to the northern section.

The age of the Jubba pottery has been difficult to establish, due to the lack of a prehistoric pottery chronology for Somalia. Recent excavations at Gogoshiis Qabe rockshelter, Buur Heybe (Brandt 1986b in press) have yielded the only systematically analyzed prehistoric pottery from Somalia. However, the Gogoshiis Qabe sample, which is dated equivocally to between ca. 8,000 and 3,000 B. P., is still undergoing analysis. The fact that over half of the pottery sites include MSA artifacts implies that either:

- these sites were re-occupied by pottery-using people tens (if not hundreds) of thousands of years after the MSA artifacts were deposited; or, more likely,
- post-depositional physical processes have resulted in the mixing of artifacts.

Several pottery variables such as firing color, number and types of partially reconstructible vessel forms, evidence of pitting or sooting, and other morphological data are presented in Appendix E2. Most sherds show little evidence of weathering, suggesting they have not been exposed on the surface for any great length of time. A study of decorative motifs and associated techniques of manufacture (Appendices A3 and E3) reveals the most common body motifs to be incised parallel vertical lines ("Halbad Jooge" [Ahmed 1986]), incised horizontal lines ("Xariijin"), and horizontal strips of modeled clay ("Kasiir"). These, as well as other Jubba pottery motifs, are identical to motifs used to decorate pottery manufactured today in the inter-riverine and coastal areas of southern Somalia (Ahmed 1986). The few partially reconstructible vessels from the Jubba sample also reveal forms similar to those made by contemporary potters (Ahmed 1986), *i.e.*, "cooking jars" with globular bodies, short necks, and rounded bases; "incense

burners" with wide mouths, straight walls, and flat bases; "braziers" with wide mouths, thick straight walls, and interior "brackets;" and "coffee pots," characterized by globular bodies, collared necks, round bases, and exterior handles.

A sample of Jubba pottery was also examined critically by the local potters of Buur Heybe. They recognized six geographically distinct patterns or "wares."

Hawal Dheeri ware (Figure 14:1,2,5,6; for Figures 14-17, see pages 38-41), manufactured at the village of Hawal Dheeri, Buur Heybe (~ 210 kilometers northeast of Baardheere), is characterized by one or more of the following motifs:

- Halbad Jiife (slanted parallel incised lines) with Maroog motif (combed impressions) between the Halbad Jiife incised lines;
- Dhuun (stamped hollow circles) placed laterally across the vessel (occasionally with a punctated mark in the center of the circle) and Halbad Jiffe and/or Halbad Jooge (vertically parallel incised lines) connected to but not extending into the circles; and
- Durdur-Xariig (slanted and parallel combed impressions) found directly beneath the lip of the rim and/or at the junction of the rim and body.

Bardaale ware, manufactured at Bardaale village, Buur Heybe (~ 205 kilometers northeast of Baardheere) is characterized by one or more Xariijin (laterally incised lines) placed beneath the lip of the rim up to the junction of the rim and body. Halbad Jiife and/or Halbad Jooge are placed directly underneath and are usually connected to these incised lines. Where the Halbad Jiife or Halbad Jooge incised lines end, Kasiir begins. Bardaale pottery is very similar to Hawal Dheeri pottery, with the main difference being the color and texture of the clay.

Buur Dinsor ware (Figure 15:5,8), from the granite hill of the same name (~ 80 kilometers northeast of Baardheere), is recognized by Dhuun being placed directly beneath the lip of the rim. Parallel incised lines are placed laterally around the body, with Halbad Jiife incised alternately between the laterally incised lines. Color and texture of the clay are also distinctive.

Buur Xakaba pottery (Figure 15:6,7), from the granite hill of the same name (~ 170 kilometers northeast of Baardheere), is recognized by the distinctive color and texture of the clay and by pinched or modeled clay placed directly beneath the rim with a combed impression running through the modeling.

Baydhabo ware (Figure 15:1-4), from the limestone plateau ~ 160 kilometers northeast of Baardheere, includes decorative motifs similar to Hawal Dheeri ware. Dhuun is also used and a punctation is made in the center of the stamped circles. Halbad Jooge does not terminate at the circles like Hawal Dheeri pottery, but instead the incised lines extend into the circles. Xariijin is also incised laterally through the middle of Dhuun. Color and texture of the clay also differentiates this ware from the others.

Jilib/Jamaame pottery (Figure 14:3,4; Figures 16-17), named after the towns ca. 220 kilometers south of Baardheere, is significantly different from any of the other wares. The clay is much coarser, the pottery much thicker and the sherds consistently different in color (buff/brown rather than black or red). The motifs are also very different. Vertically combed (rather than slanted) Durdur-Xariig is combined with laterally incised lines to produce a unique motif. Durdur-Xariig is usually combed on modeled clay. Maroog is also used but not in any regular or predictable fashion.

Each of the above wares is distributed throughout the entire length of the study area with the exception of Buur Xakaba, which is apparently restricted to the northern sections (Appendix E3). Such a distribution suggests that pottery is being brought into the Jubba Basin from sources more than 200 kilometers to the south and northeast, implying sizeable pastoral trading networks and/or settlement patterns.

In summary, most of the Jubba pottery appears to be of recent, if not modern, age. Nevertheless, it is possible that at least some of the sites encompassing LSA lithics and/or pottery represent relatively undisturbed later LSA, Neolithic, or Iron Age/Early Islamic occupations.

E. Cairns

Rock piles, or cairns, occur throughout the reservoir. Because of a high degree of variability in size and shape and their similarity to some Islamic graves, cairns created classification problems. The majority of cairns are isolated, circular, or (less frequently) oblong piles of rock. Almost all cairns

PHOTOGRAPHS OF POTTERY SPECIMENS COLLECTED IN SURVEY AREA
(Figures 14-17)

Figure 14. Pottery

Hawal Dheeri Ware: 1,6 (CE282); 2,5 (NE130)

Jilib/Jamaame Ware: 3,4 (CW138)

Figure 15. Pottery

Baydhabo Ware: 1 (NE71); 2-4 (CE149)

Buur Dinsor Ware: 5,8 (CE44)

Figure 16. Pottery

Jilib/Jamaame Ware (NE189) except center row right (CW138)

Figure 17. Pottery

Jilib/Jamaame Ware (CW28)

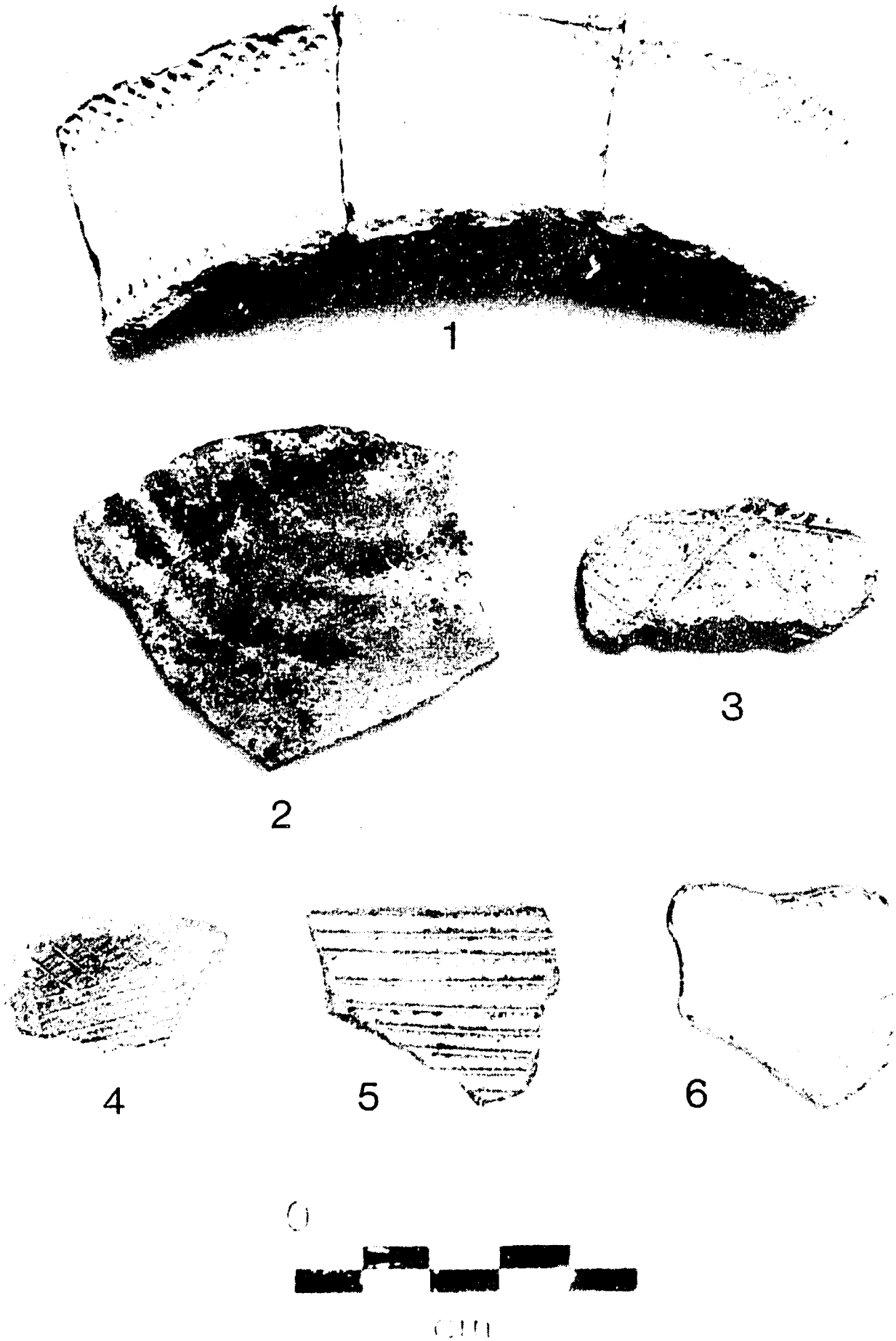

Figure 14.

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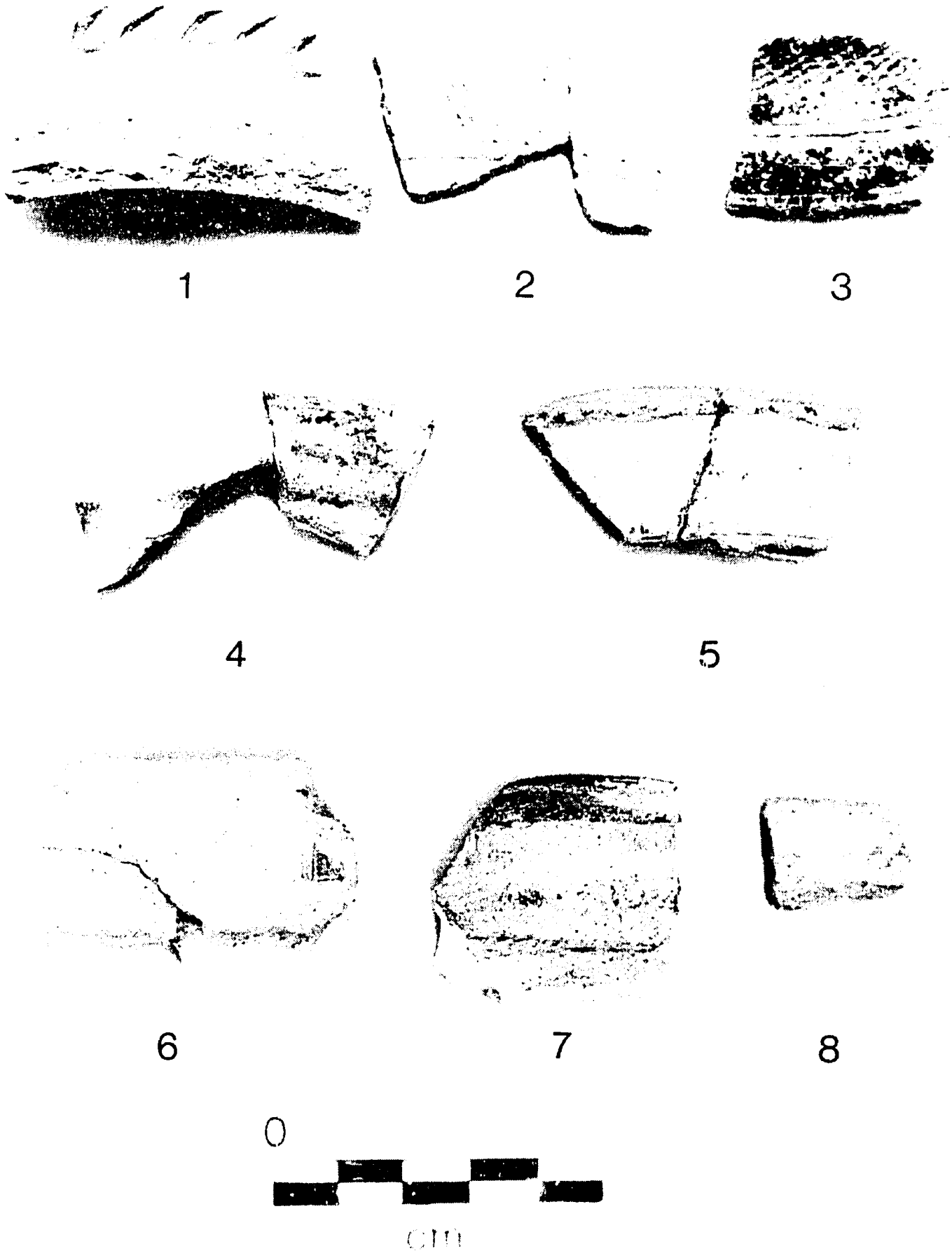

Figure 15.

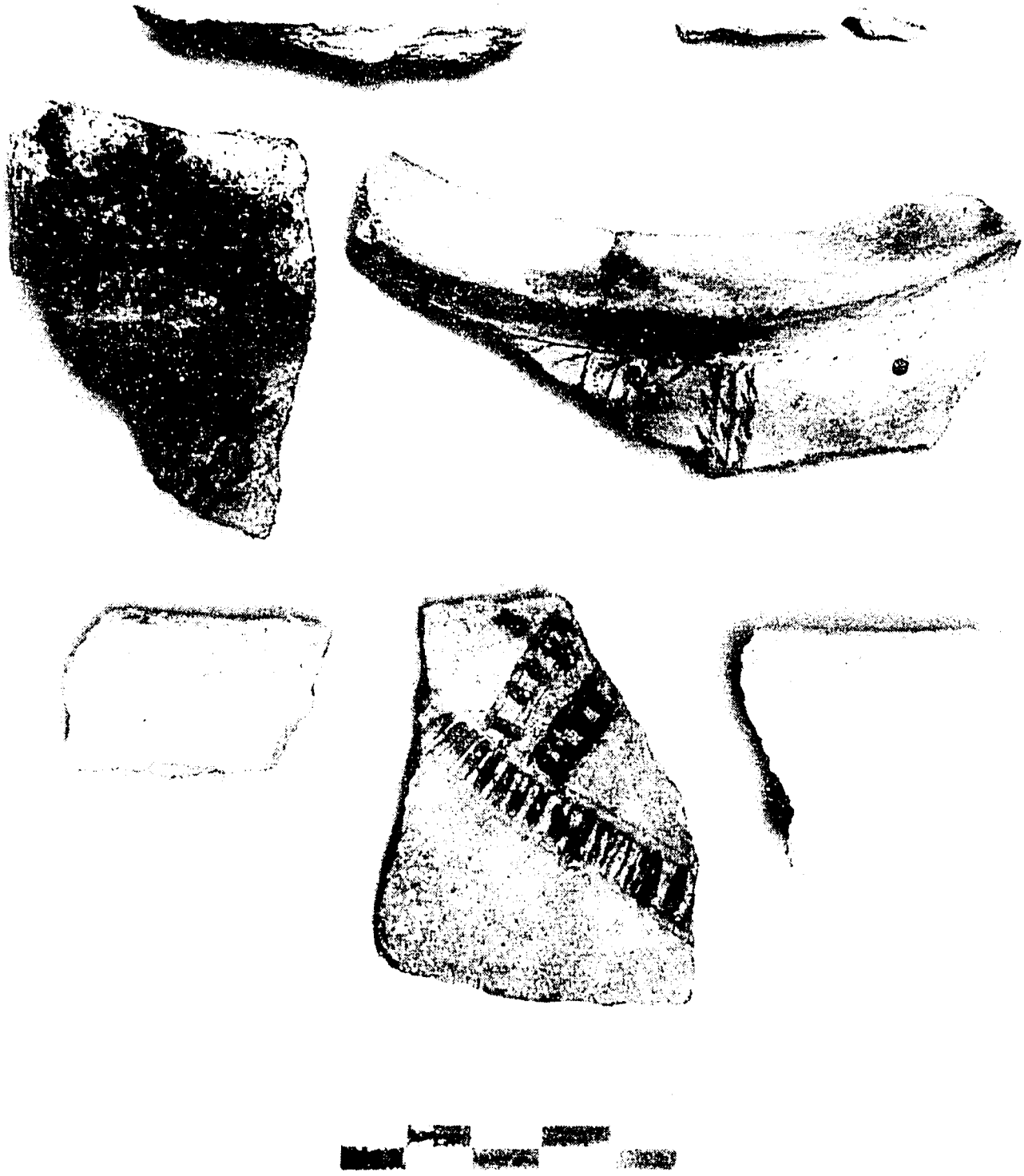

Figure 16.

360

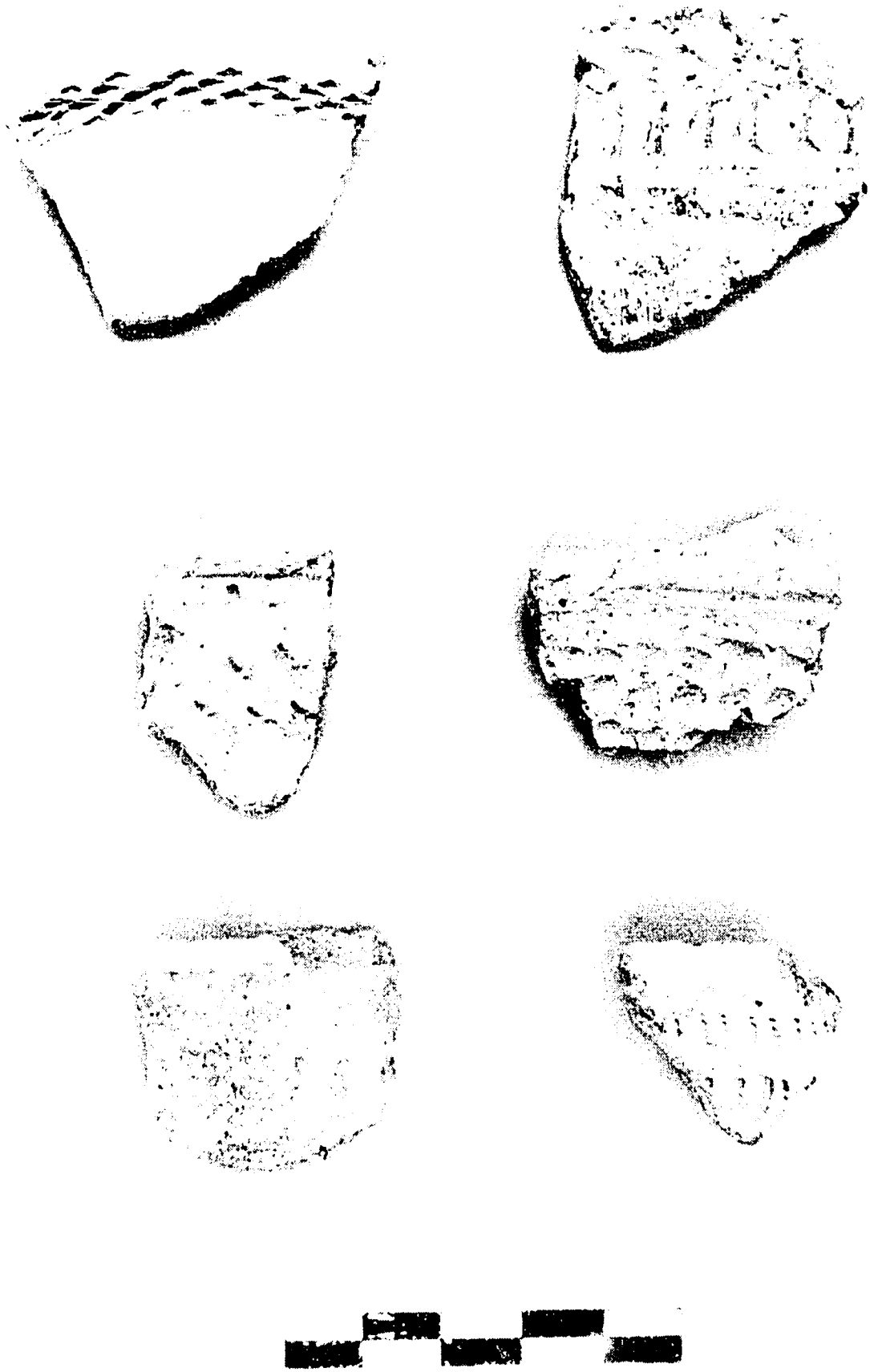

Figure 17.

-36'

are located at the base of a hill or talus slope. Cairn diameters range from 1.5 to 8.0 meters, whereas height varies from 0.5 to approximately 1.5 meters. Occasionally, cairns occur in cemeteries with linear graves. The authors assume these cairns are associated in some way with the rite of passage, and could very well be graves of a specific type or age.

Of the 121 cairn sites not associated with cemeteries, 98 (81 percent) occur in the northern section. Over 83 percent of the cairn sites (n=101) are isolated, single cairns, the function(s) and ages of which remain unknown. Twelve sites consist of two cairns, five sites consist of three cairns, and two sites consist of four cairns. A tentative classification of cairns follows.

First, *small rounded cairns* are the most common type of cairn in the survey area. These cairns are composed of locally procured, angular rock and average three meters in diameter and less than one meter in height.

Second, *large rounded cairns*, except for size, are virtually identical to the small rounded cairn. They average seven meters in diameter and slightly more than 1 meter in height (Figure 18).

Third, *platformed cairns* are circular rock and earth platforms approximately 14 meters in diameter and 0.3 meters in height with a second cairn, averaging 10 meters in diameter and 1.5 meters in height, resting on top of the base platform. There are three occurrences of these more regularly constructed large cairns in the northern section.

Fourth, *irregular cairns* are irregularly shaped, linear cairns occurring singly and in groups in the northern section. These cairns are probably graves, as they occur with modern, Islamic graves and/or are arranged like a cemetery. Irregular cairns are generally more level and lower to the ground than the rounded cairns and are most often composed of large blocks of tabular mudstone. The stones are usually somewhat dispersed, and could indicate a greater antiquity than Islamic graves.

Cairns are highly visible features. The authors believe most of those in the northern and southern sections were recorded. However, as the number of cairn sites increased in the northern section, site documentation became extremely time-consuming and cairn sites were recorded by simply noting the location, number of cairns, and associated landforms in the field notebooks.

F. Cemeteries and Graves

Cemeteries (including some isolated graves) are the second most common class of site, occurring throughout the reservoir area. Cemeteries in the northern section are more numerous, larger in dimension and contain more graves (Table 14). Those located near the refugee camps in the central and northern sections are obviously modern and were not recorded.

The vast majority of cemeteries are clearly Islamic. Both the Somali crew members and local inhabitants had no difficulty in identifying cemeteries as Islamic, but determining their age was another matter. Informants would occasionally identify Islamic cemeteries as "old," but could not really explain why. The authors were usually unable to determine even an approximate age. Most of the Islamic cemeteries consist of a series of east/west-oriented graves, usually occurring within a protective brush or rock fence (Figure 19). On average, the graves are constructed from gravels and measure three meters in length and 0.5 meters in height. In the larger cemeteries, two to six fenced compartments separate family or clan burials. In the southern section, people would carve tribal marks into logs or scratch them onto rock surfaces forming the walls of the cemetery. In rare cases, grave goods, such as a milk container, are associated with a grave.

*Table 14. Cemetery Sites by Number of Graves and Section**

No. of Graves	SW	SE	CW	CE	NW	NE	Total
	1	2	3	2	4	3	17
2 - 5	17	8	3	3	32	13	76
6 - 10	4	3	3	2	15	7	34
11 - 20	1	7	5	8	21		
21 - 50	1	2	1	4	9	17	
> 50	2	3	5				
Total	25	21	10	10	61	43	170

**Cemetery sites where graves were counted.*

Throughout the survey area, the majority of cemeteries occur on terraces or elevated bases of hills. In the southern section, only four of the 46 cemeteries occur in the bottom lands, while in the northern section only 11 of 124 occur in bottomlands. Cemetery maintenance by the local populations varies considerably. This may be related to the age of the cemetery. The vast majority of the cemeteries in the southern section have fences, while many in the northern section do not.

Figure 18. Large Rounded Cairn

Figure 19. Islamic Cemetery

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Some graves within cemeteries are morphologically different from recent Islamic graves and therefore could be pre-Islamic, non-Islamic, or early-Islamic. These graves are constructed from a tabular stone (most often mudstone) and consist of a low mound or veneer of stone in an oblong shape (Figure 20). The stones are often somewhat dispersed. These oblong graves are never fenced and occur singly or in groups of up to 34 graves.

G. Caves and Rockshelters

A total of 23 caves and rockshelters were recorded as sites, although not all exhibited evidence of human use. Caves and shelters occur in the main gorge wall and in the walls of the togga, usually at the interface between the talus slope and gorge wall. Caves and rockshelters that contained sediments or were judged by the surveyors as potentially inhabitable were considered sites, as were those displaying rock art, regardless of whether they contained sediments or artifacts. Although a precise count was not kept, at least 40 caves and shelters with sloping rock floors were examined and rejected as sites. The 23 caves and rockshelters can be broken down as follows:

No rock art or artifacts	11
Lithics only	3
Rock art only	7
Rock art and lithics	1
Rock art and ceramics	1

The caves and rock shelters vary in floor size from 3 by 4 meters to 7 by 20 meters. Two of the caves have several chambers and one (SW 48) extends about 20 meters into the gorge wall. Numerous bats, combined with the potential of discovering large carnivores, limited exploration of some of the caves. Most of the rockshelters are shallow and appear to have thin sediments, although several were as large as 20 meters wide (Figure 21).

Of the four caves and shelters with stone artifacts, two (SW 47 and SE 51) yielded Levallois flakes indicative of MSA occupation. The rockshelter with ceramics and rock art also had some fiber mats,

Figure 20. "Old Islamic" Cemetery

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indicating that the shelter is still in use. Site SE 51, a large rockshelter with rock art, had the greatest number of artifacts (43). These appear to be all MSA and are eroding out of a large talus slope in front of the shelter, suggesting the shelter may contain sub-surface archaeological deposits.

H. Rock Art

There is a total of 11 rock art sites in the survey area. Ten sites are in the limestone gorge of the southern section (six in the southeast and four in the southwest) and one site is situated in the northern section (northeast). Nine of the sites are painted caves/rock shelters, while two sites (SE 39 and NE 133) consist of scratchings and engravings on boulders.

Many of the painted limestone rockshelters could not have been found without the help of local informants, as vegetation was usually very dense with no obvious paths leading to the shelters. A site form was filled out and artifacts collected, if present. The paintings were then sketched, color coded, and photographed. Measurements were taken of some of the larger motifs. Back in camp, more detailed sketches were made from the field notes.

Southeast

SE 39

This site, situated 45.3 kilometers north of the proposed dam, consists of a large boulder at the edge of the main camel path. On the south side of the boulder are a series of highly schematic scratchings which appear to be of recent origin. Also present are two schematic engravings which may be older.

Sites 48, 49, and 50 are rock art sites located within a one-kilometer stretch about 55 kilometers north of the proposed dam and 30 kilometers south of Buurdhuubo. Each of the three rockshelters lies along the escarpment face in dense vegetation only 50 meters from the river's edge. There are no discernable paths to these shelters and no evidence of present day use. The shelters were formed when large boulders separated from the escarpment face and shifted downslope. Detachment of the boulders left smooth rock faces for painting. Each painted

Figure 21. Large Cave

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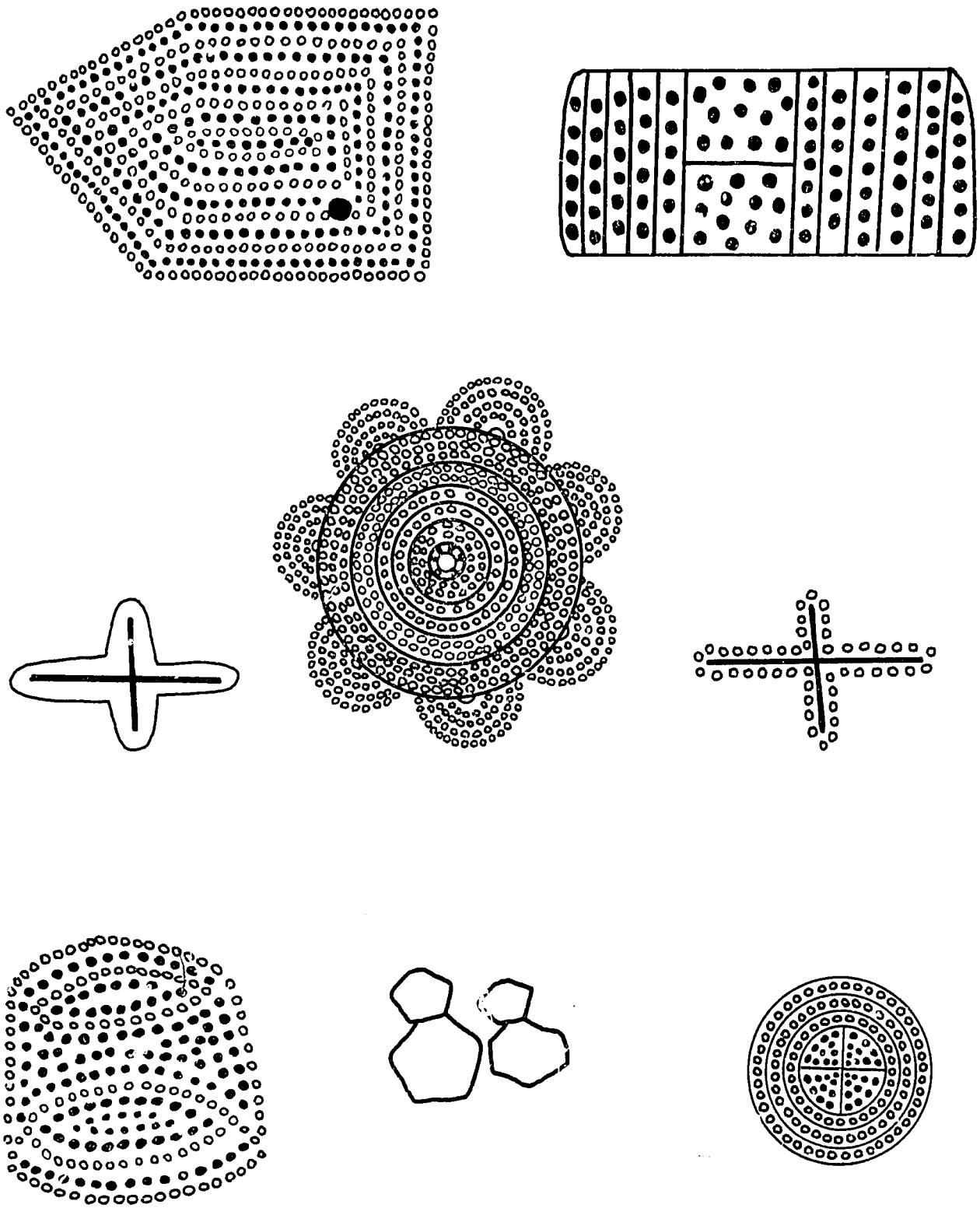

Figure 22. Sketches of Rock Art in Rock Shelter SE 48 (not to scale)

shelter had a stone floor with no visible trace of artifacts present.

SE 48

This rockshelter is located 55.5 kilometers from the dam. It lies about 50 meters from the river's eastern bank, facing southwest. The shelter measures 10 meters in length, four meters in depth, and approximately three meters in height. Over 20 paintings are displayed irregularly along the back wall. This irregularity is due, in part, to the wall's undulating surface. Preservation is excellent overall, although some figures are now indiscernible. This appears to be due to a variation in pigment base rather than a significant difference in the age of the paintings. The majority of the figures are geometrical compositions of dots and circles (Figure 22) and most are polychromatic motifs in red, orange, black, and white. Of the geometrical motifs, one highly complex, rosette-like figure measures 35 x 35 centimeters. The rosette is composed of hundreds of open red dots, red dots, black lines, and red circles. Thick streaks of a fatty white pigment have been superimposed on top of the figure. Other motifs in the shelter range in size from 2 by 3 centimeters to 30 by 40 centimeters. These include crude animal-like figures and highly schematic designs.

SE 49

Located 55.6 kilometers from the proposed dam site, this site, like SE 48, faces the southwest 50 meters from the river's edge. The shelter measures 10 meters in length, two meters in depth, and three meters in height. A detached boulder inhibits ready access to the paintings. Approximately 15 paintings are displayed along the escarpment detachment face. Most are clustered on the northern wall just below a 1.5-meter overhang. Preservation, in most cases, is excellent. The majority of the figures are geometrical motifs of red, white, and orange dots with solid red lines. Also included are snake-like designs (Figures 23 and 24). Particularly striking are two undulating compositions in red, orange, and white. The larger of the two measures almost 50 centimeters in length (Figure 24).

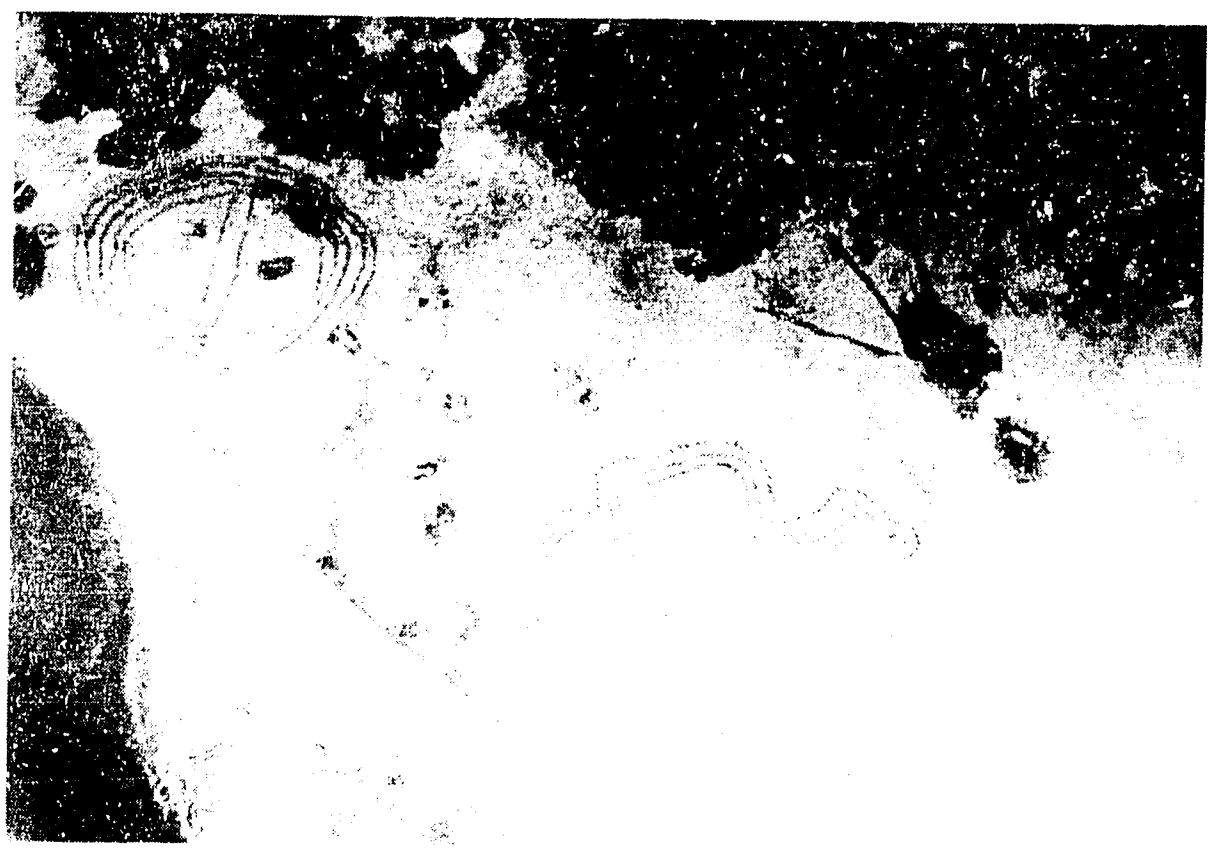

Figure 23. Rock Art in Rockshelter

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SE 50

This rockshelter is located 55.62 kilometers from the proposed dam. The shelter faces southwest and measures 10 meters in length and three meters in depth. Site 50 is still in an active formation stage with layers of limestone peeling off the concave detachment surface. It appears that the entire back wall contained paintings, but strip weathering of the surface has removed all but a few traces of the art work. Informants claimed that local inhabitants attribute the paintings to supernatural causes and have taken an active role in expediting the natural weathering process.

SE 44 ("QARIIB")

SE 44 is situated 56.25 kilometers north of the dam at the base of a vertical ridge. The shelter opens to the southwest and is approximately 150 meters from the eastern bank of the river. It measures 10 meters in length, five meters in width, and four meters in height. The shelter floor contains a thin veneer of sediment, which spills into the shelter mouth. No artifacts were found. Today, local inhabitants use the shelter to store sleeping mats and honey-collecting equipment.

The nearly 100 paintings displayed on the back wall can be divided into three main panels, corresponding to the natural topography of the rock face. Panel 1, at the far northern end of the shelter, is composed of about 20 paintings, all executed in reds. The figures include motifs formed by linear arrangements of dots, circular compositions of dots, and schematic figures, including modern day tribal symbols (Figure 25). One interesting figure is a plant-like motif measuring 20 by 10 centimeters. Panel 2 consists of approximately 50 monochromatic red paintings and a single black motif. Again, the paintings include intricate compositions of dots and schematic motifs. No single motif from Panel 1 is repeated in Panel 2. The largest figure in Panel 2 is a globe-like arrangement of crisscrossing dots measuring 22 by 25 centimeters. The third panel lies at the extreme southern end of the shelter and contains over 40 individual figures. The paintings are monochromatic and include red, orange, and black figures. Linear and circular arrangements of dots, as well as schematic motifs, are common. One motif, a cross enclosed within a box, is repeated frequently. Local informants claim this is a modern tribal symbol of local populations. A red figure composed of a linear pattern of dots is painted on the southern entrance to the shelter. The figure measures 34 by 10 centimeters and resembles an ear of maize.

SE 45

This rockshelter is located 60.0 kilometers from the proposed dam site, about 200 meters from the river's edge up a steep, lightly vegetated slope. It is clearly visible from the main path, in an open area at a bend in the river. Several paths make the shelter readily accessible. Today, local villagers use the shelter as a storage facility for mats. The shelter is large and relatively deep, measuring 10 meters in length, five meters in depth, and five meters in height. It affords a panoramic view of the river and opposite bank, and is striking for its coolness and absence of bats and other carnivores.

Approximately 20 paintings are displayed intermittently along the back wall. The paintings are all monochromatic figures in reds and black (Figure 26), with the majority occurring just south of the center. Preservation is good to poor. Most motifs are schematic figures, including wavy and crossed lines. The largest of these figures measures 43 by 34 centimeters. Several smaller, indeterminate animal-like figures are also displayed. The figures in this shelter are interesting for their dissimilarity to the figures in the shelters just one kilometer south.

SE 51

Located 73.05 kilometers from the dam, this shelter lies 100 meters south of a large gypsumous spring named "Ceel Barre" and is clearly visible from the path. The shelter is situated 100 meters from the eastern bank of the river and is readily accessible from the north, but a sheer rock face and dense vegetation make access from the south extremely difficult. The shelter measures seven meters in depth, 15 meters in length, and five meters in height. A deposit of sediment extends onto a talus slope. A small amount of MSA and LSA material was collected from the talus deposit. Today the shelter is used for storage.

The rock art is confined to two panels, reflective of the cave topography. Preservation is good to poor. Panel 1 is located at the extreme western side of the shelter and consists of approximately 15 monochromatic figures in red. Only one figure is black. Motifs from Panel 1 include irregular arrangements of dots, the largest measuring 43 by 21 centimeters. Crosses and simple streaks of pigment are also displayed.

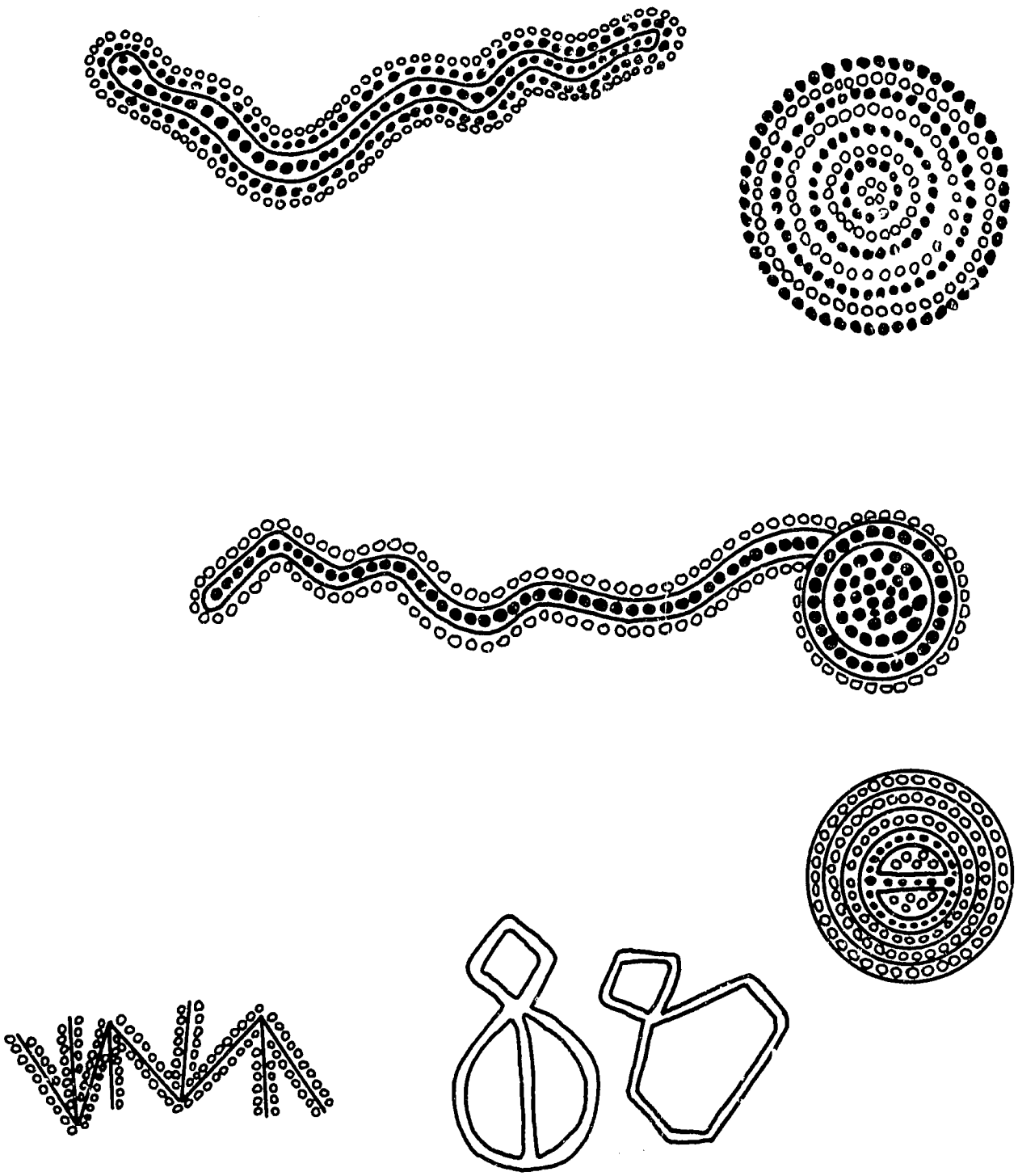

Figure 24. Sketches of Rock Art in Rockshelter SE 49 (not to scale)

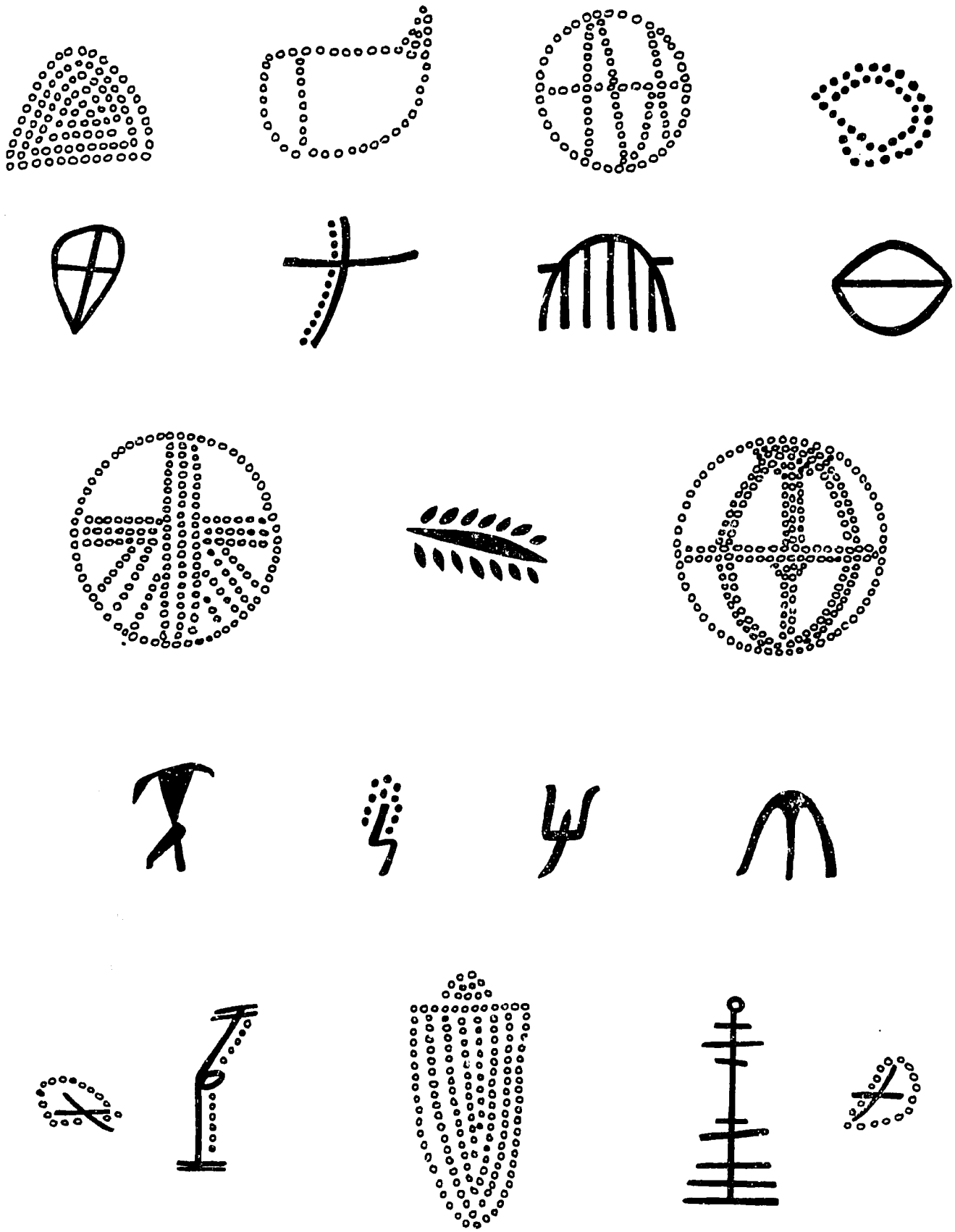

Figure 25. Sketches of Rock Art in Rock..elter SE 44 (not to scale)

Figure 26. Sketches of Rock Art in Rockshelter SE 45 (not to scale)

-371'

Along the center back wall of the shelter are a few indeterminate smudges of pigment. Here preservation is extremely poor. At the far eastern end of the shelter, a dozen paintings are displayed. All figures are black, except for one red design. The motifs include linear and irregular arrangements of dots, simple lines, and crosses. The largest figure from Panel 2 measures 41 centimeters in length.

Southwest

SW 55

This shelter is located 55.8 kilometers from the proposed dam, 80 meters north of a tog, and 35 meters from the western bank of the river. The cave measures seven meters in length, 8 meters in depth, and approximately 2.5 meters in height. The floor of the cave contains a deposit of sediment. Pottery was collected inside the cave and on the talus slope. A recently abandoned hearth was located just outside the cave's entrance. Today, local inhabitants use the cave for storing fiber mats.

This site contains nine monochromatic figures in red. Preservation is very good overall. The figures are confined to the exposed rock face of the cave entrance and just inside the ceiling close to the entrance. Most of the figures are irregular arrangements of dots and lines, or dots enclosed in circles. The largest motif, a "house-like" design of interwoven lines and dots, measures 30.5 centimeters in height. A 20-centimeter cross enclosed in a box, a local tribal motif branded on domestic animals in the valley, is included among the painted figures.

SW 57

This cave is located 56.1 kilometers north of the dam site, 40 meters from the river's edge and 20 meters south of site 56. It measures seven meters in length and six meters in depth. The stone floor of the shelter is littered with rockfall.

Less than 10 figures are displayed on the south wall of the cave. Preservation is good to excellent. The majority of the designs are monochromatic figures of red or black. Only one polychromatic figure is portrayed and consists of red, black, and white pigments. The designs include arrangements of dots enclosed in boxes and highly schematic motifs. These schematic designs are similar to those found on the eastern side of the river (Sites 45, 46).

SW 56

This shelter lies 40 meters from the river's edge, approximately 15 to 20 meters above the floodplain, and is 56.2 kilometers from the dam. It measures seven meters in length and three meters in depth, with a stone floor.

Several clusters of paintings are displayed along the back wall of this shelter. Most of the paintings are polychromatic figures of red, black, and white. Preservation is very good overall but weathering of portions of the wall has rendered some figures indiscernible. Highly regular, geometric compositions of lines and dots are common, as are schematic motifs. One particularly striking design is a double "zigzag" of lines and dots painted in black, white, and red.

Northeast

NE 133

Site 133 occurs alongside the major footpath leading to Luuq. It consists of three flat, engraved stones placed end on end. The stones display schematic scratchings, one a local tribal motif, and are obviously of recent origin. A local informant indicated the scratchings were associated with a purposeful arrangement of pebbles and were made as part of a healing ritual for a sick camel.

In summary, the rock art of the Jubba Valley displays significant stylistic differences from other rock art of the Horn. The patterned arrangement of dots and lines to form both highly regular and irregular motifs is a novel use of design elements, not only in the Horn, but in all of African rock art. However, while stylistically unique, tribal symbols in the Jubba rock art bear a functional similarity to other rock art sites in the Horn. The display of tribal motifs is apparently a common component of southern Somalia rock art sites (Carder 1988).

At this stage of analysis, there is little one can say about the age, function, or cultural affinities of Jubba rock art. Like most of the world's rock art, there are no reliable means for dating the Jubba paintings. Preservation alone tells us very little. Many of the rock paintings in southern African shelters appear as crisp and fine in detail today as they did 10,000 to 20,000 years ago. Stylistic criteria remain the most common means of dating rock art. This method necessitates a systematic col-

lection and consistency in documentation of rock art sites, but is not possible in the Horn at present, due to weaknesses in the data base.

I. Summary and Conclusions

The absence of sites dating to the Early Stone Age (ca. 2.3 million years ago to 200,000 B.P.) is not surprising given the complete lack of Oldowan or Acheulian sites elsewhere in southern and central Somalia. However, it still remains a mystery why this is the case. Further archaeological, as well as geomorphological and paleoenvironmental research in the Jubba Valley, and elsewhere in southern Somalia, should provide information contributing to a resolution of this puzzle.

The MSA open-air sites represent the earliest evidence of human occupation in the upper Jubba River basin. Not enough is known of MSA regional variability in Somalia to indicate how the Jubba MSA compares temporally, stylistically, functionally, or culturally to other MSA assemblages, such as those from the Buur Heybe region or the Mudugh (Clark 1954). The Jubba MSA could date anywhere between 150,000-200,000 to 30,000-40,000 years ago. The division of the Jubba MSA into "Big" and "Little," if found through excavations of stratified and datable sites to be viable, could represent temporal stages similar to those Clark (1982) has recognized for the MSA of the Horn. However, they could also reflect differences in artifact and site function, or represent differential access to raw material sources.

LSA sites, although not as common as MSA occupations, are well-represented in all sections of the basin. Subdivision of the Jubba LSA into Blade LSA and Micro LSA, as well as the possible association of ceramics, suggests a temporal span of about 30,000-40,000 years to 5,000 years B. P. (or later) for LSA hunter/gatherer occupation of the upper Jubba basin. Whether these divisions, like the MSA, represent temporal and/or functional differences, or if they are valid taxonomic entities at all, can only be determined through excavations and chronometric dating of suitable sites.

The LSA of southern Somalia is somewhat better described and dated than the MSA. Nevertheless, the data base on LSA regional variability is still meager (Brandt 1986b). The LSA assemblage from Buur Medow, east of Luuq, hypothesized by Mussi (1987) to be of early Holocene age, resembles Micro LSA assemblages from the northern sections of the reservoir in many respects. This is hardly surprising given the close proximity of Buur Medow to the Jubba River. What is surprising is the apparent lack of Eibian components along the Jubba. The Eibian is a late/terminal Pleistocene industry known from sites east of the Jubba and characterized by distinctive pressure-flaked bifacial and unifacial tools (Brandt 1986b; Brandt and Gresham in press). The absence of the Eibian from the upper Jubba River basin, if substantiated by further research, has various implications for understanding hunter/gatherer adaptations in southern Somalia during the late Pleistocene/early Holocene (Brandt in press).

While it seems likely that Neolithic pastoral and/or horticultural groups periodically occupied the upper sections of the river basin sometime after 5,000 years ago, specific archaeological evidence for this is lacking. Ceramic-bearing Micro-LSA assemblages could represent the material remains of such groups, but the absence of a well-defined and dated pottery sequence for Somalia, the fact that LSA hunter/gatherers also made and used pottery, the virtual absence of any organic remains from sites, including carbonized cereal grains or domesticated plants and bones of domesticated animals, make the identification of Neolithic habitations in the river basin difficult. Once again, recognition of the presence of prehistoric populations engaged in food production must await archaeological excavation. The same holds true for evidence of Iron Age occupation in the valley.

Pastoral or horticultural occupation of the basin during early Islamic times may be represented by the "old" graves, cemeteries, and cairns as well as some of the pottery scatters distributed throughout the survey area. However, until a sample of these sites are excavated, this remains conjecture.

Judging from the few regional archaeological surveys undertaken in Sub-Saharan Africa so far (Bower 1986), the discovery of 686 sites within a 420-km^2 survey area indicates relatively intensive prehistoric utilization of the upper Jubba River basin over time. These sites exhibit considerable variability in size, location, and artifact density. However, we are reluctant, at this initial stage, to draw any conclusions pertaining to demography, site functions, changing patterns of land use, and other aspects of prehistoric socio-territorial organization in the upper Jubba Valley.

This initial phase of archaeological research in the Jubba Valley has raised the following issues:

- whether prehistoric populations used the Jubba Valley as a refuge during more arid times; or
- did they abandon the river valley during exceptionally humid and/or arid periods;
- was the Jubba River basin a corridor for seasonal movements of hunter/gatherers and/or pastoralists from the Indian Ocean coast to the foothills of the southern Ethiopian highlands;
- who was responsible for painting the rock art and what purpose(s) did the rock art serve;
- who constructed the cairns and why;
- did populations establish horticulture along the small alluvial pockets of the southern section hundreds if not thousands of years ago, and, if so, why?

However, the authors are reluctant to address these and other issues at this time due to:

- an inadequate understanding of past geological, geomorphological, hydrological, and climatic conditions in the Jubba Valley;
- the absence of excavated sites and chronometrically dated culture/stratigraphic sequences from which to tie in surface finds;
- the absence of faunal and floral remains for reconstructing subsistence strategies;
- incomplete knowledge of the range and detail of rock art; and
- artifact samples too scanty to gauge site activities and functions.

The following chapters suggest ways in which these issues can be addressed through the establishment of a program of additional archaeological research.

V. ASSESSMENT OF RESULTS AND SIGNIFICANCE

Once archaeological sites have been located within proposed construction zones, their significance needs to be evaluated and the impacts of the proposed projects assessed. It is not the intent at this time to fully assess the significance of the cultural resources discovered during this survey. Proper assessment requires subsurface testing, recommended for future phases of work (see the next section). However, the survey has provided enough data to make some general statements of significance and evaluate the significance of a few specific sites. Some assessment of the impacts to sites can also be tentatively formulated, but full assessment must wait until final project designs (*e.g.*, the precise reservoir boundary) are known and mapped.

Several sets of criteria can be used to judge the significance of prehistoric cultural resources. According to U.S. National Register of Historic Places criteria (which seem applicable to Somalia), a significant site:

- is associated with persons or events that made a major contribution to the history of the country or region;
- embodies distinctive characteristics of a particular type, period, or method of construction; or
- may be likely to yield information important in prehistory or history.

The first criterion is geared primarily to historic period sites. Since the historic period (when written records were kept) for the interior of Somalia is relatively recent, this criterion may apply to only a few sites. Historic research of the reservoir area will be necessary before it can be applied. At this time, the authors are not aware of any sites in the reservoir associated with significant persons or events other than the tombs of recently deceased sheiks in the central section, one or more of which may fall within this criterion.

The second criterion is primarily geared to architectural remains, although it is rightfully used to recognize and protect some prehistoric, nonarchitectural sites. This criterion is sometimes applied to a group of sites of a particular type, with the result that one is considered significant in that it represents the group as a whole. None of the standing structures encountered during this survey were recorded as sites. The houses, tombs, mosques, pens, and other structures encountered are ubiquitous throughout Somalia and do not seem to be significant.

The third criterion is the most widely used and applies mainly to archaeological sites. Its broad scope, covering sites with the potential to yield important archaeological and historical information, needs to be more precisely defined to become a useful guide. Almost any archaeological site can be reasonably argued to contain some important information. However, often the information can be gained from initial survey. It becomes necessary to identify those sites that are likely to contribute substantially to the survey data. These are sites that contain relatively intact, subsurface cultural deposits. Such deposits have the potential of yielding archaeological materials (such as artifacts, botanical remains, faunal remains, and features) in primary context (*i.e.*, as they were left by the inhabitants of the sites), thus allowing detailed analysis of past lifeways. Intact, subsurface cultural deposits are rare and archaeologically significant.

Applying the above criteria (in particular the last) to the survey data, the significance of the various classes of sites can be judged as follows. First, open-air artifact scatters are the largest and most diverse class of site. These sites occur on talus slopes, terraces, and open plains. While this class of site will need subsurface testing to determine the presence of subsurface deposits, it is the authors' estimation that the majority will not have intact deposits, will not be able to yield additional important information, and thus are not significant to the degree that further work would be warranted. This opinion is based on fortuitous glimpses of the subsurface (in warthog holes, maize storage pits, and small ravines) that suggest most surface scatters are either deflated and lying on culturally sterile subsoil or in a mixed context resulting from erosion on a talus slope. It should be stressed that this needs to be verified through archaeological testing.

One open-air site on a low terrace, NW 125, had artifacts eroding out of small gullies in a way strongly suggesting the site contained intact subsurface deposits. This site also contained a great density of artifacts that constitute an assemblage unlike any other found in the reservoir. For these reasons, the

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site is likely to be significant. Another site, SE 58, had an artifact-bearing stratum visible in a maize pit about 1.0 meter below surface. This site also may be significant.

Second, the rock art styles are unique to Somalia and possibly to Africa, and therefore all the painted caves and rockshelters are clearly significant.

Third, caves and rockshelters are often significant because they have the potential to yield stratified cultural deposits in relatively undisturbed contexts. Some of the caves and rockshelters recorded by this survey lacked floors with sediments. Others had sediments but no artifacts, while others had sediments and artifacts. The significance of these sites generally corresponds to depth, extent, and integrity of the sediments they contain. While the presence of artifacts provides proof of past human use, adding to the significance of the site, the absence of artifacts on the surface does not necessarily denote lack of human occupation, since cultural deposits could be buried below surface. Therefore, all of the caves and rockshelters found to contain sediments are potentially significant.

Rock cairns form an enigmatic class of sites common throughout the reservoir area. Their cultural affiliation and function remain unknown, making it difficult to assess their significance. While many appear as simple piles of rock, some are carefully constructed and composed of a circular base and a rounded mound of stones. As a class, they seem to be significant, but their potential for yielding information may vary. Similar rock piles in North America seldom contain artifacts and the few cairns excavated in eastern Africa have often yielded few artifacts or other information. However, a few cairns have yielded burials and/or artifacts.

Numerous cemeteries, most of which are clearly Islamic, are scattered throughout the reservoir. Islamic cemeteries are a difficult class of site to evaluate for significance. Since the Judeo-Christian/Western attitude towards death is different than the Islamic/Somali attitude, local criteria should guide the decisions on which, if any, of the Islamic cemeteries are significant. In regard to the specific issue of inundation of Islamic graves and cemeteries, local informants told us that no special measures (such as removal and reburial) need or even should be undertaken. It was not clarified whether this attitude would prevail in the case of a "famous" person, such as a great sheik. The authors were hesitant to discuss the possible inundation of the Valley with residents who were not aware of such plans and thus this issue was not fully explored.

VI. RECOMMENDATIONS

The Phase II survey has demonstrated clearly that the proposed Baardheere Reservoir encompasses a vast array of prehistoric through historic sites, constituting a large, diverse, and potentially valuable data base. This report attempts to highlight the types of analyses that can be derived from this data base and the authors are confident this data base will be used for additional analyses. While all of the sites are of some value, some sites are of particular significance as they have the potential to yield substantially more information than was gathered from the survey. Some of these significant sites can be recognized now (*e.g.*, rock art sites and some caves and rockshelters), but the significance of most sites remains unknown. Recommendations for further work are outlined below.

A. Cultural Resource Management of River Basins: An Overview

Archaeological surveys of river basins have played a significant role in the reconstruction of North American prehistory (Willey and Sabloff 1980). Pioneering archaeological work in the United States focused on the major river valleys of the Midwest and Southeast, and river valleys in the eastern United States are still principle attractions because they often contain high site densities; large, intensively occupied sites; large, monumental edifices (*i.e.*, temple mounds); and buried, stratified sites.

There has not been such a clear archaeological focus on African river basin surveys (Bower 1986). The archaeological potential of river valleys in Africa cannot be assessed adequately because little survey and evaluation have taken place. The reasons for this are complex and not entirely clear, but it is reasonable to assume that African river basins should be as archaeologically rich as other well-studied river basins in the world.

Building on antiquity laws established in the early part of this century, recent U.S. federal legislation has resulted in laws to identify and protect significant cultural resources on federal property, or that might have an impact on federally funded or licensed construction projects. Statutes established in the 1960s and 1970s provide an infrastructure and mechanism for carrying out the mandate to protect threatened significant cultural resources. This system, which typically involves private or institutional archaeologists working with state and federal review agencies, is now well-established and, despite some flaws, seems to be working reasonably well. In the United States, archaeological investigations of areas where construction and development threaten cultural resources typically have three principal objectives:

- identify cultural resources in the project area;
- evaluate the significance of those resources; and
- retrieve important information from the significant resources.

These objectives are usually addressed in three corresponding phases of research:

- During the *survey* phase, all (or a representative sample of) archaeological and historical sites are located, briefly described, and sometimes evaluated. This phase usually involves limited or no excavation. If the project area is only sampled, predictive models of site location are formulated.
- During the second, or *testing*, phase, sites are revisited and test excavations (typically one to four square meters) are placed in promising sites to determine their integrity and research potential. In the case of a large number of sites, a stratified sample of sites are selected for testing.
- The third phase is *data recovery*, during which information is retrieved from those sites determined by testing to be significant. This usually involves large-scale excavations at a few sites, but can include smaller-scale excavations as well.

This multi-phase approach to cultural resource management is generally applied to areas of direct (primary) impact. For reservoirs, this includes the high-pool impoundment zone, the construction zone around the dam, borrow pits and staging areas near the dam, and main transmission line corridors. Areas of secondary impact, which are often more poorly defined, sometimes also receive archaeological attention. Secondary impacts include

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roads built to the project area and construction and development prompted by the project.

B. A Three-Phase Cultural Resource Management Program for the Baardheere Reservoir

Except for the celebrated case of the High Aswan Dam in Egypt and a few less publicized projects, there have been few reservoir projects in Africa associated with archaeological salvage work. Furthermore, comprehensive culture-resource management programs have not yet been established in most African countries, including Somalia. With little continental precedent and no salvage-oriented infrastructure in Somalia, it is strongly recommended that the United States' three-phase model of cultural resource management, mentioned above, be applied to the Baardheere Reservoir. The bulk of the recommendations relate specifically to the main area of direct impact, the impoundment zone. However, recommendations for the cultural resource assessment of other areas of direct impact (*i.e.*, the construction zone around the dam, borrow pits, staging areas near the dam, and main transmission line corridors) should also be worked into the Baardheere Reservoir culture-resource management program. Phases I and II, detailed below, can be undertaken during the same field season(s).

1. Continued Survey and Site Documentation

Although the project described in this report adequately surveyed the majority of the proposed reservoir, certain areas still require additional and/or more intensive examination.

First, because of their potential significance, *a more intensive survey for additional caves and rockshelters in the southern limestone gorge is required.* The Phase II survey was unable to devote the amount of time necessary to thoroughly explore the densely vegetated walls of the main gorge, particularly the area about 20 kilometers south of Buurdhuubo where the bulk of the rock art sites is located. Undoubtedly some caves remain to be discovered in this area. Furthermore, all major togga within the impoundment zone which dissect the limestone escarpment need to be surveyed (not all were).

Second, *several expanses of land in the northern section require initial or additional inspection*, including two large lobes of land on the eastern side, the horseshoe bend containing site NW 125, and the alluvial plains just south of Luuq, if indeed they are in the impoundment zone.

Third, the authors have no idea how site density and site types in the proposed reservoir basin compare with areas immediately adjacent to the reservoir basin. For this reason, *a survey of nonriverine areas is necessary.* Twelve 1.0 kilometer-long, 100 meter-wide transects (two in each section), extending from the rim of the river valley, should be surveyed.

Fourth, lack of time permitted only the recovery of small artifact samples from most of the larger and/or more artifact-rich sites. While, from this survey, density samples are valuable in redressing the bias towards tools and larger artifacts in our general site collections, sample size is far too small to accurately characterize site assemblages. Consequently, to obtain more adequate representations of site assemblages, it is recommended that *total collections of 100-m^2 units at about 20 sites representative of varying types and techno-stages be made.* At some sites with noticeable intra-site variability, several 100-m2 collections may be required.

Fifth, comprehensive documentation of rock art sites is highly recommended. Anthropologists are just beginning to explore the potential of rock art for contributing to our knowledge of human adaptation and behavior. For this reason, and the ephemeral nature of the artifact itself, complete documentation of the Jubba rock art is critical. To insure this, future work must include thorough tracing of the individual motifs with color coding of the pigments. Additionally, the rock art and the shelters must be photographed comprehensively in color, black and white, and infra-red film. Descriptions should include an attribute analysis of the individual motifs, and mapping of the art and the shelter. Samples of the pigments should be collected for chemical analysis and possible radiometric dating. Finally, the possibility of removing some of the panels for permanent display in the Somali National Museum needs to be considered.

2. Site and Non-Site Testing

Caves/Rockshelters

The discovery of caves with evidence of MSA/LSA occupation in a context that suggests stratified deposits is exciting because there are relatively few such sites in eastern Africa in general and southern Somalia in particular. *A minimum of one-m^2 excavation unit should be placed in each of the sediment-*

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bearing caves to determine the presence and extent of subsurface artifact-bearing deposits.

Open-Air Sites

This most frequent type of site (n=421) will require the greatest amount of testing, including excavation of one or two square meter test pits at a number of sites. Sites chosen to be tested should be representative of the range of open-air sites. *The six sites judged by the surveyors to most likely be significant (SE58, CW74, NW125, NE187, NE188, and NE189) should be tested with three to six test units placed on each site, and 12 of the 53 sites judged by the surveyors to be possibly significant should be tested with two to six test units each.* This would include six of 26 sites in the northern section, two of the nine in the central section, and four of the 18 in the southern section.

The test excavations should provide an indication of the presence, depth, density, and context of culture- (artifact) bearing deposits. On some sites, several one-by-two-meter units will be placed in a line to provide a stratigraphic profile of the entire site. Cultural deposits were exposed to a depth of 1.0 meter below surface at one site (SE 58), and it is anticipated that cultural material could be this deep or even deeper at other sites. In most cases, units will be excavated no deeper than 2.0 meters, for the sake of safety and expediency. It is expected that cultural material will be only at the ground surface on some sites, thus requiring only shallow test units.

Rock Cairns

Although there is considerable variability among the cairns, they can be grouped into four types—small mounded, large mounded, irregularly shaped, and large platformed. *At least one of each type should be tested by first recording it thoroughly, then excavating it by sectioning (halving).* Soil samples should be taken at the base and subsurface of the cairns. Careful inspection for burials and artifacts will be required.

Cemeteries

While the majority of cemeteries appears to be of recent Islamic style, many are morphologically different and could be of pre-Islamic or early Islamic age. Excavating graves, even very old ones not related to modern populations, can be upsetting to local inhabitants. However, graves and skeletal remains often provide very important archaeological data. If local Somalis give permission, as past experience indicates they will, *the excavation of at least two non-Islamic-type graves is recommended to determine the state of bone preservation and age/cultural affiliation.*

Non-Site Areas

Large tracts of recently alluviated bottomlands were not surveyed because artifacts were unlikely to occur on the surface. *Six of these non-site locations should be tested.* In conjunction with the proposed geomorphological investigations (see below), a sample of alluvial formations should be test excavated. A two-by-two-meter excavation unit should be step excavated to a depth of two meters to test for deeply buried deposits.

Geomorphological and Paleoenvironmental Research

There is a wealth of landform and paleoenvironmental information which will be lost forever if geological investigations are not conducted in the proposed reservoir prior to flooding. *Therefore, it is imperative that geomorphological research be incorporated into future phases of research.* Such research would include the study of stratified fluvial and alluvial deposits as well as cave speleothem deposits (*e.g.*, stalactites). The speleothems can provide radiometric dates and give a history of climatic and vegetational change in the Jubba Valley. To the authors' knowledge, the southern section caves are the only known sites in southern Somalia which have the potential of providing such information.

3. Data Recovery

This last phase would involve large- and small-scale excavations of those sites determined by test excavations to be of greatest significance.

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JUBBA Environmental and Socioeconomic Studies Project

Archaeological Site Survey Form

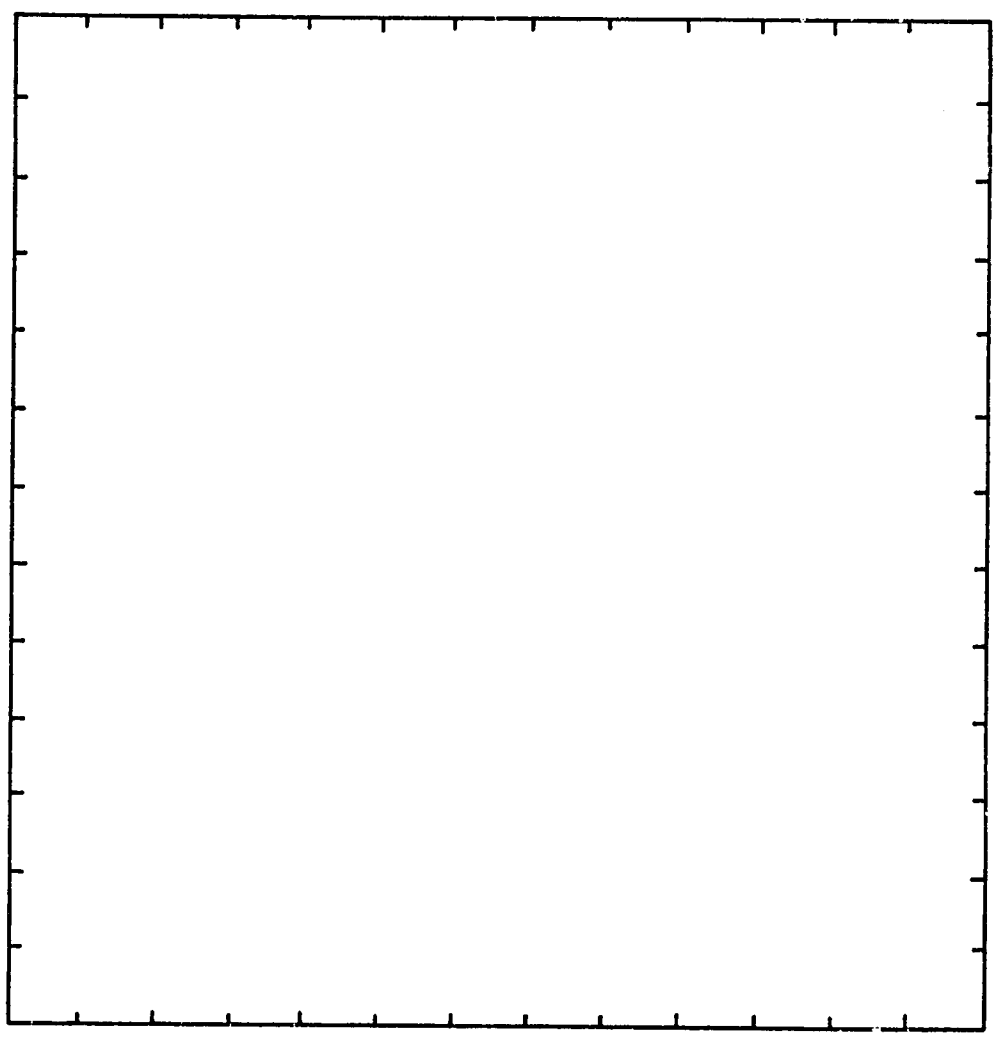
Date: Time: Surveyors:

Location: 1. SW 2. SE 3. CW 4. CE 5. NW 6. NE

GENERAL SITE LOCATION

1. Site #:
2. Air photo #:
3. Topo#:
4. Tug #:
5. Transect #:
6. Distance from Dam:

Profile:



Scale:

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GENERAL SITE ENVIRONMENT

7. Topography:

0. extends from ... to ...
1. hill top
2. hill slope
3. foot of hill
4. plain
5. 1st levee
6. 2nd levee
7. first terrace
8. undiff. bottoms
9. second terrace

8. Location of Artifacts

1. surface
2. ravine
3. stream bed
4. river bed
5. road cut
6. path
7. disturbance

9. Vegetation

1. bush-land
2. bushed grassland
3. bush-land thicket
4. forest
5. grassland
6. sand dunes
7. woodland
8. wooded grassland
9. cleared/deforested
10. burned area

10. Height above River

1. 0-1 m
2. 1-3 m
3. 3-5 m
4. greater than 5 m

11. Soil Type/Texture

1. clay/silt
2. sand
3. gravel/rocky
4. loam
5. duracrust

12. Soil Color

1. white/pale
2. light brown
3. reddish
4. dark brown
5. dark grey/black

13. Known Depth of Cultural Deposits

5. surface
6. shallow (0-2 cm)
7. medium (2-100 cm)
8. deep (over 1 m)
9. likely extends beyond known depth
10. surface known, possible depth

14. Soil Erosion

1. deflation
2. bisected by tug
3. ravine

15a. Closest Water Source/Type

1. river
2. permanent stream
3. seasonal stream
4. spring/seep
5. spring/pool
6. artificial well
7. artificial pond
8. natural pond
9. swamp
10. seasonally flooded low-lying area
11. bedrock catchment

15b. Maximum Width of Nearest Water

_____

16. Distance to Nearest Water

_____

17. Special/Natural/Resources

1. quarriable quartz
2. quarriable chert
3. other lithics
4. pottery clay
5. hematite/magnetite

18. Evidence of Animal Use

1. burrows
2. animal bones/lair
3. animal dung

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19. Modern Land Use

0. [nearby-within view]
1. [abandoned]
2. unknown
3. homestead (max 3)
4. village
5. pastoral camp
6. rain-fed cultivation
7. irrigated cultivation
8. flood crops - riverbank
9. flood crops - depression
10. storage
11. pottery making
12. pottery storage
13. undifferentiated cultivation

20. Land Modification

1. unknown
2. plowed
3. levees
4. roads
5. terraces

21. Predominant Crops

1. sorghum
2. sesame
3. maize
4. fruit trees
5. other

GENERAL SITE INFORMATION

22. Type of Archaeological Site

1. rock shelter
2. cave
3. open air site - lithic
4. open air site - ceramic
5. stone cairn
6. grave/tomb
7. shrine
8. mosque
9. monument
10. building
11. homestead
12. village
13. structural feature
14. rock art
15. iron slag

23. Site length (m) _____

24. Site Width (m) _____

25. Age/Cultural Affiliation

1. LSA
2. MSA
3. ESA
4. Iron Age
5. Islamic
6. Colonial
7. modern
8. unknown lithic
9. unknown ceramic
10. unknown

26. Associated Features

1. storage pit
2. hearth
3. fire pit
4. earthen mound
5. stone cairn
6. stone scatter

27. Characterization of Assemblage

1. chert artifacts
2. quartz artifacts
3. other flaked stone artifact
4. pottery
5. grinding stones
6. metal/glass
7. no artifacts - features only
8. modern-plastics, fiber
9. fire-cracked rock

28. Recognized Tools

1. hand axe
2. bifacial points
3. unifacial points
4. microliths
5. side scrapers
6. end scrapers
7. burin
8. bec/perforator
9. Levallois points/flakes
10. unshaped tools

29. Overall Lithic Density

1. none
2. trace
3. light
4. moderate
5. heavy

30. % of Quartz Lithics _____

31. % of Chert Lithics _____

32. % of Other Lithics _____

33. Estimated Lithic Artifacts

1. less than 10
2. 10-50
3. 51-100
4. 101-500
5. 501-1,000
6. over 1,000

34. Sherd Density

1. none
2. trace
3. light
4. moderate
5. heavy

35. Estimated # of Potsherds

1. less than 10
2. 10-50
3. 51-100
4. 101-500
5. 501-1,000
6. over 1,000

36. # of Grind Stones/Frags

1. less than 5
2. 6-10
3. 11-25
4. 26-50
5. over 50

37. # of Rock Cairns _____

38. Shape of Cairns

1. all round
2. all linear
3. some of both

39. Average Length of Linear Cairns:

_____

40. Average Height of Linear Cairns:

_____

41. Average Diameter of Round Cairns:

_____

42. Average Height of Round Cairns:

_____

43. Organic Preservation

1. bone
2. shell
3. charcoal
4. ash
5. vegetal remains

44. Sampling Technique

1. random collection
2. 100% collection
3. density collection (3 m dia.)
4. all I.D. tools, sherds collected
5. most I.D. tools, sherds collected
6. no collection

45. Other Samples Taken

1. raw materials
2. organic
3. C-14

46. Attached Map or Form?

1. map
2. form
3. rock art sketches

47. Significance

1. none
2. little
3. medium
4. high

Notes:

_____

_____

_____

_____

FORM#___ANALYST___DATE_____SITE#_____ LOCATION_____ >1 FORM PER SITE_____

SAMPLING: 1.random 2.100% 3.density 4. All ID 5. Most ID

LITHICS: total#_____ total wt._____ DENSITY: total#_____ total wt._____

ABRASION: 1. none 2.light 3. moderate 4. heavy

ALTERATION: 1. varnished 2. heat fractured 3. color altered

AMOUNT PATINATION(%): 1.<25% 2. 25-50% 3. 50-75% 4. 75-100%

DEGREE PATINATION: 1. light 2. moderate 3. heavy

RAW MATERIAL(#): Chert_____ Quartz/Quartzite_____ Sand/Siltstone_____

Basalt_____ Limestone_____ Other_____

DOMINANT CHERT: 1. undiff. 2. blue/grey/brown/white 3. fine-grained brown

4. other browns 5. multi-colored pebbles

ARTIFACT CLASS(#): shaped tools_____ unshaped tools_____ cores_____

angular waste_____ flakes_____ blades_____ Lev. flakes_____ Lev. points-

SHAPED TOOL TYPOLOGY:

Code	#	Code	#	Code	#	Code	#	Code	#

CORE TYPOLOGY:

Code	#	Code	#	Code	#	Code	#	Code	#

CERAMIC SUMMARY: total wt.____ total #_____

(#) plain body_____ plain rim_____ dec. body_____ dec. rim_____ non-Somali_____

NEW AGE/STAGE: 1.big MSA 2.little MSA 3.undiff MSA 4.blade LSA 5.micro LSA

6.undiff LSA 7.modern 8.undiff. lithic 9.undiff. ceramic

Site No.____ Date:____ Recorder:____

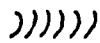
	Dec.	Undec.	Total
No.Rim	____	____	____
No.Rim/Body	____	____	____
No.Body	____	____	____
No.Lug/Body	____	____	____
No.Hand/Body	____	____	____

Surface Decoration		Body	Rim	Lip	Handle
1.Halbad Jiife					
Incised		11 ____	12 ____	13 ____	14 ____
Combed		15 ____	16 ____	17 ____	18 ____
2.Halbad Jooge					
Incised		21 ____	22 ____	23 ____	24 ____
Combed		25 ____	26 ____	27 ____	28 ____
3.Jiiddo/Incised					
4.Baaley/Incised		31 ____	32 ____	33 ____	34 ____
5.Saaley-Beenad/Incised		41 ____	42 ____	43 ____	44 ____
6.Maroog/Combed		51 ____	52 ____	53 ____	54 ____
7.Fraante/Incised		61 ____	62 ____	63 ____	64 ____
8.Saamow Sagaar/Incised		71 ____	72 ____	73 ____	74 ____
9 Dhargaas/Incised		81 ____	82 ____	83 ____	84 ____
10.Xa ijin 1/Incised		91 ____	92 ____	93 ____	94 ____
11.Xariijin 2/Incised		101 ____	102 ____	103 ____	104 ____
		111 ____	112 ____	113 ____	114 ____

386'

12.Kasiir/Modeling

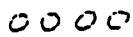
13.Sursur/Fing'nail Imp. 121 --- 122 --- 123 --- 124 ---



14.Kasdi-Diti/Incised 131 --- 132 --- 133 --- 134 ---

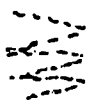
15.Firinja/Incised 141 --- 142 --- 143 --- 144 ---

16.Dhuun/Stamping 151 --- 152 --- 153 --- 154 ---

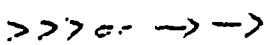


17.Andaano/Combing 161 --- 162 --- 163 --- 164 ---

18.Rocker Stamping 171 --- 172 --- 173 --- 174 ---



19.Falladdh/Incised 181 --- 182 --- 183 --- 184 ---



20.11/Stamping 191 --- 192 --- 193 --- 194 ---

21.Durdur-Xariig 201 --- 202 --- 203 --- 204 ---

Combing 211 --- 212 --- 213 --- 214 ---

22.Tatatid/Pinch

23.Honey Comb/Stamping 221 --- 222 --- 223 --- 224 ---

24.Borehole Drilling 231 --- 232 --- 233 --- 234 ---

241 --- 242 --- 243 --- 244 ---

Rim Thickness: _____ Avge.: ____
Body Thickness: _____ Avge.: ___
Overall Color: _____
Weathered: _____
App. Age: _____
Rim Type: _____
Rim Diameter: _____

Comments: _____

_____

This appendix presents the entries for 26 variables for the 686 recorded sites. The abbreviated variable headings used are explained below. The number in parentheses refer to variable numbers on the site form (Appendix A1). The values for the nominal variables are also listed in Appendix A1.

L = Location

Site = Site Number (1)

Sitet = Site Type (22)

Sig = Significance (47)

Sit = Depth of Cultural Deposits (13)

Len = Site Length (23)

Wid= Site Width (24)

Sitesi= Site Size (length x width computed)

Art = Location of Artifacts (8)

T = Tog Number (4) [applies only to Central Section]

Tra= Transect Number (5) [applies only to Central Section]

Dista= Distance from Dam (6) [applies only to Southern and Northern Sections]

Topograp = Topography (7) [values of landforms are listed from the river to the site; the last value is the landform on which the site is situated; if a site extends to two landforms a "0" is coded between those landform values]

Ve = Vegetation (9)

Ht= Height above River (10)

So = Soil Type/Texture (11)

H20S= Closest Water Source/Type (15a)

H20D= Distance to Nearest Water (16)

Modern = Modern Land Use (19)

Cro = Predominant Crops (21)

Fe = Associated Features (26)

#C = Number of Rock Cairns (37)

C= Shape of Cairns (38)

Li = Average Length of Linear Cairns (39)

Lin = Average Height of Linear Cairns (40)

Ro = Average Diameter of Round Cairns (41)

Rou= Average Height of Round Cairns (42)

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
1	1	3	1	5	15	15	225	1			0.3	5703	1	4	13	3	1	40									
1	2	3	1	5	50	15	750	1			0.4	57302	1	4	13	2	1	70									
1	3	36	3	10	80	70	5600	126			0.6	57	1	4	2	2	3	5	5		5	8	2	3	0.8		
1	4	3	2	5	65	50	3250	1			2.4	570302	1	4	23	2	3	15	15								
1	5	3	1	5	55	25	1375	1			2.5	570302	1	4	23	2	13	15									
1	6	3	1	5	20	10	200	1			2.6	5732	1	4	23	2	1	30									
1	7	3	2	5	180	130	23400	12			2.9	570302	1	4	23	2	3	10	15								
1	8	3	1	5	375	150	56250	1			5	570302	1	4	23	2	3	1	15			12	3	4	0.5	7	1
1	9	6	1	5	15	10	150	1			6.7	5832	1	4	1	3	1	100	150			1	1	6	1		
1	10	6	1	5	20	18	360	1			9.3	583	1	4	1	3	1	200	50			3	2	3	0.3		
1	11	3	1	5	25	10	250	12			9.4	5832	1	4	3	2	1	200									
1	12	5	1	5	5	5	25	1			9.6	583	1	4	23	2	1	150				1	1			5	0.6
1	13	5	1	5	4	4	16	1			9.7	5832	1	4	3	2	3	2				1	1			4	1
1	14	3	2	5	30	15	450	1			11	5703	1	4	23	2	13	10									
1	15	3	1	5	40	15	600	1			11.9	56832	1	4	23	2	1	60									
1	16	345	2	5	80	70	5600	1			12.3	57	1	4	23	2	3	15	15			1	1			4	1
1	17	346	3	510	200	90	18000	1			12.5	58703	1	4	2	2	3	20	15			4	2	4	0.4		
1	18	3	1	5	30	25	750	1			13.4	5832	1	4	23	2	1	150									
1	19	3	3	10	90	35	3150	12			13.7	57	1	4	23	2	13	20	15								
1	20	3	1	5	30	15	450	1			15.5	5832	1	4	3	2	3	45									
1	21	35	1	5	30	20	600	12			17.3	58302	1	4	23	2	1	30				2	2	4	0.3		
1	22	5	1	5	25	10	250	1			18.7	5832	1	4	23	2	1	200	3			2	1			4	0.8
1	23	35	2	5	60	40	2400	12			19.6	5870302	1	4	23	2	1	15				1	1			4	0.8
1	24	3	3	10	200	35	7000	12			20.5	5870302	1	4	23	2	3	20									
1	25	346	2	5	400	320	128000	12			21.7	58703	1	4	1	2	24	20	45			11	2	4	0.4		
1	26	3	3	5	100	70	7000	12			22.1	587	1	4	23	2	24	25	15								
1	27	3	2	5	80	15	1200	1			23	58703	1	4	23	2	1	30	390								
1	28	36	2	5	250	30	7500	1			25.2	5870302	1	4	23	2	1	120				4	4	2	0.6		
1	29	3	2	5	160	60	9600	12			25.5	568703	1	4	23	2	3	20	4								
1	30	2	2		4	4	16				25.6	11	1	4		3	3	10									
1	31	6	1	5	12	9	108	1			25.2	58	5	4	1	3	1	30	30	1		3	2	4	0.4		
1	32	3	3	5	20	10	200	1			27.5	5832	1	4	23	2	1	150									
1	33	6	1	5	10	7	70	1			27.5	583	5	4	1	3	1	100									
1	34	3	3	5	500	80	40000	12			28.5	5870302	1	4	23	2	3	30	5			2	2	4	0.3		
1	35	6	1	5	11	8	88	1			32.3	587	1	4	1	2	1	35									
1	36	5	1	5	6	6	36	1			33.4	5832	1	4	23	2	1	120				4	2	4	0.4		
1	37	6	1	5	8	7	56	1			35.5	583	1	4	1	2	1	125				1	1			6	0.6
1	38	5	1	5	4	4	16	1			35.8	583	1	4	23	2	1	100				1	2	5	0.6		
1	39	36	1	5	30	30	900	1			37.4	587	1	4	1	2	1	40				1	1			4	1
1	40	6	1	5	18	16	288	1			42.8	587	1	4	1	2	1	60	50			7	3	4	0.3		
1	41	34	2	5	100	60	6000	12			44.5	5870302	1	4	23	2	3	20				7	2	5	0.3		
1	42	346	1	5	40	45	1800	1			44.7	58703	1	4	23	2	3	20	15			2	2	4	0.2		
1	43	6	1	5	16	12	192	1			45.9	7	1	4	1	2	1	75	390	13		3	2	4	0.4		
1	44	2	1		4	4	16				48.2	11		4			1	70									
1	45	36	1	5	100	40	4000	12			49	58302	1	4	1	2	1	120	30			2	2	5	0.4		
1	46	34	1	5	75	20	1500	12			49.4	5870302	1	4	23	2	3	25	15								
1	47	1	4	10	20	4	80	1			49.5	11	1	4		5	3	5									
1	48	2	3		30	3	90				49.5	11	1	4			3	10									
1	49	1	3		6	4	24				53.6	11	1	4		3	1	30									
1	50	1	3		6	2	12				53.5	11	1	4		3	1	30									
1	51	1	2		8	3	24				53.2	11	1	4		3	1	45	15		2						
1	52	1	3	10	8	3	24	1			52.5	11	1	4		3	1	40	1510		2						
1	53	3	2	5	250	40	10000	12			55.5	5870302	1	4	23	2	3	20	3								
1	54	3	3	5	70	25	1750	12			55.6	5302	1	4	23	2	1	20									
1	55	214	4	10	7	8	56	1			55.8	11	1	4		3	1	35	15		2						
1	56	114	4		7	3	21	5			56.2	11	1	4		3	1	40									

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
1	57	214	4		7	6	42				56.1	11	1	4		3	1	40									
1	58	2	1		6	2	12				57.3	11	1	4		3	1	100									
1	59	6	1	5	9	7	63	1			57.7	583	1	4	1	2	1	75	40			3	2	4	0.4		
1	60	5	1	5	4	4	16	1			59.8	5832	1	4	2	2	1	120				1	1			4	0.5
1	61	3	1	5	60	20	1200	1			60.2	5832	1	4	23	2	1	90									
1	62	3	2	5	60	20	1200	12			60.4	5832	1	4	23	2	1	90									
1	63	34	3	5	330	20	6600	1			63.2	5703	1	3	23	2	1	15	15								
1	64	346	2	5	40	30	1200	1			63.3	570302	1	4	123	2	1	10				5	2	4	0.2		
1	65	34	1	5	30	30	900	1			63.5	5703	1	3	23	2	3	10									
1	66	5	1	5	8	8	64				65.7	5832	1	4	23	2	1	35				1	1			8	1.5
1	67	34	1	5	100	25	2500	12			66.7	58302	1	4	23	2	3	30									
1	68	2	2	5	20	7	140	12			66.9	11		4	13	3	3	5									
1	69	36	1	5	90	25	2250	12			67	5870302	1	4	23	2	3	30				8	2	3	0.3		
1	70	1	2		8	2	16				67.8	11		4			1	70									
1	71	2	1		4	3	12				67.9	11	1	4		2	1	60									
1	72	56	1	5	14	7	98	1			71.7	586832	1	4	2	2	1	100				2	1			7	0.7
1	73	6	1	5	16	14	224	1			71.8	586	1	4	1	3	1	70				2	2	4	0.3		
1	74	6	1	5	14	10	140	1			73.1	5832	1	4	1	3	1	150				2	2	6	0.4		
1	75	6	1	5	5	5	25	1			73.1	586	1	3	2	2	1	60	14			2	1	4	0.6		
1	76	34	1	5	70	25	1750	12			76.3	5832	1	4	23	2	3	20									
1	77	56	1	5	10	8	80	1			76.5	5832	1	4	23	2	3	10				2	3	4	0.4	8	0.7
1	78	3	1	5	25	20	500	12			79.4	58302	1	4	23	2	13	30									
1	79	346	1	5	40	20	800	1			79.5	58703	1	4	23	2	1	100				3	3	6	0.3		
1	80	346	3	10	60	50	3000	12			79.7	5687	1	4	12	2	13	30	50			32	2	4	0.4		
1	81	3	1	5	25	20	500	12			81	58687	1	4	23	2	3	25									
2	1	3	1	5	7	5	35	1			0.9	5832	1	4	3	2	1	45	510								
2	2	346	2	59	80	35	2800	1			4.0[illegible]	583	1	4	2	2	1	100	510			2	2	2	0.5		
2	3	3	1	5	35	30	1050	16			4.35	583	1	4	1	2	3	20									
2	4	3	3	59	300	30	9000	16			4.5	58	1	4	1	2	3	150	510								
2	5	6	1	5	20	10	200	1			4.8	58	1	4	1	2	3	180			6	11	2	3	0.3		
2	6	3	2	5	70	15	1050	1			5.4	5832	1	4	1	2	1	200	30	12							
2	7	3	2	5	80	12	960	1			6	583	1	4	1	2	3	100	30								
2	8	3	1	5	15	15	225	1			7.8	5832	1	4	1	2	1	100	30								
2	9	36	3	510	20	25	500	16			9	583	1	4	1	2	13	100				11	2	3	0.5		
2	1[illegible]	3	1	5	60	25	1500	16			10.35	2	1	4	1	2	13	50									
2	1[illegible]	5	1	5	5	5	25	1			10.95	2	1	4	1	2	13	100	50			1	1			5	0.5
2	12	3	1	5	60	15	900	1			11.55	5832	1	3	1	2	1	75	3090								
2	13	3	2	5	70	15	1050	1			16.5	5832	1	3	13	2	1	80	13090	13							
2	14	3	1	5	50	20	1000	1			16.8	5832	1	3	13	2	1	100									
2	15	36	1	5	30	25	750	167			16.95	5832	1	3	1	2	1	75	30	13		11	2	3	0.5		
2	16	3	1	5	50	20	1000	1			18	5832	1	3	13	2	1	75	4090	3							
2	17	3	1	5	20	15	300	1			19.5	5832	1	4	13	2	1	100									
2	18	3	1	5	25	20	500	1			22.8	5832	1	3	13	2	3	10									
2	19	36	1	5	35	30	1050	17			22.9	5832	1	4	1	2	3	20			6	2	2	3	0.4		
2	20	34	3	5	85	65	5525	1			24	583	1	3	13	2	1	150	405								
2	21	3	1	5	45	30	1350	1			25.65	58632	1	3	13	2	3	10	3060	3							
2	22	1	3		20	6	120	1			27.3	58683211	1	4	1	3	3	20	8090	23	2						
2	23	2	4	9	25	3	75	1			27.75	58683211	1	4	1	3	3	10	60								
2	24	6	1	5	5	5	25	1			28.2	58	9	3	1	3	1	50	8090	3		1	2	3	0.4		
2	25	6	1	5	25	15	375	1			30.9	583	1	4	1	2	1	100				11	2	3	0.4		
2	26	6	1	5	10	20	200	1			31.35	5832	1	4	1	2	3	100				2	2	3	0.3		
2	27	3	1	5	60	30	1800	1			34.5	5832	1	4	13	2	1	150									
2	28	6	1	5	20	20	400	1			35.4	583	1	4	1	2	1	75			4	6	2	3	0.5		
2	29	3	1	5	30	20	600	1			35.7	583	1	4	1	2	3	10									
2	30	6	1	5	20	20	400	1			36.3	5832	19	4	13	2	1	120	30			8	2	3	0.5		
2	31	34	3	5	85	70	5950	1			36.4	5832	1	3	1	2	3	5	3								

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
2	32	34	1	5	35	40	1400	1			38.55	5832	1	4	13	2	3	10									
2	33	5	1	5	4	4	16	1			40.05	5832	1	4	13	2	1	200				1	1			4	0.4
2	34	6	1	5	7	10	70	1			41.7	5832	1	4	13	2	1	150				3	2	3	0.4		
2	35	3456	3	5	90	40	3600	1			41.85	5832	1	4	1	2	3	20				3	3	3	0.5	4	0.5
2	36	3	2	5	50	40	2000	1			42	583	1	1	1	2	3	100									
2	37	56	1	5	35	20	700	1			43.65	583	19	4	1	2	1	150				14	3	3	0.5	3	0.5
2	38	34	3	59	75	30	2250	1			44.4	583	1	3	1	2	3	10	130								
2	39	14	3	5	2	3	6	15			45.3	2	3	4	13	2	1	50									
2	40	6	1	5	15	8	120	1			48	5832	39	4	13	2	1	100	3080	13		5	2	3	0.3		
2	41	6	1	5	5	5	25	1			50.7	58	1	3	2	3	1	30				1	2	3	0.4		
2	42	6	1	4	8	5	40	1			52.5	5832	39	4	13	4	1	200	30			1	2	4	0.6		
2	43	3	1	5	120	30	3600	1			54.75	5832	1	4	13	2	2	15	30								
2	44	114	4	5	10	5	50	1			56.25	583211	3	4			1	150	10								
2	45	114	4	5	40	15	600	1			60	583211	3	4			1	200	809010	13							
2	46	34	3	5	70	30	2100	1			59.75	5832	1	3	13	2	3	20	380	31							
2	47	5	1	5	40	20	800	1			63.9	5832	19	3	13	2	3	5	4890	1		14	2	4	0.5		
2	48	114	4		10	4	40	1			55.5	83211	3	4			1	50									
2	49	114	4		20	2	40	1			55.6	83211	3	4			1	50									
2	50	114	4		10	3	30	1			55.62	83211	3	4			1	50									
2	51	1314	4	5	30	45	1350	1			73.05	83211	1	34	13	4	1235	100	10		2						
2	52	356	3	5	150	40	6000	1			73.06	5843	1	4	13	2	2	10			5	2	3	3	0.7	3	0.7
2	53	13	2	5	40	40	1600	1			73.4	3211	1	4	13	3	2	50									
2	54	6	1	5	10	5	50	1			75.3	5832	1	4	13	32	3	50	6090	1		4	2	3	0.4		
2	55	56	1	5	60	60	3600	1			75.5	5832	1	4	13	32	3	100	6090	13		11	3	3	0.5	3	0.5
2	56	5	1	5	7	8	56	1			75.7	583	1	3	13	2	3	100			2	3	1			4	1
2	57	56	1	5	18	18	324	1			76.1	5832	1	4	13	2	3	60	50		4	8	3	3	0.5		
2	58	34	4	58	50	50	2500	17			76.5	5832	1	4	13	2	3	100	50								
2	59	567	1	5	40	50	2000	1			78.9	583	1	34	13	2	13	150				11	3	3	0.6		
2	60	5	1	5	5	5	25	1			82.95	5832	1	4	13	2	13	150				1	1			5	1
3	1	3	1	5	34	20	680	1	G			4	2		1	1	3	25									
3	2	3	1	5	6	4	24	1	G			4	2	3	1	1	3	14									
3	3	35	1	10	60	16	960	1	G			4	2	4	1	1	3	0	13			1	1			3	0.4
3	4	3	1	5	16	11	176	1	G			4	2	4	1	3	3	0									
3	5	3	1	5	65	40	2600	1	F			4	2	3	1	1	3	0									
3	6	3	2	10	425	135	57375	1	C			4	2	4	1	3	3	0									
3	7	3	1	5	190	80	15200	1	A			4	2	4	13	1	3	0									
3	8	3	1	5	45	40	1800	1	A			4	2	4	13	1	3	100									
3	9	5	1	5	7	6	42	12	C			4	2	4	1	3	3	35				1	1			7	0.5
3	12	35	1	5	200	80	16000	1		6		4	2		13	3	3	150				1	1			9	0.8
3	13	3	1	5	500	150	75000	1		8		4	2		1	3	3	60	15								
3	14	3	1	5	350	100	35000	1		8		4	2		13	1	2	750									
3	15	3	1	10	300	100	30000	12		10		4	2		13	3	3	350									
3	16	5	1	5	3	2	6	1		18		4	2	1	1	3	3	60				1	1			3	0.4
3	17	3	1	5	140	100	14000	1		22		2	2	1	13	3	3	100									
3	18	3	1	5	100	30	3000	1		22		4	2	1	1	2	3	40									
3	19	3	1	5	150	80	12000	1		22		4	2	1	13	3	3	200									
3	20	3	1	5	100	60	6000	1		22		2	2	4	3	2	1	600									
3	21	3	1	5	80	60	4800	1		22		2	2	1	3	2	1	400									
3	22	3	1	5	130	80	10400	1		26		1	2	4	3	1	1	400									
3	23	3	1	5	130	90	11700	1		30		4	2	1	13	1	1	700									
3	24	6	1	7	50	30	1500	1		34		9	2	3	1	1	1	700	4080	3		25	2	3	0.6		
3	25	6	1	5	30	20	600	1		60		4	2	1	1	3	3	900				6	2	3			
3	26	4	1	5	9	5	45	1		60		4	2	1	1	3	3	1000	51								
3	27	356	1	10	500	300	150000	1		68		12	2		13	1	3	150	5				3			4	0.4
3	28	34	2	5	620	190	117800	1		80		4	2		1	2	1	1500									
3	29	3	1	5	210	210	44100	1		88		2	2		13	1	1	900	40								

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HY	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
3	30	3	2	5	3	3	8	1		84		4	2		1	3	3	1									
3	31	356	1	5	600	300	180000	1		40		2	2		13	1	1	2000				8	3	5	0.4		
3	32	3	1	5	280	130	36400	1		40		4	2		1	3	3	150									
3	33	3	1	5	290	150	43500	1		52		4	2		13	1	1	1000									
3	34	4	1	5	3	3	9	1	G			4	2	1	1	3	3	25	50								
3	35	3	1	10	45	40	1800	1	E			4	2	1	1	23	3	5	50								
3	36	3	3	10	120	75	9000	12	E			4	2	2	1	2	3	25	50								
3	37	4	1	5	8	5	40	1	E			4	2	1	1	3	3	30	50								
3	38	34	1	5	45	30	1350	12	E			4	2	1	1	3	3	3	40								
3	39	3	1	5	85	35	2975	12	E			4	2	1	1	3	3	5	40								
3	40	3	3	9	55	40	2200	12	A			4	2	1	1	3	3	5									
3	41	3	2	5	400	20	8000	12	A			4	2	2	12	23	3	5									
3	42	3	3	10	400	200	80000	12	A			4	2	2	13	23	3	15									
3	47	3	1	5	45	30	1350	1		102		4	2	1	13	3	3	300	40								
3	48	3	1	5	90	80	7200	1		102		4	2	1	1	3	3	350	40								
3	49	3	1	5	100	55	5500	1		102		4	2	1	1	3	3	350	40								
3	50	3	1	5	40	30	1200	1		102		4	2	1	1	3	3	400	40								
3	51	3	1	5	35	25	875	1		102		4	2	1	13	3											
3	52	3	1	5	60	25	1500	1		102		4	2	1	3	3											
3	53	3	1	5	45	15	675	1		104		4	2	2	13	1	1	300	40								
3	54	3	1	5	55	25	1375	1		104		4	2	2	3	2	1	250	304070								
3	55	34	1	5	60	30	1800	1		104		4	2	1	1	3	3	400	40								
3	56	3	1	5	60	50	3000	1		106		4	2	2	3	2	1	300	5070								
3	57	34	1	5	20	5	100	1		110		4	2	1	1	3	3	100	40								
3	58	3	1	5	170	75	12750	1		110		4	2	1	1	3	3	400	40								
3	59	34	2	5	160	140	22400	1		110		609	2	2	3	2	1	250	4070								
3	60	3	1	5	75	40	3000	1		134		4	2	1	3	2	3	100	50								
3	61	3	1	5	40	55	2200	1		134		4	2	1	3	3	3	400	40								
3	62	34	1	5	25	15	375	1		126		4	2	1	1	2	1	800	4070								
3	63	36	1	5	130	90	11700	1		126		4	2	2	13	3	3	500	40		4	1	2				
3	64	3	2	5	150	100	15000	1		154		4	2	1	23	23	1	350	50								
3	65	3	1	10	220	80	17600	1		154		402	2	2	23	2	3	300	50								
3	66	3	1	5	175	150	26250	1		154		4	2	1	13	3	3	5									
3	67	3	1	5	2	1	1	1	H			4	2		3	3	3	9									
3	69	3	1	5	20	19	380	1	H			4	2		3	3	3	60									
3	74	3	4	8	4	1	2	8	F			4	2		3	2	3	0									
3	76	3	1	5	8	5	40	1	F			4	2		1	3	3	45									
3	79	3	3	5	76	55	4180	1	F			4	2		3	2	3	10									
3	80	6	3	6	28	16	448	1	F			4	2		3	2	3	50	14			4	2	4	0.7		
3	83	3	1	5	2	2	4	2	J			4	2		1	3	3	10									
3	83	3	1	5	2	2	4	2	J			4	2		1	3	2	10									
3	84	3	1	5	8	5	40	1	J			4	2		1	2	3	10									
3	106	3	1	5	3	2	6	6		76		4	2		2	3	1	600									
3	115	3	1	5	8	6	48	1		76		4	2		1	2	1	900									
3	116	3	1	5	5	5	25	1		76		4	2		1	2	1	400									
3	119	3	2	9	1	1	1	7		76		4	9		1	4	1	400	7	2							
3	122	34	1	5	6	2	12	1		76		4	2	1	2	3	3	100									
3	134	3	1	10	160	75	12000	1		154		4	2	1	1	2	3	45									
3	135	3	1	5	200	175	35000	1		154		4	2	1	3	2	3	50									
3	136	3	1	5	55	15	825	1		138		4	2	1	3	2	1	700	170								
3	137	36	3	5	350	100	35000	1		98		4	2	1	13	23	3	300	4								
3	138	4	2	10	75	35	2625	1		94		5	2	1	2	2	1	10	3070								
3	139	3	1	5	120	110	13200	1		186		4	2	1	1	3	3	360									
3	140	356	1	5	250	175	43750	1		186		4	2	1	3	3	3	400	40			2	3	3	0.3	3	2
3	141	3	1	5	110	80	8800	1		182		4	2	1	12	3	1	550	40								
3	142	34	1	5	110	70	7700	1		182		4	2	1	12	2	1	400	40								

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
3	143	3	3	5	300	100	30000	1		170		60903	2	3	3	2	1	85	470								
3	167	3	1	5	85	45	3825	1		52		4	2		13	1	1	1400									
3	168	3	1	5	100	50	5000	1		48		4	2		1	3	3	1									
3	169	36	1	5	150	100	15000	1		48		2	2		13	1	1	2000				1	2	3	0.4		
3	170	34	1	5	150	120	18000	1		72		4	2		1	1	1	1000									
3	171	36	1	5	240	200	48000	1		44		4	2		13	1	3	70				7	2	3	0.5		
3	172	3	1	5	260	256	66560	1		44		12	2		13	1	1	1750									
3	173	3	1	5	250	180	45000	1		44		4	2		1	1	3	70	50								
3	174	3	1	5	100	80	8000	1		56		4	2		1	1	1	1500	45								
3	175	34	1	10	140	55	7700	1		56		4	2		1	3	1	2000	6	1							
3	191	6	1	5	33	51	1683	1		114		4	2		1	3	3	100				27	2	2	0.7		
3	192	34	1	5	130	195	25350	1		114		4	2		13	2	3	800			6						
3	193	6	1	5	100	50	5000	1		114		4	2	1	1	3	3	20				3	2	2	0.4		
3	194	3	1	5	80	100	8000	1		114		4	2		3	4	3	80									
3	195	3	1	5	100	220	22000	1		114		4	2	1	3	4	3	150									
4	10	34	3	5	150	75	11250	1	R			4	2		1	2	3	0	46	5							
4	11	3	2	5	207	136	28152	1	V			4	2		1	1	3	0			5	1	1	7			
4	43	4	1	5	6	3	18	1	U			4	2	2	1	23	3	30	50								
4	44	346	3	10	350	100	35000	1	R			4	2	2	13	13	3	10	50			25	2	3			
4	45	3	1	5	65	45	2925	12	X			4	2	1	13	3	3	10									
4	46	3	1	5	60	45	2700	1	X			4	2	1	1	3	3	10									
4	90	3	1	5	3	2	6	2	W			4	2		3	3	3	9									
4	93	3	1	5	2	2	4	1	Y			4	2		3	3	3	20									
4	95	3	1	5	8	6	48	1	X			4	1		3	2	3	15	50								
4	97	3	1	5	2	2	4	1	X			4	2		3	3	3	5	50								
4	123	34	1	5	11	6	66	1		76		2	2		3	2	1	500	40								
4	124	3	1	5	9	7	63	1		52		1	1		3	3	1	1000									
4	125	6	1	5	15	4	60	1		44		4	1		1	3	1	1800				5	2	3	0.4		
4	126	5	1	5	5	4	20	1		44		4	1		2	2	1	500				1	1			3	0.5
4	127	55	1	5	20	5	100	1		44		4	2		2	2	1	400				10	3	4	0.4		
4	128	3	1	5	6	3	18	1		44		4	1		2	2	1	300									
4	129	5		5	3	3	9	1		44		4	2		2	2	1	300				1	1			3	0.2
4	130	6	1	5	3	1	3	1		44		4	1		2	2	1	300				1	2	3	0.3		
4	131	3	1	5	125	35	4375	1		90		4	2		3	2	3	50									
4	132	3	1	5	7	4	28	1		90		4	1		3	3	3	40									
4	133	3	1	5	42	35	1470	1		102		4	2		1	3	1	500									
4	144	3	1	5	30	15	450	1		34		2	3	3	3	2	1	350	70								
4	145	4	1	5	15	10	150	1		34		1	2	1	1	2	1	450	15								
4	146	3	1	5	90	60	5400	1		146		4	2	1	13	3	1	700	50								
4	147	3	3	5	200	75	15000	1		145		4	2	1	1	3	3	400									
4	148	36	2	5	175	110	19250	1		146		4	2	1	3	2	3	300				3	2	3	0.5		
4	149	34	2	5	120	65	7800	1		142		4	2	1	1	3	3	400									
4	150	3	1	5	280	160	44800	1		134		4	2	1	13	23	3	300									
4	151	3	1	5	130	95	12350	1		134		4	2	1	13	23	3	350									
4	152	3	1	5	65	55	3575	1		134		4	2	1	3	2	3	700									
4	153	4	1	5	3	2	6	1		134		4	2	1	1	3	3	900									
4	154	3	1	5	115	65	7475	1		130		4	2	1	1	3	3	30									
4	155	3	1	5	70	45	3150	1		130		4	2	1	1	3	3	150									
4	156	3	1	5	120	65	7800	1		110		4	2	1	3	3	3	250									
4	157	3	1	5	65	40	2600	1		110		4	2	1	3	2	1	850	5								
4	158	34	1	5	4	3	12	1		60		4	2	1	1	23	3	20	15		6						
4	159	6	1	5	3	3	8	1		60		2	2	2	3	2	3	20	15			1	2	3	0.5		
4	160	34	1	5	10	7	70	1		56		4	2	1	13	3	3	400			6						
4	200	567	1	35	52	40	2080	1		64		4	2	1	13	2	3	500									
4	201	34	1	5	20	17	340	1		64		4	2	1	2	2	3	525									
4	202	6	1	5	57	47	2679	1		64		3	2	2	2	2	3	600									

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
4	203	6	1	5	119	53	6307	1		60		4	2	1	2	2	1	150			6	9	2				
4	204	6	1	5	2	1	2	1		68		4	2	1	2	2	3	80				1	2	2	0.4		
4	205	5	1	5	3	3	6	1		68		4	2	1	2	3	3	100				1	1			3	0.4
4	208	6	1	5	5	4	20	1		76		4	2	1	1	2	3	150				1	2	5	0.4		
4	212	3	1	5	4	3	12	1		80		4	2	1	1	2	3	600									
4	213	6	1	5	7	5	35	1		80		4	2	1	1	2	3	600	30			2	2	5			
4	214	3	1	5	57	50	2850	1		80		4	2	1	3	3	1	600									
4	215	3	1	5	26	18	468	1		86		4	2	1	3	3	3	100									
4	216	3	1	5	18	14	252	1		84		4	2	1	3	3	3	100									
4	220	34	1	5	12	11	132	1		88		4	2	1	2	2	3	30									
4	221	4	1	5	11	10	110	1		98		4	2	1	2	3	3	600									
4	222	3	1	5	17	11	187	1		98		4	3	1	2	3	3	525									
4	223	4	1	5	2	1	2	1		98		4	3	1	2	3	3	400	5		3						
4	224	3	1	5	11	9	99	1		98		4	2	1	3	2	3	600									
4	225	3	1	5	12	6	72	1		98		4	2	1	2	3	3	600									
4	226	3	1	5	13	13	169	1		98		4	2	1	1	2	3	600									
4	227	3	1	5	20	15	300	1		96		4	2	1	3	2	3	200	30								
4	234	4	1	5	2	2	4	1		102		4	1		1	3	1	500									
4	235	3	1	5	13	9	117	1		102		4	1		1	3	1	200									
4	236	4	1	5	7	6	42	1		102		4	1		1	3	1	100									
4	267	34	1	5	8	5	40	1		114		4	2	1	1	2	3	50									
4	268	3	1	5	9	5	45	1		114		4	2	1	1	3	3	25									
4	269	3	1	5	7	5	35	1		114		4	2	1	2	3	3	900									
4	270	3	1	5	9	6	54	1		114		4	2	1	1	3	3	900									
4	271	3	1	5	5	3	15	1		118		4	2	1	1	3	3	150									
4	272	3	1	5	11	6	66	1		118		4	2	1	1	3	3	30									
4	273	3	1	5	84	25	2100	1		118		4	2	1	1	3	3	20									
4	274	3	1	5	4	5	20	1		118		4	2	1	2	2	1	40									
4	275	3	1	5	6	5	30	1		122		4	2	1	1	3	3	10									
4	276	3	1	5	6	4	24	1		122		4	2	1	1	3	3	20									
4	277	4	1	5	5	3	15	1		122		4	2	1	1	3	3	150									
4	278	4	1	5	1	1	1	1		122		4	2	1	1	3	3	160									
4	279	3	1	5	93	300	27900	1		122		4	2	1	1	3	3	150									
4	280	3	1	5	99	200	19800	1		122		4	2	1	1	3	3	10									
4	281	3	1	5	14	9	126	1		122		4	2	1	1	3	3	5									
4	282	4	1	5	17	11	187	1		126		4	2	1	1	2	3	80									
4	283	3	1	5	9	7	63	1		106		4	2	1	2	2	1	900									
4	284	3	1	5	17	11	187	1		106		4	2	1	1	3	1	950									
4	285	3	1	5	9	6	54	1		106		4	2	1	1	3	3	500									
4	286	3	1	5	7	5	35	1		106		4	2	1	2	3	3	300									
4	287	5	1	5	3	2	6	1		106		4	2	1	2	3	3	100				1	1			3	0.5
4	288	3	1	5	8	6	48	1		106		4	2	1	1	3	3	40									
5	82	5	1	5	20	15	300	1			115	5832	1	4	3	2	1	400				1	1			20	1.5
5	83	3	2	5	25	15	375	1			116.6	587	1	3	5	2	1	80									
5	84	3	2	5	70	25	1750	1			117	58703	1	4	3	2	1	110									
5	85	5	1	5	8	8	64	1			117.3	24	1	4	3	2	1	250				1	1			8	1.5
5	86	3	1	5	45	40	1800	1			117.5	24	1	4	3	2	2	90									
5	87	6	1	5	12	8	96	1			117.5	582	1	4	3	2	3	80				52	3	3	0.2		
5	88	3	1	5	40	40	1600	1			117.5	24	1	4	3	2	3	60									
5	89	3	1	5	40	25	1000	1			117.6	4	1	4	3	2	3	50									
5	90	3	1	5	70	30	2100	1			117.8	4	1	4	3	2	3	550									
5	91	3	2	5	15	15	225	1			118.3	543	1	4	3	3	1	700	50								
5	92	6	1	5	45	30	1350	1			118.4	543	1	4	2	3	1	800				45	2	4	0.3		
5	93	3	1	5	20	20	400	1			119.4	4	1	4	3	2	3	85	30								
5	94	3	3	5	25	10	250	1			119.4	3	1	4	23	2	3	120									
5	95	3	2	5	60	30	1800	1			119.5	4	1	4	3	2	3	120									

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
5	96	6	1	5	50	45	2250	1			119	4	1	4	2	2	1	1000				30	2	4	0.2		
5	97	5	1	1	8	8	64	1			119	4	1	4	3	2	1	1000				1	1			8	1
5	98	36	2	5	70	25	1750	1			119	302	1	4	23	2	1	1000				6	2	4	0.2		
5	99	3	1	5	700	50	35000	12			119	302	1	4	23	2	1	800									
5	100	3	2	5	90	40	3600	1			119.5	7	1	4	23	2	1	150									
5	101	3	1	5	25	25	625	1			119.5	7302	1	4	3	2	1	250									
5	102	36	1	5	140	40	5600	1			119.8	7	1	4	23	2	1	130				7	2	4	0.3		
5	103	6	1	1	20	12	240	1			120.1	587	1	4	5	1	1	300				4	2	3	0.4		
5	104	6	1	5	10	9	90	1			120.2	8	1	4	1	2	3	75				4	2	4	0.1		
5	105	5	1	5	7	7	49	1			120.9	3	1	4	3	2	1	400				1	1			7	1
5	106	3	1	5	80	40	3200	1			121.5	i	1	4	23	3	3	30									
5	107	6	1	1	25	25	625	1			121.3	587	1	4	23	2	1	150				10	2	4	0.3		
5	108	6	1	5	10	10	100	1			121.1	587	1	4	23	2	1	150				4	2	4	0.1		
5	109	3	3	5	40	30	1200	1			121.8	587	1	4	5	2	1	200									
5	110	34	2	5	35	25	875	1			121.7	587	1	4	5	2	1	200									
5	111	3	3	5	90	50	4500	12			121.9	587	1	4	5	3	1	150									
5	112	3	2	5	50	40	2000	1			122.1	587	1	4	5	2	1	150									
5	113	3	1	5	80	40	3200	1			122.3	58789	1	4	5	2	1	400									
5	114	3	1	5	20	20	400	1			122.4	58789	1	4	5	2	1	300									
5	115	3	1	5	90	80	7200	1			122.6	58789	1	4	5	2	1	500									
5	116	3	1	5	50	40	2000	1			122.5	58789	1	4	5	2	1	350									
5	117	3	1	5	30	20	600	1			122.5	58789	1	4	5	2	1	360									
5	118	3	1	5	10	10	100	1			124.8	58789	1	4	5	2	1	1000									
5	119	3	1	5	20	20	400	1			124.8	58789	1	4	5	2	1	1000									
5	120	3	1	5	40	30	1200	1			125	58789	1	4	5	2	1	950									
5	121	3	1	5	30	30	900	1			125.2	58789	1	4	5	2	1	850									
5	122	3	1	5	40	40	1600	1			127	58789	1	4	5	2	1	550									
5	123	3	1	5	50	20	1000	1			127	58789	1	4	23	2	1	260									
5	124	6	1	5	6	5	30	1			127	5873	1	4	23	2	1	180				1	2	4	0.5		
5	125	34	4	10	500	40	20000	12			124.9	587	1	4	12	3	1	300									
5	126	5	1	5	7	7	49	1			128	14	1	4	3	3	1	200				1	1			7	1
5	127	56	1	5	15	10	150	1			128.2	587	1	4	5	1	1	250				2	3	3	0.3		
5	128	3	1	5	20	10	200	1			128.5	587	1	4	5	2	1	80									
5	129	6	1	5	45	20	900	1			128.6	7	1	4	5	2	3	25				10	2	4	0.2		
5	130	3	1	5	20	20	400	1			128.4	7	1	4	5	12	3	50									
5	131	4	1	5	3	3	9	1			128.4	4	1	4	2	2	1	500	150								
5	132	346	1	5	400	70	28000	1			129	587	1	4	5	23	1	200	4			8	2	4	0.3		
5	133	6	1	5	10	8	80	1			128.7	7	1	4	5	2	3	50				6	2	4	0.3		
5	134	5	1	5	10	10	100	1			131.4	5832	1	4	3	2	1	900				1	1			10	0.2
5	135	5	1	5	5	5	25	1			132.1	32	1	4	3	2	1	900				3	1			5	1
5	136	6	1	5	8	6	48	1			134.6	5832	1	4	3	2	1	50				1	2	4	0.2		
5	137	3	1	5	25	25	625	1			133.2	2	1	4	23	4	3	100									
5	138	6	1	5	11	14	154	1			133	587	1	4	23	2	1	700				8	3	4	0.2	4	0.2
5	139	6	1	5	10	10	100	1			132.8	587	1	4	2	2	1	650				5	2	4	0.3		
5	140	6	1	5			0	1			133.8	583	1	4	1	3	1	100					2	4	0.3		
5	141	3	3	5	100	40	4000	12			137	7	1	4	2	1	3	80									
5	142	3	1	5	30	30	900	1			137	14	1	4	13	3	3	80									
5	143	3	1	5	25	20	500	1			137	3	1	4	23	3	3	250									
5	144	3	1	5	80	60	4800	12			137	3	1	4	13	3	3	300									
5	145	3	1	5	180	150	27000	1			137	302	1	4	23	3	3	700									
5	146	3	2	5	130	100	13000	12			137	4	1	4	23	3	3	80									
5	147	3	1	5	1	1	0	1			137.5	1	1	4	23	2	3	100									
5	148	3	1	5	50	30	1500	1			137.6	4	1	4	2	2	3	300	30								
5	149	3	1	5	60	30	1800	1			147	4	1	4	23	2	3	20									
5	150	3	2	10	250	40	10000	12			147.5	3	1	4	2	3	1	500									
5	151	3	1	5	50	30	1500	1			147.7	7	1	4	23	2	1	400									

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
5	152	3	1	5	60	30	1800	12			147.8	7	1	4	23	2	1	250									
5	153	3	1	5	160	50	8000	12			149.7	302	1	4	23	2	1	700				10	2	4	0.3		
5	154	34	1	5	50	50	2500	12			149.7	302	1	4	23	2	1	400									
5	155	3	2	5	140	30	4200	1			146	587	1	4	5	2	1	600									
5	156	4	1	5	30	30	900	1			145.2	583	2	4	23	2	1	300									
5	157	3	2	5	20	15	300	12			139.8	2	1	4	3	2	1	600									
5	158	3	1	5	30	20	600	1			147.6	587	1	4	5	2	1	40									
5	159	3	1	5	75	25	1875	1			148	7	1	4	5	2	1	100									
5	160	36	1	5	130	50	6500	1			148.4	7	1	4	5	2	1	300				4	2	3	0.2		
5	161	3	1	5	30	20	600	1			148.6	7	1	4	5	2	1	500	30								
5	162	3	1	5	30	10	300	1			152.5	7	1	4	23	3	3	20									
5	163	3	1	5	40	20	800	1			152.7	7	1	4	235	3	3	2									
5	164	3	2	5	50	30	1500	12			152.7	70302	1	4	235	3	3	50									
5	165	3	1	5	25	15	375	1			152.7	703	1	4	5	2	3	50									
5	166	35	2	5	180	50	9000	12			152.7	70302	1	4	235	2	3	30				1	1			6	0.6
5	167	3	2	5	350	100	35000	12			153.5	70302	1	4	235	2	3	40									
5	168	5	1	5	13	11	143	1			153.5	3	1	4	3	2	3	40				1	1			9	1.5
5	169	5	1	5	10	8	80	1			153.5	3	1	4	3	2	3	50				1	1			10	1.5
5	170	36	1	5	70	40	2800	1			153.5	587	1	4	235	2	1	80				15	2	4	0.1		
5	171	3	1	5	60	30	1800	1			154.2	58703	1	4	23	2	1	80									
5	172	3	1	5	300	50	15000	1			154.5	58703	1	4	23	2	1	200	5								
5	173	3	1	5	175	60	10500	1			158	703	1	4	23	2	1	400									
5	174	3	1	5	5	5	25	1			158.5	587	1	4	5	2	1	150									
5	175	3	1	5	25	25	625	1			160.4	5832	1	4	23	2	1	400									
5	176	3	1	5	35	30	1050	1			161.9	703	1	4	23	2	3	30									
5	177	3	1	5	200	40	8000	1			161.9	7	1	4	3	2	3	5									
5	178	3	1	5	280	100	28000	12			162	70302	1	4	5	2	3	30									
5	179	346	2	5	450	110	49500	1			162.2	5870302	1	4	235	2	1	50				3	2	4	0.3		
5	180	3	1	5	260	60	15600	12			162.5	70302	1	4	23	2	3	30									
5	181	3	1	5	20	20	400	1			162.5	7	1	4	3	5	3	40									
5	182	3	1	5	20	20	400	12			162.8	302	1	4	3	2	3	200									
5	183	3	2	5	560	240	134400	12			162.9	5870302	1	4	235	2	1	40	3								
5	184	5	1	5	17	17	289	1			163.8	3	1	4	23	2	1	300				1	1			17	1.7
5	185	3	1	5	25	15	375	1			164.7	302	1	4	23	2	1	350									
5	186	3	1	5	200	60	12000	1			164.8	587	1	4	5	2	1	60									
5	187	3	2	5	180	50	9000	1			165	58302	1	4	3	2	1	350									
5	188	3	2	5	30	30	900	1			165.2	3	1	4	23	2	1	400									
5	189	3	1	5	25	10	250	1			165.3	3	1	4	2	2	1	250									
5	190	36	1	5	350	60	21000	1			165.9	58302	1	4	3	2	1	500				10	2	4	0.2		
5	191	3	3	5	50	25	1250	12			166.9	58703	1	4	23	2	1	80									
5	192	3	1	5	110	30	3300	1			171.8	587	1	4	5	2	3	5									
5	193	4	1	5	50	20	1000	1			171.6	5	6	2	2	2	1	2			2						
5	194	36	2	5	70	60	4200	1			172.3	587	1	4	5	1	1	80				10	2	4			
5	195	3	1	5	330	150	49500	12			176.8	43	1	4	23	12	1	70									
5	196	34	1	5	60	60	3600	12			174.5	43	1	4	23	2	1	600									
5	197	34	2	5	120	100	12000	1			173.3	43	1	4	23	2	1	800									
5	198	3	2	5	325	200	65000	1			173	7	1	4	2	3	1	400									
5	199	3	1	5	130	50	6500	12			172.7	302	1	4	23	2	1	500									
5	200	36	2	5	220	80	17600	1			172.6	587	1	4	5	1	1	80				2	2	4	0.2		
5	201	3	1	5	25	20	500	1			172.8	587	1	4	5	2	1	300									
5	202	3	1	5	70	25	1750	1			173.4	586	1	4	2	1	1	400									
5	203	4	3	6	45	10	450	1			178.4	5	9	2	12	3	1	55	7	3	36						
5	204	4	1	6	20	10	200	1			178.3	5	9	2	1	2	1	10	7	3	36						
5	205	3	1	5	325	15	4875	12			177.5	58302	1	4	3	2	1	200									
5	206	35	1	5	150	25	3750	12			180	58302	1	4	3	2	1	250									
5	207	3	2	5	15	15	225	1			180.4	5832	1	4	3	2	1	500	40								

L	SITE	SITET	SIG	SIT	LEN	WID	SITES1	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2O5	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
5	208	4	1	6	55	35	1925	1			180.8	5	1	4	2	1	1	5			23						
5	209	4	1	6	125	20	2500	1			181.6	5	5	2	2	1	1	2			26						
5	210	46	1	5	60	10	600	1			182.2	5	9	3	2	1	1	2			3	8	2	3			
5	211	34	2	5	80	15	1200	1			182.5	7	9	3	23	1	1	2	40								
5	212	3	1	5	30	20	600	1			182	58302	1	4	3	2	1	200									
5	213	46	1	6	70	30	2100	12			182.7	8	1	3	1	3	3	5	40			100	2	3	0.3		
5	214	4	1	6	70	10	700	1			183.8	5	1	2	2	2	1	2	7	3	2						
5	215	34	1	5	110	40	4400	12			168.1	57	1	4	235	2	1	50									
5	216	5	1				0	1			136.8	4										1	1				
5	217	5	1	5			0	1			137.2	2										1	1				
5	218	6	1	5			0	1			137.4	4										5	2				
5	219	6	1	5			0	1			137.4	4										5					
5	220	5	1	5			0	1			137.5	2										1	1				
5	221	5	1	5			0	1			137.8	2										1	1				
5	222	6	1	5			0	1			137.8	7										4	2				
5	223	6	1	5			0	1			138	7										4	2				
5	224	6	1	5			0	1			138.1	7										4	2				
5	225	6	1	5			0	1			138.6	7										8	2				
5	226	5	1	5			0	1			138.5	2										1	1				
5	227	6	1	5			0	1			148.8	7										25	2				
5	228	6	1	5			0	1			140.8	7										2	2				
5	229	6	1	5			0	1			141.1	7										15	2				
5	230	5	1	5			0	1			142.2	4										3	2				
5	231	6	1	5			0	1			142.2	3										5	2				
5	232	6	1	5			0	1			142.4	4										5	2				
5	233	6	1	5			0	1			142.3	4										7	2				
5	234	6	1	5			0	1			142.3	4										5	2				
5	235	6	1	5			0	1			142.5	4										5	2				
5	236	5	1	5			0	1			145.1	2										1	1				
5	237	5	1	5			0	1			145.2	2										1	1				
5	238	6	1	5			0	1			145.4	7										30	2				
5	239	6	1	5			0	1			145.4	7										2	2				
5	240	6	1	5			0	1			139.9	8										5	2				
5	241	6	1	5			0	1			150.4	7										10	2				
5	242	5	1	5			0	1			151.5	3										1	1				
5	243	5	1	5			0	1			152.3	2										1	1				
5	244	5	1	5			0	1			152.5	3										1	1				
5	245	5	1	5			0	1			152.6	2										1	1				
5	246	5	1	5			0	1			152.6	2										1	1				
5	247	5	1	5			0	1			152.7	2										1	1				
5	248	5	1	5			0	1			152.9	3										1	1				
5	249	5	1	5			0	1			153.2	4										1	1				
5	250	5	1	5			0	1			153.3	2										1	1				
5	251	5	1	5			0	1			153.4	2										1	1				
5	252	5	1	5			0	1			153.5	3										1	1				
5	253	5	1	5			0	1			153.6	3										1	1				
5	254	5	1	5			0	1			153.6	2										1	1				
5	255	5	1	5			0	1			154.7	2										1	1				
5	256	6	1	5			0	1			155.2	7											2				
5	257	5	1	5			0	1			155.8	2										1	1				
5	258	6	1	5			0	1			157.2	7											2				
5	259	5	1	5			0	1			157.4	2										1	1				
5	260	5	1	5			0	1			157.7	2										1	1				
5	261	6	1	5			0	1			158.4	7										5	2				
5	262	6	1	5			0	1			158.9	3										4	2				
5	263	6	1	5			0	1			160.2	4										5	2				

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRC	FE	# C	C	LI	LIN	RO	ROU
5	264	6	1	5			0	1			160.2	4										10	2				
5	265	6	1	5			0	1			160.4	4										5	2				
5	266	5	1	5			0	1			160.5	3										1	1				
5	267	5	1	5			0	1			161.6	2										1	1				
5	268	6	1	5			0	1			162.7	3										3	2				
5	269	6	1	5			0	1			182.3	4										20	2				
5	270	6	1	5			0	1			182.4	4										5	2				
5	271	6	1	5			0	1			163.2	7										5	2				
5	272	6	1	5			0	1			163.4	7										5	2				
5	273	6	1	5			0	1			163.6	3										5	2				
5	274	6	1	5			0	1			163.7	8										3	2				
5	275	6	1	5			0	1			164	3										5	2				
5	276	6	1	5			0	1			165.6	7										20	2				
5	277	5	1	5			0	1			170.5	2										1	1				
5	278	5	1	5			0	1			170.7	7										1	1				
5	279	6	1	5			0	1			170.9	3										12	2				
5	280	6	1	5			0	1			171.7	3										7	2				
5	281	5	1	5			0	1			171.9	4										1	1				
5	282	6	1	5			0	1			172.5	7										3	2				
5	283	6	1	5			0	1			172.5	7										1	2				
5	284	5	1	5			0	1			172.8	4										1	1				
5	285	6	1	5			0	1			176.6	3											2				
5	286	6	1	5			0	1			176.6	4											2				
5	287	5	1	5			0	1			179.8	3										1	1				
5	288	5	1	5			0	1			180.2	3										1	1				
5	289	5	1	5			0	1			180.2	3										1	1				
5	290	5	1	5			0	1			180.4	3										1	1				
6	61	5	1	5	3	4	12	1			106.3	58683	1	4	13	2	3	100	70	1		1	1			4	0.2
6	62	345	3	5	200	50	10000	1			107.8	586832	1	3	13	23	3	100	70			1	1			4	0.5
6	63	6	1	5	20	8	160	1			108.3	58684	1	4	1	2	1	250				4	2	3	0.4		
6	64	5	1	5	6	6	36	1			109.1	5868432	1	4	13	3	3	150				1	1			6	2
6	65	3	2	5	280	30	8400	1			109.6	586843	1	3	13	32	1	175	30								
6	66	36	3	5	60	50	3000	1			112.3	5832	1	4	13	2	3	175	15030			12	2	3	0.6		
6	67	3	2	5	20	5	100	1			114.1	5832	1	3	13	32	1	100									
6	68	3	2	5	200	45	9000	1			114.4	5832	1	3	13	2	1	75									
6	69	5	1	5	8	8	64	1			114.8	58432	1	4	13	2	3	10				1	1			6	1
6	70	3	1	5	40	20	800	1			115.2	586832	1	3	13	32	3	50	30600	3							
6	71	346	2	5	55	35	1925	1			115.3	586832	1	4	13	32	1	300			4	1	2	3	0.4		
6	72	5	1	5	7	7	49	1			115.9	58432	1	4	13	2	1	50				1	1			7	1.5
6	73	3	2	5	40	40	1600	1			117.0	58321	1	4	13	32	3	5									
6	74	6	1	5	12	7	84	1			117.1	584321	1	4	13	2	3	5				4	2	3	0.4		
6	75	3	2	5	300	275	82500	1			119.5	5832	1	4	31	32	3	20									
6	76	35	2	5	25	15	375	1			120.0	58321	1	4	13	23	3	20				1	1			6	1.2
6	77	35	3	5	70	70	4900	1			120.3	5832	1	4	13	23	1	150				2	1			7	1
6	78	5	3	5	12	12	144	1			120.7	584	1	3	2	23	1	100	50		6	1	1			8	1
6	79	3	2	5	50	50	2500	1			121.9	583214	1	4	13	32	1	700									
6	80	3	1	5	25	15	375	1			122.4	5832	1	3	13	2	1	150									
6	81	5	1	5	5	4	20	1			123.0	5843	1	3	13	23	1	150				1	1			5	0.8
6	82	3	2	5	80	40	3200	1			123.6	5832	1	3	31	2	1	75									
6	83	35	2	5	30	30	900	1			123.9	5832	1	3	2	4	1	75	3090	1		2	1			5	0.8
6	84	6	1	5	30	15	450	1			124.2	587	1	4	5	2	1	200				11	2	3	0.3		
6	85	56	1	5	25	20	500	1			124.5	58321	1	4	5	2	1	100			6	8	3	3	0.5	3	0.7
6	86	56	1	5	20	15	300	1			124.9	587	16	4	12	12	13	150			6	15	3	3	0.3	3	0.5
6	87	6	3	5	2	1	2	1			125.4	587	1	4	12	2	3	2				1	2	2	0.3		
6	88	34	3	5	6	6	36	1			126.3	587	1	3	5	2	1	50									
6	89	3	2	5	100	50	5000	1			126.5	587	1	3	5	2	3	75									

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
6	90	346	1	5	80	40	3200	1			127	587	1	4	5	2	1	50			6	2	3	3	0.3	3	0.3
6	91	5	1	5	30	8	240	1			127.6	58	1	3	1	3	3	0				2	1			4	0.8
6	92	5	2	5	4	4	16	1			127.8	5832	1	4	13	23	3	50				1	1			4	0.6
6	93	3	1	5	400	175	70000	1			127.8	58732	1	4	13	23	3	5									
6	94	5	2	5	6	4	24	1			128.2	587321	1	4	13	1	3	250				2	1			3	0.5
6	95	3	1	5	30	15	450	1			128.5	58732	1	4	13	2	3	75									
6	96	356	1	5	160	100	16000	1			128.8	58732	1	4	13	2	1	60				4	3	3	0.3	5	0.7
6	97	5	1	5	3	3	9	1			128.2	87	1	34	5	2	1	20				1	1			3	0.7
6	98	5	2	5	3	2	5	1			128.5	58	9	3	24	34	1	30	90	1		1	1			2	0.7
6	99	3	1	5	100	60	6000	1			129.3	587	1	4	13	12	3	50	15								
6	100	6	2	5	15	20	300	1			129.9	587	1	4	123	2	3	600	5			41	2	3	0.5		
6	101	35	3	5	250	400	100000	1			130	5832	1	4	13	2	1	500	5			1	1			4	1
6	102	3	2	5	50	50	2500	1			131.5	7	1	4	12	12	1	2	5								
6	103	5	1	5	40	30	1200	1			132.1	83	1	3	13	2	3	75				4	1			5	2
6	104	3	1	5	225	100	22500	1			133	587	1	4	13	2	3	15	150								
6	105	36	1	5	100	75	7500	1			134.5	587	1	4	13	2	13	100	15			1	2	3	0.5		
6	106	345	1	5	50	50	2500	1			135.7	587	1	4	13	2	3	10	150			2	1			3	0.7
6	107	35	3	5	180	70	12600	1			136.2	587	1	4	13	2	3	20				1	1			4	0.7
6	108	36	3	5	70	16	1120	1			136.8	5832	1	3	2	1	1	250	30			6	2	3	0.3		
6	109	5	1	5	4	4	16	1			136.8	832	1	4	13	2	1	250	30			1	1			4	1
6	110	356	2	5	110	70	7700	1			137.1	832	1	4	13	2	1	200	30			4	3	3	0.3	4	0.7
6	111	6	1	5	15	15	225	1			142.5	83	1	3	13	2	1	20	30			7	2	3	0.3		
6	112	5	1	5	20	15	300	1			143.5	5832	1	4	1	3	3	500			6	7					
6	113	56	1	5	40	30	1200	1			143.6	5832	1	4	1	3	3	450			6	6	3	3	0.3	3	0.6
6	114	35	1	5	40	25	1000	1			143.7	5832	1	3	1	2	3	450			6	2	1			3	0.3
6	115	5	1	5	12	8	96	1			144.5	832	1	3	13	2	1	50				3	1			2	0.2
6	116	5	1	5	6	6	36	1			144.9	82	1	4	13	2	1	30				1	1			6	1.5
6	117	3	1	5	20	15	300	1			145.3	7	1	3	1	12	1	40									
6	118	3	2	5	35	20	700	1			145.6	7	1	4	1	12	1	60									
6	119	5	1	5	10	10	100	1			145.9	5832	1	4	1	12	1	150	70	1		34	2	3	0.3		
6	120	35	2	5	50	50	2500	1			145.3	587	1	4	1	2	1	200				1	1			3	0.7
6	121	56	1	5	30	15	450	1			146.5	58732	1	4	13	23	1	300	15		46	5	3	3	0.7		
6	122	5	1	5	2	2	2	1			147.7	58732	1	4	13	2	1	200				1	1			2	0.2
6	123	6	1	5	15	5	75	1			147.4	5874	1	4	12	12	1	200				6	2	3	0.3		
6	124	34	1	5	20	20	400	1			147.3	5874	1	4	123	12	1	150									
6	125	35	2	5	60	35	2100	1			147.2	5874	1	4	13	2	1	150				1	1			2	0.5
6	126	34	3	5	100	50	5000	1			148.4	584	1	3	12	2	3	75									
6	127	356	1	5	400	200	80000	1			148.9	584	1	3	1	23	3	200	30		6	60	3	3	0.4		
6	128	5	1	5	3	3	6	1			149.5	584	1	4	1	2	1	400	50			1	1			3	0.2
6	129	34	2	5	50	50	2500	1			149.8	584	1	3	12	2	1	500									
6	130	3456	3	5	100	100	10000	1			151	584	1	4	12	23	1	400			6	40	3	3	0.5	4	0.5
6	131	34	1	5	150	150	22500	1			151.3	584	1	3	1	2	3	10									
6	132	56	1	5	15	10	150	1			150.9	584	1	4	13	23	1	400				2	1			4	1
6	133	14	1	5	1	1	1	1			151.6	584	1	4	13	12	3	100			6						
6	134	56	1	5	40	20	800	1			151.7	584	1	3	1	4	1	200	70	35		15	2	2	0.3		
6	135	34	2	5	80	60	4800	1			151.9	584	1	3	13	2	3	150	3070	135							
6	136	356	3	5	150	80	12000	1			151.9	584	1	4	12	12	3	180			6	60	3	3	0.5		
6	137	56	1	5	20	20	400	1			152.2	584	1	4	13	2	1	200	70	35	6	4	3	3	0.5		
6	138	5	1	5	3	3	6	1			152.4	5832	1	4	13	2	1	150	70	35		1	1			3	0.9
6	139	3	2	5	20	20	400	1			153.7	5874	1	3	123	2	1	200	30								
6	140	56	1	5	90	30	2700	1			154.3	583	1	3	12	4	1	60				60	2	3	0.4		
6	141	35	1	5	200	75	15000	1			155.1	5832	1	4	13	3	3	150	150			1	1			2	0.7
6	142	35	2	5	80	20	1600	1			157.3	58432	1	3	13	2	1	200				1	1			2	0.5
6	143	34	3	5	130	60	7800	1			159.7	5874	1	3	5	2	1	250									
6	144	356	2	5	200	75	15000	1			160	5874	1	4	5	2	3	200			6	12	3	3	0.4		
6	145	345	2	5	200	150	30000	1			160.3	5874	1	3	5	2	3	150	150			1	1			2	0.6

400

L	SITE	SITET	SIG	SIT	LEN	WID	SITES1	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H20S	H20D	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
6	146	3	1	5	70	40	2800	1			160.4	587	1	3	13	2	3	10									
6	147	56	1	5	25	20	500	1			162	5874	1	3	13	2	3	10				4	3			3	0.9
6	148	56	1	5	35	25	875	1			163.3	5874	1	4	13	2	1	50				15	3	3	0.5		
6	149	5	1	5	2	2	4	1			164.8	5874	1	4	12	2	1	300				1	1			2	0.3
6	150	34	2	5	100	100	10000	1			164.5	5874	1	4	5	2	3	100									
6	151	56	1	5	25	10	250	1			164.2	5874	1	4	5	2	3	4				12	3	3	0.3	2	0.5
6	152	356	2	5	280	180	50400	1			164.5	587	1	3	5	2	13	250				50	3	3	0.3	3	0.5
6	153	5	1	5	4	4	14	1			164.8	58732	1	4	13	23	1	250	150			2	1			4	1
6	154	3	3	5	50	30	1500	1			165	5832	1	4	13	23	1	200									
6	155	356	1	5	60	50	3000	1			167.5	583	1	3	13	2	13	25				4	3	3	0.3		
6	156	5	1	5	5	5	25	1			169.3	5832	1	4	13	2	1	30	90	1		1	1			5	1.8
6	157	5	1	5	2	2	4	1			169.3		1	4	13	23	3	1000				1	1			2	0.3
6	158	6	1	5	20	20	400	1			169.3		1	4	1	23	3	2				3	2	3	0.5		
6	159	5	1	5	5	5	25	1			169.5	5832	1	4	13	2	3	150				1	1			5	2
6	160	356	1	5	120	50	6000	1			169.6	587	1	4	13	2	3	200	150		6	30	3	3	0.4	4	1
6	161	56	1	5	25	15	375	1			169	58	1	3	4	3	3	50				4	3	3	0.3	3	0.5
6	162	5	1	5	7	7	49	1			170.8	587	1	4	13	12	1	150				1	1			7	0.5
6	163	56	1	5	35	10	350	1			171.3	587	1	4	12	12	1	200				7	3	2	0.3		
6	164	356	1	5	25	20	500	1			172.3	587	1	4	5	1	1	100	90			12	3	3	0.3		
6	165	3456	3	5	100	50	5000	1			172.3	587	1	4	13	12	1	170				30	3	3	0.3		
6	166	5	1	5	25	15	375	1			172.9	583	1	4	1	2	1	250				4	3	2	0.3	4	0.5
6	167	34567	2	5	100	60	6000	1			173.2	587	1	4	1	12	1	200	90	1	6	30	2	3	0.4	3	0.5
6	168	346	3	5	110	60	6600	1			173.5	587	1	4	1	12	1	200	90	1	6	30	2	3	0.3		
6	169	345	2	5	120	60	7200	1			174.1	587	1	4	13	23	1	250	3070	13		3	1			2	0.5
6	170	36	2	5	200	120	24000	1			174.4	5832	1	4	123	123	1	200	3070	1		40	2	3	0.4		
6	171	5	1	5	5	5	25	1			174.7	5832	1	3	13	23	1	175	3070	13		1	1			5	1
6	172	346	1	5	100	40	4000	1			174.9	5832	1	3	13	2	3	175	30			4	2	3	0.5		
6	173	5	1	5	3	3	9	1			175	583	1	3	123	23	3	15				1	1			3	0.6
6	174	3	3	5	100	30	3000	1			175.2	5832	1	4	123	23	3	10									
6	175	35	2	5	150	80	12000	1			175.3	5832	1	4	13	32	3	10	70	13		1	1			3	0.8
6	176	3	3	5	400	50	20000	1			176.5	5832	1	4	13	3	3	1									
6	177	5	1	5	4	4	16	1			177.0	5832	1	4	13	2	3	150	70	1		1	1			4	1.5
6	178	6	1	5	10	10	100	1			178.3	58	1	3	12	23	13	50	50			8	2	2	0.2		
6	179	3	3	5	215	70	15050	1			178.6	587	1	4	1	23	3	20									
6	180	35	2	5	400	250	100000	1			178.8	587	1	4	15	23	3	30	70	13		2	1			2	0.5
6	181	3	2	5	150	60	9000	1			178.9	587	1	4	5	23	1	3	4570	13							
6	182	6	1	5	20	20	400	1			179.2	583	1	4	1	2	1	300	70			40	2	3	0.6		
6	183	34	1	5	100	50	5000	1			181	587	1	4	5	1	3	30	4			1	1			7	2.5
6	184	3	1	5	120	60	7200	1			181	58743	1	4	13	23	3	3	40								
6	185	5	1	5	5	5	25	1			181.5	5832	1	4	13	23	1	100	70	13		1	1			5	1
6	186	13	1	5	400	40	16000	1			183.0	5832	1	4	13	23	1	100	70	13							
6	187	4	4	5	70	40	2800	1			183.0	58	9	3	12	4	1	50	7	135							
6	188	3	4	5	50	50	2500	1			184	8	1	3	12	4	1	2	70								
6	189	4	4	53	110	50	5500	1			185.8	58	9	3	12	24	1	3	4070	3							
6	190	4	3	53	15	15	225	1			186.1	8	9	3	12	24	1	25	7	135							
6	191	34	3	5	120	75	9000	1			189.1	587	16	3	12	1	13	5	40								
6	192	34	3	5	30	10	300	1			192.4	507	2	3	2	2	1	10	70	1							
6	193	4	2	5	20	10	200	1			192.1	507	9	3	2	1	1	20	4070								
6	194	6	1	5			0	1			149.5	4											2				
6	195	6	1	5			0	1			157	2											2				
6	196	6	1	5			0	1			161.4	8											2				
6	197	6	1	5			0	1			161.5	8											2				
6	198	6	1	5			0	1			170.5	7											2				
6	199	6	1	5			0	1			171.8	7											2				
6	200	6	1	5			0	1			171.8	7											2				
6	201	6	1	5			0	1			179.5	3											2				

L	SITE	SITET	SIG	SIT	LEN	WID	SITESI	ART	T	TRA	DISTA	TOPOGRAP	VE	HT	SOI	SOI	H2OS	H2OD	MODERN	CRO	FE	# C	C	LI	LIN	RO	ROU
6	202	5	1				0	1			181.8	2										1	1				
6	203	5	1	5			0	1			182	2										1	1				
6	204	5	1	5			0	1			182.4	2										1	1				
6	205	6	1	5			0	1			182.9	2											2				
6	206	5	1	5			0	1			183.2	2										2	1				
6	207	6	1	5			0	1			183.2	2											2				
6	208	5	1	5			0	1			183.9	4										1	1				
6	209	5	1	5			0	1			183.9	4										1	1				
6	210	6	1	5			0	1			185.8	4											2				
6	211	6	1	5			0	1			126.3	8											2				
6	212	6	1	5			0	1			135.7	4											2				
6	213	6	1	5			0	1			137.7	4											2				
6	214	6	1	5			0	1			144.1	8											2				
6	215	6	1	5			0	1			144.4	8											2				

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Lithic Assemblage Condition and Raw Material Composition - Appendix C1

Key to Headings:

SITE# = Site Number

ST = Techno-stage

AVGWT = Average weight per artifact (grams)

AB = Degree of Abrasion

ALT = Degree of Alteration

PA = Amount of Patination

DPA = Degree of Patination

DC = Dominant Chert Type

BAS = Basalt

CHER = Chert

LIM = Limestone

OTH = Other

QUA = Quartz

SLT = Siltstone

ALL = Total Lithic Artifacts

Key to coding values is presented in Appendix B2.

LITHIC RAW MATERIAL-SOUTHWEST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	OTH	QUA	SLT	ALL
1	2	7.4	2	2	3	2	1		12	1		1	1	15
2	4	3.1	2	3	3	2	1		19					19
3	26	4.7	2	2	1	1	2		35	1		2	1	39
4	3	4.5	2	2	2	2	1		51			1	1	53
5	6	2.7	2		2	1	2		33			6		39
6	8	7.2	2	2	2	1	1		12					12
7	36	1.8	2	3	1	2	2		67	1		4		72
8	26	1.4	2	1	2	3	2		56			4		60
11	45	2.1	2	1	1	1	1		15			3		18
14	26	2.6	3	23	2	2	2		33			3		36
15	6	3.7	2	23	3	2	1		18			2		20
16	26	2.4	2	1	1	1	1		25			6		31
17	2	2.0	2	2	3	1	1		25	1				26
18	34	5.7	2	2	4	2	1		18					18
19	5	2.3	2	1	2	2	2		38			4		42
20	16	4.2	3	13	1	3	2		20					20
21	8	4.3	2	1	2	1	1		23			1		24
23	26	4.1	2	1	3	1	1		72					72
24	145	3.5	2	1	2	1	2		99		1	1		101
25	26	2.4	2	13	3	2	1		120		1	3	2	126
26	45	1.9	3	1	2	1	2	1	140			3		144
27	8	1.9	2	12	2	1			27					27
28	3	1.3	2	1	3	2	1		25					25
29	24	2.5	3	3	1	3	2		95	1			1	97
32	38	2.9	2	1	1	1	2		26			1		27
34	24	2.8	2	12	3	2	2		74					74
38	4	2.0	2		4	1			1					1
39	3	4.4	2		3	1	2		9					9
41	29	1.7	2	2	3	2	1		56	1		4		61
42	4	3.5	2	1	2	1	1		37	1		1		39
45	45	2.9	2	12	3	2	1		60		1	3		64
46	24	1.8	2	1	1	1	1		26			1		27
47	8	7.2	2	2	3	2			11					11
52	4	3.7	2		1	1	1	1	2					3
53	24	1.8	2	23	3	2	2		59			5	1	65
54	1	3.8	2	1	2	1	1		96			11	2	109
61	4	3.4	2	1	1	1	1		26			5		31
62	45	3.8	2	1	1	1	1		75			8	1	84
63	34	2.8	2	1	1	1	2		37		1	2	3	43
64	145	4.2	2	1	1	1	2		48		1	2	1	52
65	24	4.1	2	1	2	1	1		29			3	1	33
67	36	2.8	2	12	2	1	2		25		1	1		27
68	8	9.0	2	1	1	1	1		3			1	2	6
69	34	3.4	2	1	2	2	2		63			8		71
76	245	3.3	2	1	2	2	1		45			8		53
79	24	5.8	2	1	2	1			14					14
80	145	4.1	2	13	1	1	1		59			1	3	63
81	35	4.0	2	1	1	1	1		43			4	1	48
ALL	1	5.2	2	1	1	1	1	2	2002	7	6	113	21	2151

LITHIC RAW MATERIAL-SOUTHEAST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	OTH	QUA	SLT	ALL
1	35	3.8	3	1	1	1	1		26			1		27
2	5	8.5	2	1	1	1	1		17			4		21
3	2	2.7	2	13	1	2	2		49		1	6	2	58
4	4	1.6	3	1	1	1	1		39			7	5	51
6	26	1.1	2		2	1	1		62			5		67
7	2	2.5	3	1	1	1	1		49			4		53
8	5	1.8	3	13	1	1	1		28			1		29
9	5	2.1	2	13	1	1	1		39		1	9	7	56
10	26	1.0	3	1	1	1	1		20			3		23
12	8	4.7	3	1	4	3	2		18			2		20
13	4	2.0	2	1	3	1	1		50			7		57
14	36	2.4	[illegible]	13	3	1	1		18	1				19
15	25	3.4	2	1	1	1	1		37			8		45
16	2	2.8	4	3	1	1	1		13		1	1		15
17	6	3.8	3	13	3	2	2		24			1		25
18	6	2.8	2	3	2	1	1		26			2		28
19	2	1.5	2	1	1	1	1		27			7		34
20	15	2.1	2	1	2	1	1		57	2	2	5		66
21	36	2.7	3	1	1	1	1		32			3		35
27	4	2.0	2	123	2	1	2		27		1	1		29
29	26	3.6	2	[illegible]		1	1		51			3		54
31	2	2.2	3	[illegible]	1	1	1		35		1	3		39
32	245	2.4	2	1	2	2	2		34			2		36
34	36	2.8	3	1	1	1	1		36	1		5		42
36	26	2.5	2	1	1	1	1		36	1	2	5	1	45
38	245	2.6	3	12	1	2	1		53			2		55
43	3	5.8	3	12	1	1	1		49			4	1	54
46	26	3.2	2	1	2	1	1		67			7		74
51	1	3.9	2	2	1	1	1	5	37					42
52	35	2.7	2	3	1	1	1		63		1	15	3	82
53	8	3.6	4				1		7					7
58	1	1.8	2	1	1	1	3		67			1		68
ALL		6.4	2	1	1	1	1	5	1193	5	10	124	19	1356

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LITHIC RAW MATERIAL-CENTRAL WEST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	OTH	QUA	SLT	ALL
1	3	6.9	3	1	1	1	4		23					23
2	8	5.6	4	1	2	1	1		11					11
3	1	7.3	3	1	1	1	2		44	1				45
4	6	3.3	3		4	2	2		19					19
5	14	6.1	2	1	3	2	4		89					89
6	3	5.6	4	1	4	3	2		195			3		198
7	24	6.8	4		4	3	2		76					76
8	15	11.6	2		1	2	2		55					55
12	3	8.9	4		4	3	1		47					47
13	2	7.8	2		2	2	2		76				1	77
14	3	4.4	3		4	3	1	1	13					14
15	3	10.0	3	23	3	3	1		61			1		62
17	8	5.0	3	3	2	2	2	1	15					16
18	24	4.1	4		3	3	1		17					17
19	5	3.9	3		2	2	1		21					21
20	26	5.0	3		4	3	1		27			1		28
21	8	3.6	3		1	2	2		33	1				34
22	24	4.5	3	3	4	2	1		37			1	1	39
23	2	3.7	3		2		2		27			2		29
27	8	6.5	2	13	3	2	1	1	37					38
28	8	4.8	3		1	1	1		9	1		1		11
29	36	3.8	3	2	1	2	2		90			4		94
30	24	7.2	3	2	1	2	2		42	2		1		45
31	3	5.3	2	13	3	3	1		39			3	1	43
32	3	10.5	4	13	2	2	1		21		1	1	1	24
33	26	4.8	3	23	2	2	2		42					42
35	3	3.2	3	1	3	2	1		38			1		39
36	36	6.0	2	2	1	1	1		43			7		50
38	24	3.1	2	1	1	1	1		15			2		17
39	34	8.0	2	3	2	1	1		12			1		13
40	5	5.6	2		4	2	1		12					12
41	36	6.1	3	1	3	2	1		33			3		36
42	24	6.2	2		2	2	2		30			4		34
47	26	6.3	3		4	2	1		10			1		11
48	6	6.5	2	3	2	1	1		12			5		17
49	24	5.1	3		1	1	1		13			2		15
50	5	1.9	2		1	2	2		12			4		16
51	2	2.6	3	3	2	1	1		10			2		12
52	2	4.7	2		2	2	2		8			8		16
53	6	7.2	2		2	2			13			1		14
54	2	3.4	2		2	1	1		32			3		35
56	4	3.8	2		1	1	1		14			5		19
58	4	3.1	3		2	1	1		13			3		16
59	4	1.9	2	1	2	1	1		15			3		18
60	2	3.1	2		3	2	1		11					11
61	6	3.8	3		4	2	2		17			1		18
62	6	3.2	3	3	4	2	1		5					5
63	4	5.1	2		2	1	1		26			5		31

LITHIC RAW MATERIAL-CENTRAL WEST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	OTH	QUA	SLT	ALL
64	34	5.6	2	1	1	2	1		35			4		39
65	2	5.4	2	12	3	13	1		29			1		30
66	24	4.0	3	1	2	1	1		20			5		25
67	3	8.5	3		4	3	1		10					10
69	3	5.5	4		4	3	1		30					30
74	8	8.2	3		2	2	1		10					10
76	2	3.6	3	1	1	3	2		17					17
79	1	141.6	3		3	13	1		7					7
83	2	4.3	2		3	2	1		8			2		10
84	25	3.5	2	1	3	2	1		23			3		26
115	5	3.8	3	2	1	1	1		32			1		33
116	24	2.5	2	12	2	2	1		34			1		35
119	3	4.7	2	1	2	2	1		6					6
122	8	4.3	3		3	3	1		16					16
134	5	2.3	2		1	1	1		16			3		19
135	3	4.8	3		2	2	2		21			2		23
136	26	2.5	2	1	3	1	1		11			2		13
137	6	4.1	2	1	3	3	1		30			6		36
139	34	3.0	2	3	2	1	1		18			2		20
140	6	2.7	2		2	1	2		15			4		19
141	5	1.4	2		2	2	1		24					24
142	25	2.8	2		1	1	1		10			2		12
143	34	3.3	2	1	1	3	1		16			2		18
167	3	3.0	3		2	2	1		23					23
168	8	13.8	4	2	4	3	1		21			2		23
169	24	4.5	3		2	2	1		33			3		36
170	4	2.7	2	12	2	2	1		54					54
171	2	3.1	3		1	1	2		48				1	49
172	24	6.4	3	123	4	3	1		44	1		2		47
173	8	2.5	3	3	2	2	2		21					21
174	38	2.4	3	13	3	3	1		40					40
175	5	2.3	2		1	1	1		32	1				33
192	6	2.8	3	2	2	2	2		163					163
194	26	3.8	3	2	4	3	2		55					55
195	3	4.1	3	2	4	3	2		118					118
ALL	1	6.2	2	1	1	1	1	3	2650	7	1	126	5	2792

LITHIC RAW MATERIAL-CENTRAL EAST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
10	35	3.1	2	2	2	1	1		67	1			68
11	3	4.0	3	23	1	2	1		93		1		94
44	35	6.6	3		2	1	1		40		5	1	46
45	26	8.6	2	3	2	1	1		12				12
46	8	3.2	2	1	3	2	1		10		1		11
90	3	10.1	2		2	2	2		13				13
93	3	4.2	3	1	4	13	2		9				9
95	14	4.4	2	13	3	2	1		38				38
97	1	8.4	3	1	2	2	2		15				15
123	5	3.0	3		2	1	2		26	1	1		28
124	25	3.7	3	13	3	2	1		14		2		16
128	26	4.0	2		2	2	2		18		2		20
131	3	8.6	4	123	4	3	2		189	1	6		196
132	35	15.1	3		1	2	1		10				10
133	26	1.9	3	23	1	1	1		123		5		128
146	24	1.8	2	1	2	1	1		16		4		20
147	4	1.8	2		2	1	1		16		4		20
148	3	3.9	3		1	1	1		10		4		14
149	45	2.8	2	1	1	2	1		14		6		20
150	4	1.9	2	2	2	2	1		38		5		43
151	5	6.5	2	1	1	1	1	1	20		7		28
152	3	6.0	2		1	1	1		19		5		24
153	89	1.0	3		4	1	1		1				1
154	5	2.8	2		1	1	1		30		3		33
155	25	5.4	2		1	1	1		17		1		18
156	24	3.1	3	3	2	2	1		29		1		30
157	2	3.2	2	1	3	1	1		18				18
158	6	1.0	3				1		1				1
160	3	6.4	3		3	2	1		9				9
201	24	2.4	3	1	2	2	2		45		1		46
212	6	7.3	3	12	3	2	1		12				12
214	8	2.6	3		2	2	2		114				114
215	1	15.5	3	1	4	2	1		34				34
216	36	7.2	3	1	2	3	1		22				22
220	8	6.2	2	1	2	2	2		36				36
221	8	3.0	3	1	4	1	1		1				1
222	8	3.1	3		1	2	1		13		2		15
225	3	3.5	3		1	1	2		21				21
226	46	14.3	3	1	1	1	1		57		2	1	60
227	3	5.2	3	1	3	3	1		44				44
235	36	3.6	3	12	3	3	1		19		2		21
267	1	24.[illegible]	2		1	1	2		11				11
268	3	4.8	3	23	1	1	1		12		2		14
269	24	4.4	3	23	1		1		12				12
270	6	9.1	3		3	2	1		16		1		17
271	8	14.9	3	2	1	2	2		14				14
272	3	7.5	3	23	1	2	1		13				13
273	8	6.5	4	2	4	3	1		15				15

LITHIC RAW MATERIAL-CENTRAL EAST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
274	8	5.9	2		1	2	2		10				10
275	3	4.8	2		1	1	1		13		1		14
276	3	6.5	3		2	1	1		12		1		13
279	38	8.0	3	2	3	2	1		31		1		32
280	8	6.7	4	2	3		1		38				38
281	24	9.2	3	1	3	1	2		17		1		18
283	2	3.4	2	1	1	1	1		16				16
284	3	3.8	3	3	3	2	1		26		1		27
285	8	5.8	3		1	1	2		11		1		12
286	3	5.0	3	1	2	1	1		13		1		14
288	2	4.0	3		1		2		10		1		11
ALL	1	5.8	2	1	1	1	1	1	1623	3	81	2	1710

LITHIC RAW MATERIAL-NORTHWEST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
83	36	2.4	3	12	1	1	1		22		1		23
84	2	6.6	3		3	2	2		21		1		22
86	3	8.5	2		3	2	1		10				10
88	2	7.2	3	2	4	3	2		16		2		18
89	26	5.3	3		1	2	2		21		1		22
90	2	5.8	3		2	2	2		19		5		24
91	3	3.8	3		1	1	1		7		2		9
93	4	2.6	2		1	2	2		9		5		14
94	26	7.4	2	1	3	2	1		13		4		17
95	5	4.8	2	23	2	1			31		1		32
98	24	7.7	4	2	3	3	2		23				23
99	3	10.9	2	3	2	2	2		15				15
100	6	8.3	3	12	3	2			23				23
101	3	7.6	3	2	3	3			20		1		21
102	3	7.2	3	2	3	2	1		28		1		29
106	3	7.4	2		2	1			12		1		13
109	3	14.9	2		1	1	2		10				10
110	3	7.3	3	2	3	2			7				7
111	15	7.4	2	13	2	2	1		32			1	33
112	1	9.1	2	13	1	2	1		17				17
115	1	9.3	2		1	1			14		1		15
118	2	8.0	2	3	4	3	1		2				2
123	26	3.3	2		2	1	2		3				3
125	4	7.2	1	13	1	1	1		116		2	2	120
128	4	2.6	3	13	1	1	1		36				36
130	1	9.5	2		1	1	1		12				12
132	4	5.4	2	1	2	2	1		18		1	1	20
137	3	5.4	2		1	1	2		11		1		12
141	1	16.6	2	3	3	2	1		46		1	2	49
142	8	5.4	4		4	3	2		12		1		13
143	34	3.9	2	13	2	2	1		24		1		25
144	45	5.0	2	3	3	2	1		18		1		19
145	1	8.6	2		4	3	2		7		1		8
146	1	9.8	4	1	3	3	1		20		1		21
148	36	7.0	2	1	1	1	1		9				9
149	34	5.9	3		3	2			18				18
150	1	8.9	3	3	2	2	1		37		1	1	39
151	3	10.2	3		1	2	1		20		1		21
153	3	7.7	2	13	2	2	1		28		1		29
154	24	5.1	2		3	3			27		3		30
155	26	7.1	2		2	1	1		16				16
157	34	6.9	3	3	3	2	1		9				9
158	8	4.7	2	1	1	2	2		6				6
159	25	4.0		12	1	1	1		15		1		16
160	2	5.6	3		1	2	2		25		2		27
161	2	8.3	3		1		2		6				6
162	24	6.4	2		1	1			8				8
163	34	12.5	3		1		1		17				17

LITHIC RAW MATERIAL-NORTHWEST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
164	2	11.5	3		1	2	2		11				11
165	2	6.7	3	1	1	1	2		21		2		23
166	12	10.4	3	1	1	1	2		22		1		23
167	2	10.6	2		1	1	2		27		3		30
170	8	10.2	3	1	2	1	1		5				5
171	2	9.4	3		4	3	2		7		1		8
172	2	6.4	3		1	2	2		9				9
173	2	14.0	3		1	1	2		11		1	1	13
174	2	5.6	2	1	1	1	2		12				12
175	2	13.6	3		1		2		7		1		8
176	2	13.3	2		1	2	2		7		1		8
177	24	19.2	3		1	3	0		25		1		26
178	2	14.0	2		1	3	1		22		2	1	25
179	2	8.5	2	1	1	2	1		24		1		25
180	2	13.1	3		1	1	2		17				17
181	2	10.0	2		1	1	1		5				5
182	2	6.5	3		1		2		11				11
183	2	9.4	2	3	1	3	2		34		4		38
185	2	8.5	3		1	2	2		12		1		13
186	2	8.3	3	12	1	2	2		19				19
187	2	12.6	3		2	1	1		16		1		17
188	3	25.2	4		1	3	2		12				12
189	2	11.8	3	3	2	1	1		9				9
190	2	15.8	4		3	2	1		15				15
191	2	22.5	2	2	3	2	1		24		2		26
192	8	8.1	3	12	1	2	1		7				7
193	8	15.0	2		4	1	2		1				1
194	2	6.5	2	3	2	2	1		18		4		22
195	2	10.3	3	13	3	2	1		27				27
196	24	5.8	2	1	3	2			19				19
197	2	10.1	2	1	3	2	2		13				13
198	2	6.2	3	123	3	2			32		2		34
199	3	7.6	3	123	3	2	1		13				13
200	25	6.4	2	1	2	1			22		3		25
201	3	6.0	3	23	3	2	1		9				9
202	8	3.0	2		1	1			7				7
205	2	6.6	2	1	4	2	2		21				21
206	1	7.2	3	12	4	2			11				11
207	1	11.8	3	1	4	2	1		11				11
210	1	12.0	2	1	4	1	3		1				1
211	8	4.2	2		1	1	3		8		2		10
212	3	11.9	2		2	1	2		7				7
215	2	12.0	4	2	4	3			1				1
ALL	1	8.6	1	1	1	1	0		1548		78	9	1635

LITHIC RAW MATERIAL-NORTHEAST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
61	8	4.0	3	1	1	1	1		38	1	1		40
64	8	3.4	3		2	3	2		10				10
66	24	4.1	2	1	3	2	1		16				16
67	3	3.1	2	1	3	2	1		13		1		14
68	3	3.9	2	13	3	2	1		21				22
70	3	4.6	3	1	2	1	4		13				14
71	3	7.0	4		3	2	1		13		1		14
73	26	3.2	2	1	1	1	1		8		3		11
75	16	7.6	3	1	2	1	1		10				10
76	1	14.8	2	1	1	1	1		4				4
77	1	4.6	2	1	1	1	3		13				13
79	25	0.4	2	1	2	2	1		28		2		30
80	14	4.3	2	1	2	1	3		12				12
82	1	3.5	3	1	3	3			35		1		36
83	26	3.1	3	1	1	1	1		11				11
88	8	2.3	2	1	1	1	1		4				4
89	5	2.2	2	1	2	1	1		32		9		41
90	5	1.8	2	13	1	1	1		23		1		24
93	35	3.9	2	3	2	2	1		36		3		39
95	2	5.9	4		3	2	1	1	15				16
96	25	2.5	2	3	2	1	1		42				42
99	8	2.4	2		2	2	1		15		1		16
101	3	3.3	3	1	2	2	1		16		2		18
102	24	4.1	2	1	1	1	1		24		1		25
104	4	4.5	2	13	1	1	1		20		1		21
105	26	3.3	2		2	2	1		21		1		22
106	25	3.2	2	1	1	1	1		10		1		11
107	8	5.4	2		1	1	1		16				16
110	1	5.1	3	13	3	2	1		17		1		18
112	2	2.9	3		2	1	1		11		1		12
114	25	8.3	4		3	3	1		22			1	23
118	8	5.2	2	1	1	1	1		6				6
120	24	2.9	2		1	1	1		17				17
124	2	2.6	2	3	2	1	1		8				8
125	3	4.5	2	123	3	2	1		15				15
126	3	3.8	2	2	1	2	1		21		1		22
127	2	3.4	3	1	3	2	1		21		2		23
129	2	2.6	2	3	1	1	1		20		4		24
130	89	1.6	2	1	1	1	1		4		1		5
131	5	3.9	2		1	1	1		17		1		18
135	5	2.8	2		1	1	1		21		2		23
136	3	5.4	2	1	1	2	1		32				32
139	245	2.8	2	1	2	1	1		16		3		19
141	24	7.8	2	1	1	1	1		14		1		15
142	25	4.4	2	12	1	2	1		16				16
143	25	3.0	2		1	1	1		25		3		28
144	25	4.3	2	13	2	2	1		8				8
145	25	5.9	2		1	1	1		28		3		31

LITHIC RAW MATERIAL-NORTHEAST SITES

SITE #	ST	AVGWT	AB	ALT	PA	DPA	DC	RAW MATERIAL BAS	CHER	LIM	QUA	SLT	ALL
146	2	3.8	2	1	1	1	1		5				5
150	25	3.8	2	1	2	2	1		21				21
152	25	3.7	2	13	2	2	1		35		1		36
154	24	3.9	3	1	4	3	2		21				21
155	2	6.3	2		2	1	2		7				7
160	3	5.8	3	3	2	2	2		26				26
164	8	4.8	2		2	3	1		12				12
165	1	9.4	3		4	3	1		9				9
167	3	9.4	3	1	2	2	1		16				16
168	2	3.3	2	13	2	2	1		8				8
169	2	6.9	2	1	2	3	1		12		2		14
170	14	8.9	2	1	2	3	2		33		1		34
172	24	5.0	2	1	2		1		13				13
174	24	4.4	3		2	3	1		21				21
175	1	5.1	3	13	2	1	1		17				17
176	36	6.7	2		2	13	4		39				39
179	25	3.7	2	13	2	2	1		50				50
180	24	4.9	3		2	2	2		28				28
181	3	5.8	3	13	2	2	1		18				18
183	3	8.5	2		1	2	1		21				21
184	3	11.1	4	2	4	3	1	1	18				19
188	36	5.0	2	1	3	2	1		21				21
191	3	3.0	3		1	2	1		8				8
192	8	2.7	2				1		3				3
ALL	1	4.6	2	1	1	1	1	2	1320	1	58	1	1382

Key to headings:

SITE# = Site Number

SAMP = Sampling Technique

ST = Techno-stage

ANG = Angular Waste

BLA = Blades

COR = Cores

Flak = Flakes

LEVF = Levallois Flakes

LEVP = Levallois Points

SHA = Shapes Tools

UN. 1 = Unshaped Tools

All = Total Lithic Count

Key to coding values is presented in Appendix B2.

STONE ARTIFACT CLASSES-SOUTHWEST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
1	1	2	4	2	4	5					15
2	3	4	4		3	6			2	4	19
3	3	26	1	3	9	21	3		2		39
4	3	3	3	3	7	26	5		4	5	53
5	3	6	7	2	8	15	1		3	3	39
6	1	8	1	1	3	5	1			1	12
7	1	36	8	1	16	35	2		5	6	72
8	1	26	3	9	10	26	1		7	4	60
11	3	45	3	5	3	6	1				18
14	3	26	3	2	8	10	6		2	5	36
15	3	6	1		6	11			2		20
16	3	26	1	3	11	6	3		4	3	31
17	1	2	5	1	7	5			1	7	26
18	1	34	2		2	11	1			2	18
19	1	5	8	6	3	11			8	6	42
20	3	16	3	3	1	8	3		1	1	20
21	3	8	3		4	9	1		4	3	24
23	1	26	5	10	11	30	7		4	5	72
24	1	145	20	10	15	31	7		14	4	101
25	1	26	18	8	16	51	7		15	11	126
26	1	45	35	15	10	71			10	3	144
27	1	8	8		2	11			4	2	27
28	1	3	5		3	5	7		1	4	25
29	1	24	18	1	4	46	13		2	13	97
32	1	38	9		3	14				1	27
34	1	24	3	15	10	33	2		7	4	74
38	1	4							1		1
39	1	3		1	1	1	1		3	2	9
41	1	29	5	2	8	14	15		4	13	61
42	1	4	8	2	11	6			4	8	39
45	3	45	9	6	13	14	1		11	10	64
46	1	24	3	3	5	10			2	4	27
47	5	8				8	2		1		11
52	2	4		2		1					3
53	1	24	10	2	13	29	1		6	4	65
54	1	1	13	18	25	19	9		14	11	109
61	3	4	6	3	8	7			3	4	31
62	1	45	9	9	16	36	1		11	2	84
63	3	34	11	1	5	16	1		6	3	43
64	1	145	7	13	9	7	2		8	6	52
65	1	24	7	4	6	3	2			11	33
67	1	36	6	2	4	8	2		5		27
68	2	8	2		1	2				1	6
69	1	34	12	10	13	24			6	6	71
76	1	245	12	4	9	16	3		1	8	53
79	1	24	1		4	3			2	4	14
80	1	145	4	7	9	22	7		13	1	63
81	1	35	8	5	10	3			10	12	48
ALL			313	194	349	757	118		213	207	2151

STONE ARTIFACT CLASSES-SOUTHEAST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
1	2	35	4		6	12	2			3	27
2	5	5	4	3	5	5			3	1	21
3	3	2	12	3	7	24	1		6	5	58
4	3	4	14	3	8	11	1		5	9	51
6	3	26	23		8	25	1		6	4	67
7	3	2	8	3	11	20	2		7	2	53
8	3	5	5	1	4	11			3	5	29
9	3	5	18	2	6	28			1	1	56
10	3	26	4		3	7	1		2	6	23
12	3	8	2		9	4	1		2	2	20
13	3	4	30		15				9	3	57
14	3	36	2	2	7	6				2	19
15	3	25	13	2	6	8	3		6	7	45
16	3	2	3	2	5		1		2	2	15
17	3	6	8	1	5	5			3	3	25
18	3	6	5		5	11			4	3	28
19	3	2	5		8	19			1	1	34
20	3	15	16	6	11	25	3		3	2	66
21	3	36	6	3	8	12			2	4	35
27	3	4	7	5		7			5	5	29
29	3	26	10	3	14	21	1		4	1	54
31	3	2	3		8	9			11	8	39
32	3	245	1	3	8	12	5		2	5	36
34	3	36	8	4	7	7	1		10	5	42
36	3	26	11	1	4	17	3		7	2	45
38	3	245	19	2	7	10	4		6	7	55
43	3	3	13	1	11	16	1		10	2	54
46	3	26	12	3	15	19	1		14	10	74
51	3	1	4		3	29	1		2	3	42
52	3	35	22	2	7	23			19	9	82
53	5	8	2		1	1			2	1	7
58	3	1	11	3	1	35	14		3	1	68
ALL			305	58	223	439	47		160	124	1356

STONE ARTIFACT CLASSES-CENTRAL WEST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
1	1	3	1	2	2	12			5	1	23
2	2	8	4		2	2			2	1	11
3	5	1		5	4	20	13			3	45
4	2	6	3		2	11			1	2	19
5	5	14	9	6	3	43	10		13	5	89
6	5	3	18	17	29	92	5		20	19	198
7	5	24	3	3	19	25	9		7	8	76
8	5	15			13	29	7		3	3	55
12	5	3	1	2	7	21	5		8	3	47
13	5	2	3	4	11	32	4		11	12	77
14	5	3	3	2		4	3		1	1	14
15	5	3	7	1	15	14	2		22	1	62
17	5	8		1		6			4	5	16
18	5	24		2	2	10	2		1		17
19	5	5			4	13			3	1	21
20	5	26	6	1	6	10	2		3		28
21	5	8	7		5	15			7		34
22	5	24	4	1	4	15	4		7	4	39
23	5	2	4			11	5		4	5	29
27	5	8	4		7	14			7	6	38
28	5	8	1		1	4			3	2	11
29	5	36	18	2	14	35	3		9	13	94
30	5	24	2	8	11	13			8	3	45
31	5	3	1	5	6	15	1		7	8	43
32	5	3			4	11	2		3	4	24
33	5	26	2	4	7	7	3		9	10	42
35	5	3	2		2	25	5		1	4	39
36	1	36	2	3	4	34	3		4		50
38	1	24	5	1	2	2	1		3	3	17
39	1	34		1	5	3				4	13
40	1	5		3	1	6			1	1	12
41	1	36	1	1	6	16	4		6	2	36
42	1	24	10	1	8	4	2		9		34
47	1	26	1		3	4	1		2		11
48	1	6	1	4	3	7			2		17
49	1	24		5	2	6	1			1	15
50	1	5				12			4		16
51	1	2		1	2	4			3	2	12
52	1	2	1		3	10			2		16
53	1	6		3		6			5		14
54	1	2	1	6	2	16	1		6	3	35
56	1	4	2	2	3	9			2	1	19
58	5	4		4	2	5			4	1	16
59	1	4	2	5		3			5	3	18
60	1	2		3	2	3	2			1	11
61	1	6		4	1	6			4	3	18
62	1	6				1			1	3	5
63	1	4	2	4	6	4			6	9	31

STONE ARTIFACT CLASSES-CENTRAL WEST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
64	1	34		5	8	10	7		4	5	39
65	1	2	8		5	8			3	6	30
66	1	24		3	4	11	2		4	1	25
67	2	3			1	2	3		3	1	10
69	2	3	8	1	2	16	2		1		30
74	2	8				8			2		10
76	2	2	1	1	1	7	3		3	1	17
79	1	1			5				2		7
83	2	2	3		1	2			1	3	10
84	2	25	2	2	3	15	2			2	26
115	2	5	4		3	20	1		3	2	33
116	2	24	3	3	6	18	2		2	1	35
119	2	3	1		3	2					6
122	2	8	1		1	12			2		16
134	1	5	1	5	2	8	3				19
135	1	3	2	3		11			5	2	23
136	1	26		1		5	2		1	4	13
137	1	6	1	7	2	14			10	2	36
139	1	34		5	2	5			6	2	20
140	1	6	2	4		4			5	4	19
141	1	5		12	1	7			3	1	24
142	1	25		3	1	6			2		12
143	1	34		3	1	4	3		6	1	18
167	5	3	2	1	2	12	3		3		23
168	5	8	7	1	5	7			3		23
169	5	24	3	3	6	14	2		7	1	36
170	5	4	5	7	3	29			2	8	54
171	5	2	8		6	29	1		4	1	49
172	1	24	2	3	7	20	4		9	2	47
173	5	8	3		2	13			1	2	21
174	5	38			2	33			5		40
175	5	6	4		2	20			7		33
192	5	6	7	16	14	72	5		33	16	163
194	5	26	3		9	35	1		6	1	55
195	5	3	30	1	16	55	1		10	5	118
ALL			242	207	361	1204	147		396	235	2792

STONE ARTIFACT CLASSES-CENTRAL EAST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
10	5	35	3	4	5	47	4		4	1	68
11	5	3	6	5	5	49	15		6	8	94
44	1	35	2	7	13	17	1		4	2	46
45	1	26		1	6	1	1		3		12
46	1	8			1	4			1	5	11
90	2	3	1		6	1	3			2	13
93	2	3	1		1	1	2			4	9
95	2	14		2	3	20	9		4		38
97	2	1			2	3	7		3		15
123	2	5	9		2	10			4	3	28
124	2	25	2		2	3	2		4	3	16
128	2	26	2	1	3	10	1		3		20
131	1	3	37	1	14	118	4		16	6	196
132	2	35			2	4	3			1	10
133	2	26	6	1	8	87	9		0	9	128
146	1	24		4		6	1		8	1	20
147	1	4	1	5	4	5			4	1	20
148	1	3			3	3	1		6	1	14
149	1	45		9	2	3			4	2	20
150	1	4	6	7	4	8			5	13	43
151	1	5	1			13			5	9	28
152	1	3	2	1	5	10	1		4	1	24
153	2	89				1					1
154	1	5		7	4	16			5	1	33
155	1	25		4	3	7			4		18
156	1	24		6	5	12			4	3	30
157	1	2	2		3	2	1		4	6	18
158	2	6				1					1
160	2	3	4			1	2		1	1	9
201	2	24	6	2	8	16	1		8	5	46
212	2	6	4		2	2			1	3	12
214	2	8	32		5	50	3		23	1	114
215	1	1	1		5	3	9		11	5	34
216	3	36	2			11	3		6		22
220	2	8	6		7	10	3		6	4	36
221	2	8				1					1
222	2	8	5		1	4			4	1	15
225	2	3			1	13	4		2	1	21
226	2	46	13	2	3	24			11	7	60
227	2	3	8	1	1	22	4		7	1	44
235	2	36	2		2	13	2		2		21
267	2	1	1		4	4			1	1	11
268	2	3	5	1		6			1	1	14
269	2	24			2	6	1		2	1	12
270	2	6	1		8	7			1		17
271	2	8	7		1	3				3	14
272	2	3	9		1	2			1		13
273	3	8	12							3	15

STONE ARTIFACT CLASSES-CENTRAL EAST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
274	2	8			1	5			3	1	10
275	2	3			1	9	2		2		14
276	2	3	1	1	2	6	1		2		13
279	1	38	9		3	15	3		1	1	32
280	1	8	37							1	38
281	2	24	3	1	6	3	2		2	1	18
283	2	2	1		1	11	2		1		16
284	2	3			5	17	2		3		27
285	2	8	3		1	7			1		12
286	2	3	1		1	7	3		1	1	14
288	2	2	1	1	1	5	2		1		11
ALL			255	74	179	745	114		218	125	1710

STONE ARTIFACT CLASSES-NORTHWEST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
83	5	36	4		1	11	2		1	4	23
84	1	2	2		3	7	1		7	2	22
86	4	3	1		2	2			4	1	10
88	1	2	6		1	3	6		2		18
89	5	26	2	4	6	8			2		22
90	1	2	2		5	3			7	7	24
91	1	8	2	1	2	2			2		9
93	1	4	4			4			1	5	14
94	5	26	1		6	6	2		1	1	17
95	5	5	5	1	5	16			3	2	32
98	1	24	5	2	6	5	3		1	1	23
99	1	3			6	3	1		5		15
100	1	6		1	7	9	1		4	1	23
101	1	3	6		6	1	5		2	1	21
102	1	3	1	4	7	5	2		6	4	29
106	1	3	1		2	6	2			2	13
109	5	3			4	2	1		3		10
110	1	3			3	3			1		7
111	5	15		8	8	3	4		10		33
112	1	1		3	5	3	3		3		17
115	1	1	1		4				6	4	15
118	1	2							2		2
123	1	26							2	1	3
125	1	4	3	63	16	21			9	8	120
128	1	4	10	1	4	13	1		1	6	36
130	1	1	1	1	1	7	1			1	12
132	1	4	2	2	1	4			1	10	20
137	1	3			1	7	2		1	1	12
141	1	1	4	4	10	13	5		11	2	49
142	1	8	2		1	6			4		13
143	1	34		8	2	6	3		6		25
144	1	45	1	10	1	2			5		19
145	1	1	3		1		2		1	1	8
146	1	1			4	4	6		6	1	21
148	1	36			1	5				3	9
149	5	34	3	2	2	3	4			4	18
150	1	1	1	1	10	7	5		9	6	39
151	5	3	1		9	3	4		3	1	21
153	1	3		5	10	5	1		6	2	29
154	1	24	2	4	9	7	5		2	1	30
155	1	26		1	5	4			5	1	16
157	1	34	1		1	4	3				9
158	1	8	1			2			2	1	6
159	1	25			3	5	2		3	3	16
160	1	2		2	9	6	1		6	3	27
161	1	2			2	2			2		6
162	1	24	2		3	1	1			1	8
163	1	34		1	9	2	3			2	17

STONE ARTIFACT CLASSES-NORTHWEST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
164	1	2	1		5	2	1		1	1	11
165	1	2	1	2	10	6	1		2	1	23
166	1	12	1		17	2	3				23
167	1	2	2		13	2	5		4	4	30
170	1	8		1	1	1			1	1	5
171	5	2			6					2	8
172	1	2			4	1	2		2		9
173	1	2			10	1			2		13
174	5	2	1	1	2	6	1			1	12
175	1	2			4		4				8
176	1	2			5	1	1		1		8
177	1	24	1		20		4		1		26
178	1	2	1	2	15	4			1	2	25
179	1	2		1	14	6	2			2	25
180	1	2			12	4	1				17
181	1	2	2		2				1		5
182	1	2	5		3	3					11
183	1	2		2	10	10	5		6	5	38
185	1	2	2		6		3		1	1	13
186	1	2	1		10	7			1		19
187	1	2	2	2	7	4	2				17
188	1	3	1		7	3	1				12
189	1	2			5	1			2	1	9
190	1	2			9		4	1		1	15
191	1	2		2	15	4	4		1		26
192	1	8	1		2	1			3		7
193	1	8			1						1
194	1	2			9	7			3	3	22
195	1	2			10	6	8		1	2	27
196	1	24	1	1	6	1	4		4	2	19
197	1	2	1		9	1			2		13
198	1	2		2	15	8			5	4	34
199	1	3			5	4	2		2		13
200	1	25	1	6	9	8				1	25
201	1	3	1		1	4	1		2		9
202	1	8	2	2			1		1	1	7
205	1	2		1	5	6	4		3	2	21
206	1	1	2				3		4	2	11
207	5	1			1	3	3		3	1	11
210	5	1							1		1
211	1	8		1		5			2	2	10
212	5	3			2	1	3		1		7
215	1	2			1						1
ALL			110	155	492	364	155	1	222	136	1635

STONE ARTIFACT CLASSES-NORTHEAST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
61	5	8	9		2	10			10	9	40
64	5	8	4			1			4	1	10
66	5	24	1		3	6	2		4		16
67	5	3		2	1	6	4		1		14
68	5	3			2	8	3		5	4	22
70	5	3	2	2	1	4	4		1		14
71	5	3	1		2	3	1		5	2	14
73	5	26			3		2		3	3	11
75	5	16		1		1	4		3	1	10
76	5	1				1			1	2	4
77	5	1		1		4	4		1	3	13
79	5	25		6	4	10	2		6	2	30
80	5	14		3		3	2		2	2	12
82	5	1				14	11		8	3	36
83	5	26	3		1	1	2		1	3	11
88	5	8	1			3					4
89	5	5	2	8	1	13			5	12	41
90	5	5			3	11			5	5	24
93	5	35	2	5	3	18	3		6	2	39
95	5	2		1	1	6	1		2	5	16
96	5	25		12	4	17	2		3	4	42
99	5	8	1	4	1	4	2		1	3	16
101	5	3	1	2	4	3	3		1	4	18
102	5	24		4	2	2	4		7	6	25
104	5	4	8	5		8					21
105	5	26		3		8			9	2	22
106	5	25		4	2	2	2		1		11
107	5	8	1	2	1	5	1		4	2	16
110	5	1		3		6	7		1	1	18
112	5	2		1		6			4	1	12
114	5	25		1	5	7	8		2		23
118	5	8		1	1	3			1		6
120	5	24	1	4	3	3			3	3	17
124	5	2	3	1	2		1		1		8
125	5	3	2	1	2	4			1	5	15
126	5	3	2		4	10			5	1	22
127	5	2		2	2	7	4		3	5	23
129	5	2		1	4	8	5		2	4	24
130	5	89				5					5
131	5	5		1	1	12			2	2	18
135	5	5	1	2	2	10	1		3	4	23
136	5	3	1	4	2	3	12	1	5	4	32
139	5	245	1	4	4	4	4			2	19
141	5	24		2	4	1	2		1	5	15
142	5	25		1		9	3		2	1	16
143	5	25			5	9	3		5	6	28
144	5	25		5	2		1				8
145	5	25		5	5	6	12		2	1	31

STONE ARTIFACT CLASSES-NORTHEAST SITES

SITE #	SAMP	ST	CLASS ANG	BLA	COR	FLAK	LEVF	LEVP	SHA	UNSH	ALL
146	5	2			2	2				1	5
150	5	25	1		5	4			9	2	21
152	5	25		5	2	13	6		8	2	36
154	5	24		5		3	6		4	3	21
155	5	2			1	5	1				7
160	5	3		2	6	5	5		6	2	26
164	5	8	1	1	2	5			2	1	12
165	5	1			1	3	3		2		9
167	5	3		1	3	4	4		2	2	16
168	5	2			2	3			1	2	8
169	5	2			2	5	2		1	4	14
170	5	14		8	4	3	12		6	1	34
172	5	24			4	5			3	1	13
174	5	24		4		4	7		1	5	21
175	5	1			1	7	5	1	2	1	17
176	5	36	1	1	1	16	8		9	3	39
179	5	25	1	10	6	5	2		17	9	50
180	5	24	2	5	2	3	6		4	6	28
181	5	3				12	2		2	2	18
183	5	3		1	6	7	3		3	1	21
184	5	3	1	1	8	5	1		1	2	19
187	5	5									
188	5	36		3	2	6	6		3	1	21
189	5	5									
190	5	5									
191	5	3		1	2	2	1			2	8
192	5	8			1	2					3
193	5	5									
ALL			54	152	152	414	202	2	228	178	1382

Shaped Stone Tool and Core Typology Frequency (n) of Shaped Stone Tools and Cores by Site - Appendix C3

Shaped Tools

1. Unifacial point
2. Parti-bifacial point
3. Bifacial point
4. Distally retouched point

5. Single side scraper
6. Double side scraper

7. Convergent scraper

8. Denticulate scraper-single edge
9. Denticulate scraper-double edge

10. Notched scraper-single edge
11. Notched scraper-double edge
12. Notched and denticulate scraper

13. End scraper-single edge

14. End scraper-double edge

15. End and single side scraper
16. End and double side scraper
17. Double end and side scraper

18. Tranverse scraper

19. Inverse scraper

20. Circular and semi-circular scraper

21. Core scraper

22. Steep scraper

23. Nosed scraper

24. Scraper Frags.

25. Angle Burin
26. Dihedral Burin
27. Tranverse Burin
28. Multiple Burin

29. Burin on a backed piece

30. Core Burin

31. Bec
32. Perforator

33. Straight-backed blade-single
34. Straight-backed blade-double
35. Curved backed blade-single
36. Curved backed blade-double

37. Obliquely truncated blade
38. Orthoganally truncated blade
39. Double oblique truncation
40. Double orthogonal truncation
41. Oblique and orthogonal truncation
42. Misc. truncated blade

43. Biface or biface fragment
44. Parti-biface or fragment
45. Uniface or fragment

46. Outils esquilles
47. Crescents
48. Triangles
49. Trapezes

50. Composite tool
51. Gravers
52. Fragment

Cores

75. Flake, Single platform-normal
76. Flake, Single platform-angle
77. Flake, Single platform-pyramidal
78. Flake, Double platform-opposed, same plane
79. Flake, Double platform-right angles, same plane
80. Flake, Double platform-different planes
81. Flake, Double platform-opposed, alternate sides

415

82. Flake, Cores on flakes-single platform
83. Flake, Cores on flakes-double platform
84. Bipolar core
85. Irregular, Multiple platform
86. Biconical core
87. Levallois core
88. Levallois core on a flake
89. Levallois blade core
90. Convergent (Lev. points)
91. Convergent Nubian I
92. Discoid (flat)
93. Discoid (high backed)
94. Nubian Core II
95. Blade, Single platform-normal
96. Blade, Single platform-angle
97. Blade, Single platform-pyramidal
98. Blade, Double platform-opposed, same plane
99. Blade, Double platform-right angles, same plane
100. Blade, Double platform-different planes
101. Blade, Double platform-opposed, alternate sides
102. Blade, Cores on flakes-single platform
103. Blade, Cores on flakes-double platform
104. Core Frag.

SHAPED STONE TOOLS-SOUTHWEST SITES

SITE #	TYPE 1	2	3	5	6	7	8	10	11	12	13	14	15	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	37	38	43	44	45	46	47	48	50	ALL
2																	1			1																				2
3				1										1		1				1							1								1						2
4						1														1		1								1			1							4
5	1				1						1			1							1					1														3
7					1	1														2	1																			5
8											1					1																			2					7
14					1	1																																		2
15				1				1																																2
16																																	1			1				4
17					1																							3		2					1			1		8
19													1																						1					1
20														1																										1
21						1	1																				1			1									1	4
23	1			2		1								2		1	1		1	1			1																	4
24									2		4	1		1			2				1						1			1		1		1	1					14
25			1	1																							1			1					2					15
26			1																									1	1	3				1					2	10
27																1											1							1						4
28			1																																					1
29	2	1				1					1																	1												2
34																														1					1					7
38								1			1		1															1												1
39					1										1		1																							3
41				2																								1											1	4
42								1					1			1				1				1				3		2							1			4
45											1							1										1												11
46																												1												2
47							1										1																							1
53	2			1		1					2					2				1			1					1		2									1	6
54					1													1		1														1	2				1	14
61								1										1		1																				3
62																					1		1					4		4										11
63																				1								2		1	1								1	6
64											1		1					1							1			1							3					8
67				2							1																	1											1	5
69					1			1								2												2												6
76	1																																							1
79				1																								1												2
80				1		2			1					1		2			1									2		1					1		1			13
81							2									1		1	1	1												1		1					2	10
ALL	7	1	3	12	6	10	4	5	3		13	1	5	7	1	12	6	4	3	10	4	1	3	1	1	1	4	25	1	20	1	2	1	5	15	1	3	1	10	213

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CORES-SOUTHWEST SITES

SITE #	TYPE 75	76	77	78	79	80	81	82	83	85	86	87	88	92	93	95	96	97	98	99	100	101	102	103	104	ALL
1										1		1									1				1	4
2																1			1						1	3
3	1			2								3				1		1	1							9
4				1								4				1									1	7
5	2					1				1		2				2										8
6												1				1									1	3
7	4			4		1				1		1				2			1						2	16
8				2						3		4									1					10
11				1												1			1							3
14			1							1		2	1											1	2	8
15	1		1							1		1				1									1	6
16	1					1	1					3		2		3										11
17				1		1				1		3				1										7
18				1										1												2
19	1					1																			1	3
20	1																									1
21										1						3										4
23				1				1		1		7				1										11
24	1									2		4		1	1	2			2						2	15
25	1			2								9				2					1				1	16
26				1							1			1		4		1			1	1				10
27																									2	2
28	1											2														3
29				1									1			1					1					4
32										1		1											1			3
34				1				2		3		3				1										10
39												1														1
41			1							1		1							1		1				3	8
42	2			1		2				1						1									4	11
45	2				1	4						3						1							2	13
46			1									3									1					5
53			1				1			2		5				3			1							13
54	3	1		2		1				3		10				1			1		2				1	25
61	2			1			1			1				1								1			1	8
62	4			3	2			1		1						1									4	16
63												3					1		1							5
64	2								1	2						2			1						1	9
65										1				1		3						1				6
67															1	3										4
68																1										1
69	3			2						1		4	1	1		1										13
76	1			1			1			2		2				1									1	9
79	2									1		1														4
80			1								1					4		1		1	1					9
81	3			2				1				1													3	10
ALL	38	1	6	30	3	12	4	5	1	33	2	85	3	8	2	49	1	4	11	1	10	3	1	1	35	349

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SHAPED STONE TOOLS-SOUTHEAST SITES

SITE	TYPE 2	3	5	6	7	8	10	11	13	15	16	18	19	20	22	23	24	25	26	31	32	33	34	35	40	44	45	46	47	49	50	ALL
1																																
2															1										1			1				3
3							1			1		1		1	1									1								6
4										1														2			2					5
6			1		1	1			1						1						1											6
7			1			1			1								2							2								7
8																		1			1			1								3
9									1																							1
10				1																						1						2
12			1				1																									2
13							1						1	1			1							1					2	2		9
14																																
15									1								1					3							1			6
16										2																						2
17															1						1		1									3
18									1				1				1				1											4
19						1																										1
20				1																												3
21									1											1				2								2
27			2				1		1															1								5
29													1		1									1			1					4
31	2	2	1							1				3	1							1										11
32												1			1																	2
34			3						1	2				1							1					1	1					10
36									1					1	2							1					2					7
38							1			1	1	1	1											1								6
43			1	1						1			2	2	1	1															1	10
46			4	1	1		1						1		1					1		2		1			1					14
51			1														1															2
52			2	1			2	3		3			2	1					1		1	1		1							1	19
53							1							1																		2
58			1			1																		1								3
ALL	2	2	18	5	2	4	9	3	9	12	1	3	9	11	11	1	6	1	1	2	6	8	1	15	1	2	7	1	3	2	2	160

HA'

CORES-SOUTHEAST SITES

	TYPE	73	75	78	80	81	82	84	85	87	88	89	90	92	93	95	98	100	101	102	103	104	ALL
S	1		1		1				1				1			2							6
I	2		5																				5
T	3		1							2		1			1	2							7
E	4	1	1						5							1							8
0	6								5	3													8
	7		3						1	4						3							11
	8		3	1																			4
	9			2		1			1							1	1						6
	10								1	1												1	3
	12		2	1					1	2				2	1								9
	13		3			1			6	5													15
	14			1					1		2					2		1					7
	15		1						3	1						1							6
	16									5													5
	17		1	1					2									1					5
	18								3							2							5
	19							2		5									1				8
	20		2	1						3	1					2	1	1					11
	21								2	5						1							8
	29		1						1	7						3		1	1				14
	31		1			1				5				1									8
	32		1						3	1				2		1							8
	34				1					4						1		1					7
	36								2	1									1				4
	38								2	3	1										1		7
	43								2	5						1	2			1			11
	46		7		2	1				4	1												15
	51									2							1						3
	52		3	1						1	1				1								7
	53						1																1
	58									1													1
	ALL	1	36	8	4	4	1	2	42	70	6	1	1	5	3	23	5	5	3	1	1	1	223

SHAPED STONE TOOLS-CENTRAL WEST SITES

	TYPE 1	2	4	5	6	7	8	9	10	11	13	15	16	18	19	20	21	22	23	24	25	26	30	31	32	33	35	43	44	45	46	47	50	52	ALL
S 1				1										1						1				1									1		5
I 2				1																													1		2
T 3																																			
E 4																									1										1
8 5				1					1					1					3			1		3	3									13
6		1		4	1				1		1		1		1	2				2				1			3	1		1					20
7						1			1		1														4										7
8							1												1						1										3
12				2					1					1					1					1				1					1		8
13				2		1								1	1			2		3				1											11
14							1																												1
15				2	1	2					2	1				2			4					4			1	1					2		22
17						1												1	1								1								4
18																											1								1
19				1						1		1																							3
20																	1	1							1										3
21				1															2	1				1									2		7
22				1			1																1			2	1						1		7
23									2											1				1											4
26																																			
27																		3						1	1								2		7
28				1																					1					1					3
29				1												1			1					1	1		1	1					2		9
30															1				1						1	3	1						1		8
31						1	2					1				1			1														1		7
32				1										1																1					2
33				2				1	1												1			3			1								9
34																																			
35																										1									1
36				1							1										1				1										4
37																																			
38																		1			1					1									3
39																																			
40							1																												1
41				2														1		1				1		1									6
42	1									1		1			1	1									3	1									9
47											1																	1							2
48				1										1																					2
49																																			
50				1		1																					1				1				4
51																		1							1		1								3
52				1																	1														2
53											1			1	1									1									1		5
54				1			1									1					1	1					1								6
56																											1		1						2
57																																			
58																			1												2		1		4
59									1												1			1	1							1			5
60																																			
61												1				1		1									1								4
62																											1								1
63											1																1				1	1	2		6
64				1											1												1				1				4
65							1																	1									1		3
66									1																1	2									4
67				1														1						1											3
69																									1										1
73																																			
74		1												1																					2
76				2														1																	3
79						2																													2
83											1																								1
84																																			
115																					1				1	1									3
116																1								1											2
119																																			
122																									1								1		2
134																																			
135					2	1																		1										1	5
136																																	1		1
137				2												1								2	1		1		1		1	1			10
138																																			
139				1		1			1		1					1										1									6
140																					1			1									3		5
141				1															1							1									3
142																											2								2
143					1										1		1							1	1								1		6
167				1																					1						1				3
168														1												1		1							3
169																			1						4						1		1		7
170											1								1																2
171				1																							2				1				4
172		1									2								2						4										9
173																								1											1
174																2		1		1				1											5
175				1	1															1					1						1	1		1	7
192				1		1					5			2		1		2			2			17			1				1				33
194											1			1												1	2		1						6
195				3				1								1		2							2									1	10
ALL	1	2	1	43	6	12	8	1	11	2	19	5	1	12	7	16	2	18	21	11	10	2	1	48	38	16	26	6	3	3	11	4	26	3	376

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CORES-CENTRAL WEST SITES

SITE #	TYPE 75	76	77	78	80	81	82	85	86	87	88	92	93	95	98	99	100	101	102	103	104	ALL
1	1														1							2
2														1							1	2
3										2											2	4
4								1													1	2
5	1							1									1					3
6	4			2				8		7		2									6	29
7	1					1		2		5				2							8	19
8	1			1						9			1	1								13
12										5					1		1					7
13								3		4			1	1							2	11
15	2							1		9				2			1					15
18								1													1	2
19	1									2				1								4
20								1		2									1		2	6
21										1				1			3					5
22	3							1														4
27	5							2														7
28														1								1
29	3				1			1		5				2							2	14
30	2		1					2		2				2			1	1				11
31										4							1				1	6
32								1		1				2								4
33	1									3				2			1					7
35										1	1											2
36					1			1						2								4
38										1											1	2
39								2										1	2			5
40				1																		1
41	1				1			2		1				1								6
42								5		1	1			1								8
47	1			1				1														3
48														3								3
49																	1				1	2
51										1											1	2
52								1		1					1							3
54				1										1								2
56	2																				1	3
58	1													1								2
60										1				1								2
61								1														1
63				1	1			1		1											2	6
64		1		2				2		3					1		1					8
65	2				1			2														5
66							1	2											1			4
67														1								1
69										1				1								2
76																					1	1
79								1	1	2								1				5
83										1												1
84	2				1																	3
115	1							1							1							3
116	1			1				3												1		6
119	1									2												3
122														1								1
134				1						1												2
137								1						1								2
139										1				1								2
141				1																		1
142										1												1
143	1																					1
167										1				1								2
168														2	1	1	1					5
169								1		2							1		1	1		6
170	2																				1	3
171										4				1			1					6
172	2									3	1			1								7
173																					2	2
174								1													1	2
175	1													1								2
192	2			4	1			1		2				4								14
194				2				3		2					1						1	9
195	2							2		6				3			2	1				16
ALL	47	1	1	18	7	1	1	59	1	99	3	2	2	46	7	1	16	4	5	2	38	361

422

SHAPE: STONE TOOLS-CENTRAL EAST SITES

SITE	TYPE 1	3	5	6	7	8	10	13	15	16	18	19	20	22	23	24	25	26	27	31	32	33	35	43	44	45	46	47	48	50	51	52	ALL
10			1														1						1					1					4
11			1		1	1					2						1																6
43																																	
44	1																			1			1	1									4
45						1															1	1											3
46																	1																1
90																																	
93																																	
95			1														1			1					1								4
97			2	1																													3
123								1						1	1							1											4
124					1					1	1												1										4
128																				1							1			1			3
131			3	1					1						2					2	2			1						4			16
132																																	
133						1					1		1			1					1				1	1	1						8
145																																	
146			1										1								3	2	1										8
147																				1		2	1										4
148		1	1																		2	1								1			6
149																					1	1						2					4
150																	1			1		3											5
151															1					1			2								1		5
152			1																			1		1								1	4
153																																	
154																			1			2							1			1	5
155						1																	3										4
156													1		2							1											4
157																				2	1						1						4
158																																	
160			1																														1
201				1								1	2								2		1							1			8
212																							1										1
214		1	2	1	2		1		1		1			1	1			1		2	2		2	2			1			1		1	23
215		1					1				1				2					3				1						2			11
216			3								1				1						1												6
220									1				1			2											1			1			6
221																																	
222										1																				3			4
223																																	
225																				2													2
226									1			2	1		2						2	1						1		1			11
227			2	1											1					1							1			1			7
235											1										1												2
236																																	
267			1																														1
268														1																			1
269								1														1											2
270													1																				1
271																																	
272																									1								1
273																																	
274			1						1																					1			3
275					1										1																		2
276			1	1																													2
278																																	
279										1																							1
280																																	
281															1						1												2
282																																	
283																				1													1
284						1							1							1													3
285							1																										1
286					1																												1
28F											1																						1
ALL	1	3	22	6	6	5	3	2	5	3	9	3	9	3	15	3	5	1	1	20	20	17	14	6	3	1	6	4	1	17	1	3	218

CORES-CENTRAL EAST SITES

SITE #	TYPE 75	78	80	81	82	85	87	88	92	93	95	96	98	99	100	101	102	103	104	ALL
10	2					2				1										5
11	1						2	1			1									5
44	3	1					6				3									13
45						1	2			1	1				1					6
46																			1	1
90	3						2		1											6
93																			1	1
95	1		1				1													3
97							1	1												2
123						1					1									2
124							1				1									2
128						1					1						1			3
131						2	6				4				2					14
132		1					1													2
133	1	1				1	2				3									8
147		1				1		1											1	4
148							1				1				1					3
149	1										1									2
150	2					1													1	4
152	1					1	1						1	1						5
154	1	1				1	1													4
155			1				1						1							3
156		2			1	1	1													5
157							2	1												3
201	1			1	1	1	2				1								1	8
212																			2	2
214		1					1				1	1			1					5
215					1	1	2								1					5
220	2																		5	7
222		1																		1
225						1														1
226	1					1													1	3
227											1									1
235							1				1									2
267							1												3	4
269								1										1		2
270	2					3						1				1	1			8
271											1									1
272							1													1
274											1									1
275							1													1
276							1						1							2
279						1				1	1									3
281					2	3											1			6
283															1					1
284	1						1				1		1		1					5
285											1									1
286							1													1
288							1													1
ALL	23	9	2	1	5	24	44	5	1	3	26	2	4	1	8	1	3	1	16	179

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SHAPED STONE TOOLS-NORTHWEST SITES

SITE	TYPE 1	2	3	4	5	6	7	9	10	12	13	15	16	17	18	19	20	21	22	23	25	26	27	28	31	32	33	34	35	36	37	38	43	44	45	47	50	52	ALL
83																	1																						1
84															1			1							3	1											1		7
86									1			2						1																			1		4
88					1																																		2
89																	1										1										1		2
90					1		1				1	1												1	1							1							7
91					1						1																												2
93																											1												1
94					1																																		1
95																											1		2										3
98																																		1					1
99			1												1			1																1	1				5
100					1																													1	2				4
101												1																									1		2
102					1		1				1			1	1											1													6
106																																							3
109			1								1				1																								1
110															1																								10
111			1		2		1										1	1									3						1						3
112					1	1																													1				6
115				1		2	1																		1												1		2
118																	2																						2
123																	1																			1			9
125																		1									4		4										1
128											1																												
130																																							
131																																							
132																					1																		1
137																	1																						1
141	2				1	1		1	1					1																			3		1			11
142					1				1									1																1					4
143																							1			1	2		2										6
144																1												1	2							1			5
145							1																																1
146	1	1		1	1														1						1														6
148																																							
149																																							
150		2		1	1	1																																	
151												1																		1				1	2				9
153		3		1	1																												1				1		3
154																	1																1						6
155				1							1						1									1													2
156																											1				1								5
157																																							
158															1				1																				
159				1																																			2
160					1						2				1												2												3
161				1											1																		1				1		6
162																																							2
163																																							
164																																							
165								1							1																						1		1
167				1											1			1																					2
170										1																							1						4
172					1																																		1
173											1					1																		1					2
174																																							2
176																1																							
177						1																																	1
178																																							1
179																																					1		1
180																																							
181																																							
182																									1														1
183				3					1						1	1																							6
185				1																																			1
186																					1																		1
187																																							
188																																							
189																																							2
191																																							1
192				1																												1							3
193																	2																						
194																		1			1																1		3
195								1																															1
196																					1					1	1	1											4
197															1																						1		2
198				1		2																				1		1											5
199				1												1																							2
200																																							
201				1											1																								2
202														1																									1
203																																							
204																																							
205																1								1										1					3
206								1				1							1																	1			4
207				1																					1													1	3
208																																							
209																																							
210				2																																	1		1
211																																							2
212																								1															1
213																																							
214																																							
215																																							
ALL	3	9	1	29	9	9	1	6	1	9	6	1	2	11	6	14	7	3	1	1	3	1	1	8	6	17	2	12	1	1	1	9	6	8	2	12	3	222

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LAKES-NORTHWEST SITES

	TYPE	72	75	77	78	79	80	81	82	85	87	38	87	92	93	95	96	98	99	100	102	103	104	ALL	
S	83										1													1	
I	84	1									2													3	
T	86		1								1													2	
E	88															1								1	
0	89				2						4													6	
	90										4												1	5	
	91										1							1						2	
	94				1						4					1								6	
	95		3							1								1						5	
	98		1								4					1								6	
	99		1								4					1								6	
	100										5					2								7	
	101										5	1												6	
	102									1	4		1			1								7	7
	106				1						1													2	
	109										3					1								4	
	110				1																		2	3	
	111		1					1			5							1						8	
	112										4												1	5	
	115										2			1									1	4	
	125		8		2				1							2						1	2	16	
	128			1	2													1						4	
	130											1												1	
	132				1																			1	
	137										1													1	
	141										7					3								10	
	142																						1		1
	143										1					1								2	
	144									1														1	
	145										1													1	
	146										4													4	
	148										1													1	
	149										1									1				P	
	150		1							1	7					1								10	
	151										9													9	
	153										9				1									10	
	154								1		6												2	9	
	155		1								4													5	
	157																				1			1	
	159									1	2													3	
	160										9													9	
	161										1					1								2	
	162		1								2													3	
	163									1	8													9	
	164										5													5	
	165										8					1							1	10	
	166						1				13	2		1										17	
	167										13													13	
	170									1														1	
	171									1	5													6	
	172										4													4	
	173										7					2					1			10	
	174										1												1	2	
	175										3								1					4	
	176							1			4													5	
	177		1							1	12	1				4				1				20	
	178									1	12					1							1	15	
	179		1								13													14	
	180										12													12	
	181										2													2	
	182									1	2													3	
	183									1	9													10	
	185							1			5													6	
	186				1						8						1							10	
	187		2							1	4													7	
	188										5					2								7	
	189													1	1								3	5	
	190										7	2												9	
	191				1						11			1		2								15	
	192															2								2	
	193									1														1	
	194										3	2								2		1	1	9	
	195		1							1	8													10	
	196		1							1	3	1												6	
	197		1		1						5					1				1				9	
	198					1				2	12													15	
	199		2			1					2													5	
	200		1		2			1			5													9	
	201										1													1	
	205										5													5	
	207										1													1	
	212										2													2	
	215										1													1	
	ALL	1	28	1	15	2	1	4	2	18	340	10	1	4	2	31	1	4	1	5	2	2	17	492	

SHAPED STONE TOOLS-NORTHEAST SITES

SITE	TYPE 1	5	6	7	8	10	11	13	15	16	18	19	20	21	22	23	24	25	26	28	29	31	32	33	35	36	41	43	44	45	46	47	48	50	51	ALL
61			1					1							1	1	3																	3		10
64		2						1																										1		4
66								1									2																	1		4
67																																		1		1
68				1		1			1																				1					1		5
70		1																																		1
71		1						2							1																			1		5
73																1			1				1													3
75		1			1																			1												3
76		1																																		1
77		1																																		1
79		1				1		1	1						1								1													6
80		1											1																							2
82		3			1	2																												2		8
83																																		1		1
88																																				
89		1							1						1			1					1													5
90																			1	1	1			1		1										5
93								2	1			1				1									1											6
95				1									1																							2
96																1								1									1			3
99																									1											1
101							1																													1
102						2	1									1											1				1	1				7
105		2		2		1	2															1		1												9
106																														1						1
107		1			1																		1					1								4
110					1																															1
112			1		1								1																					1		4
114										1	1																									2
118															1																					1
120																							1		2											3
124																						1														1
125								1																												1
126		1		1							1											1	1													5
127								1			1												1													3
129	1												1																							2
130																																				
131		1																							1											2
135											1		1												1											3
136											1											1		2				1								5
139																																				
141																																		1		1
142																								1							1					2
143						1		1																1								1	1			5
144																																				
145											1												1													2
146																																				
150		1	2					1			1	1					1								1								1			9
152		1		1	1								2		1	1									1											8
154			1			1		1				1																								4
155																																				
160			1	1											1	1	1																	1		6
164																						1												1		2
165											1																		1							2
167																													1					1		2
168											1																									1
169																																		1		1
170								2	1		1													1				1								6
172				1									1												1											3
174									1																											1
175				2																																2
176	1	1				1			1								3					1		1												7
179						1		1	1			1				1								6		1								3	1	16
180								1	1				1											1												4
181		1						1																												2
183					1	1					1																									3
184		1																																		1
187																																				
188		1	1						1																											3
189																																				
190																																				
191																																				
192																																				
193																																				
ALL	2	24	7	10	7	12	4	18	10	1	11	4	9		7	9	10	1	2	1	1	6	8	17	9	2	1	3	3	1	2	2	3	20	1	228

CORES-NORTHEAST SITES

	TYPE	75	76	77	79	80	81	82	85	87	88	93	95	98	101	102	104	ALL
S	61																2	2
I	66				1		1										1	3
T	67													1				1
E	68			1						1								2
#	70									1								1
	71									2								2
	73									3								3
	79	1			1					2								4
	83								1									1
	89	1																1
	90	1					1							1				3
	93	1								1					1			3
	95									1								1
	96	1							1	2								4
	99	1																1
	101				1					1							2	4
	102							1		1								2
	106	1											1					2
	107	1																1
	114			1						4								5
	118				1													1
	120							2	1									3
	124									2								2
	125								1	1								2
	126									3							1	4
	127									1				1				2
	129								1	3								4
	131	1																1
	135	2																2
	136									2								2
	139	1	1						1		1							4
	141								1	1			1				1	4
	143	2			1		1			1								5
	144								1	1								2
	145									5								5
	146				1					1								2
	150	1								3	1							5
	152									2								2
	155									1								1
	160				1				1	2			1			1		6
	164	1											1					2
	165									1								1
	167									2	1							3
	168									1							1	2
	169									2								2
	170				1					2		1						4
	172									3							1	4
	175									1								1
	176	1																1
	179	2				1				2			1					6
	180									2								2
	183					1				5								6
	184									7			1					8
	188													2				2
	191									2								2
	192												1					1
	ALL	19	1	2	8	2	3	3	9	78	3	1	7	5	1	1	9	152

Frequency (n) of Shaped Stone Tools and Cores by Techno-Stage - Appendix C4

Table 3 in the text provides the Techno-Stage coding values.

SOUTHWEST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	6	8	14	15	16	24	26	34	36	45	58	145	ALL
1	3										1		2	1				7
2													1					1
3						1	1								1			3
5	3		1				2	1			1	1		2	1			12
6		1			1	1	1					1	1					6
7	2		1			1		2				3	1					10
8							2				1	1						4
10			1		1							1	1		1			5
11									1			2						3
13	1		1				3				1	5	1	1				13
14												1						1
15			1			1	1			1				1				5
18	2						1	1				2		1				7
19		1																1
20	2		2				1	2			1	1	2		1			12
21	1		1	1							1	2						6
22				1	1		2										1	4
23	1		1					1										3
24	1		1	2	1		1					2	1		1			10
25					1							2		1				4
26												1						1
28	1				1							1						3
29															1			1
30			1															1
31					1													1
32			1				2					1						4
33			1	2	4		1	2			3		3	1	7		1	25
34															1			1
35	1			1	3		1		1		1	2	2		8			20
37													1					1
38	1				1													2
43												1						1
44	2				1		1								1			5
45	3	1			1				1			6					3	15
46												1						1
47				1					1						1			3
48					1													1
50	1	1					4				1			1	2			10
75	3		3	3	3	2	5			1		4	3	3	5	1	2	38
76							1											1
77		1				1		1			2	1						6
78	1	1	2	1	2	1	3				1	8	4	3	3			30
79						1									2			3
80	1	1		2	1	1						2		1	3			12
81				1							1	1				1		4
82			1									2	1		1			5
83			1															1
85	5	2	2	2	1	2	5				4	8	1	1				33
86								1							1			2
87	15	4	10			1	2				8	32	8	2	3			85
88											1	1	1					3
92	0			1							1	2	2		1			8
93	1													1				2
95	3	1	2	1	1	2	11	4			4	8	2	6	2	1	1	49
96													1					1
97								1				1			2			4
98	3		3	1		1					1	1		1				11
99								1										1
100	2	2				1		1			1	2			1			10
101							2								1			3
102							1											1
103												1						1
104	3	5	4	3	2		14				1	1		1	1			35
ALL	63	21	41	23	28	17	67	18	4	2	36	112	39	28	52	3	8	562

SOUTHEAST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	6	8	15	25	26	35	36	245	ALL
2		2												2
3		2												2
5	2	2	1	2			1			1		9		18
6			2							1	1	1		5
7										1		1		2
8	1	1	1									1		4
10		1	1	1			3			1		2		9
11												3		3
13		1			1	1	3					3		9
15	1	3	2				1					5		12
16			1											1
18		1	1										1	3
19			3				3					3		9
20		4	2				2					3		11
22		2			1	1	3		1	1		2		11
23			1											1
24	1	2					2		1					6
25					1									1
26												1		1
31			1									1		2
32					2	1	1					2		6
33		2			1				3	1		1		8
34						1								1
35		2	3	3	1		3	1		1	1			15
40					1									1
44			1									1		2
45	2									2		3		7
46					1									1
47				1			1		1					3
49				1			1							2
50							1					1		2
73	1													1
75		4		2	11	1	5	1	2	5	1	4		36
78					4	1	1				1	1		8
80												4		4
81		1			1		1					1		4
82							1							1
84		2												2
85		2	2	5	1	8	9		2	1		7	5	42
87	3	20	14			1	13	2	2	5	1	8	1	70
88			1					1				4		6
89		1												1
90					1									1
92		1					2						2	5
13		1					1					1		3
95		2	1	1	2	3	3	2	2	3		4		23
98	1		1				2	1						5
100						1		1		1		2		5
101		2								1				3
102							1							1
103													1	1
104										1				1
ALL	12	61	39	16	29	19	64	9	14	26	5	79	10	383

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CENTRAL WEST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	6	8	14	24	25	26	34	36	38	ALL
1									1						1
2			1						1						2
4							1								1
5		7	15		3	5	3	1	1		2	2	4		43
6			4			1						1			6
7	2	1	4		1	1	1		1			1			12
8		2	2		1				2						7
9											1				1
10		2	3	1				1	2		1	1			11
11					1				1						2
13		1	3	2		6			3		2	1	1		19
15			2		1	1			1						5
16			1												1
18		1	3			4	2	1			1				12
19		1	1			1			2			2			7
20		1	6			3			2			1	1	2	16
21											1	1			2
22		4	3			3	4		1		1		1	1	10
23			6	2	1		3	3	5				1		21
24		4	3			1	1						1	1	11
25		1		1	2	3			1		1		1		10
26		1						1							2
30									1						1
31		3	9	1		21	3	3	1		3	1	2	1	48
32		1	4	1	1	3	3	3	18		1	1	2		38
33			1		2		1		9		1	1	1		16
35		4	4	2	1	4	1		3	2	3	1	1		26
43			3				1				1		1		6
44				1		1					1				3
45			2				1								3
46		1	1	3	1	3			1			1			11
47				2		2									4
50		1	5	3		4	6		3		1	1	2		26
52			2			1									3
75		2	10	5	2	3	5	1	10	2	2	1	4		47
76												1			1
77									1						1
78			2	1	4	4			2		3	2			18
80		1		2		1				1			3		8
81									1						1
82									1						1
85	1	6	12	1	1	4	2	1	17		5	4	4	1	59
86	1														1
87	4	14	37	1	3	2	1		21	1	7	2	6		99
88			1						2						3
92			2												2
93		1							1						2
95		3	10	1	2	9	6		7		2	1	5		46
98		1	2		1		1				1	1			7
99							1								1
100		1	5				4	1	3		1	1			16
101	1		1						1			1			4
102									2		1	2			5
103									2						2
104	2	3	7	4		1	3		12		3		2	1	38
ALL	11	68	177	34	28	92	54	16	143	6	46	32	43	7	757

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CENTRAL EAST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	6	8	14	24	25	26	35	36	38	45	46	ALL
1												1					1
3	1		1				1										3
5	3		10				3	0	1			1	3				22
6	1		3				1		1								6
7			3				2			1							6
8			2							1	2						5
10	1						2										3
13					1				1								2
15			1				3									1	5
16							1			1				1			3
18	1	1	2				1			1	1		2				9
19									1							2	3
20			1			1	1		4		1					1	9
22			1		1		1										3
23	2		4		2		1		3				1			2	15
24							2				1						3
25			1	1			1	1				1					5
26							1										1
27					1												1
31	3	3	6	2	1		2	1			1	1					20
32		1	4				2		6		2		2		1	2	20
33			2	5	3				4		1				1	1	17
35				1	2	1	2		2	4		2					14
43	1		2				2					1					6
44			1					1			1						3
45											1						1
46		1	1				2				2						6
47												1			2	1	4
48					1												1
50	2		6				6		1		1					1	17
51					1												1
52			1		1		1										3
75			6	2	1	2	1	1	1		1	6			1	1	23
78				1	1		2		2		1	2					9
80								1		0							2
81									1								1
82	1								4								5
85	1		4	2	2	3			5		3	2		1		1	24
87	4	3	17		1		1	1	3	2	4	7	1				44
88	1	1	1	1					1								5
92			1														1
93											1	1		1			3
95			9		1		4		1	1	4	3	1	1	1		26
96						1	1										2
98			3							1							4
99			1														1
100	1	1	4				1				1						8
101						1											1
102						1			1		1						3
103									1								1
104	3		1	2		4	4		1							1	16
ALL	26	11	99	17	20	14	52	7	45	13	30	29	10	4	6	14	397

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NORTHWEST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	6	8	12	15	24	25	26	34	36	45	ALL
2	3															3
3	3		5						1							9
4	1															1
5	5	10	3			1	4		2		1	2		1		29
6	6	2	1													9
7	3	3	1						1	1						9
9	1															1
10	2	2	1				1									6
12		1														1
13		3	2	1			1					1		1		9
15		2	4													6
16	1															1
17	1		1													2
18	1	5	4				2									12
19		4	1												1	6
20		5	1				2		1	1		3		1		14
21		2	2	1			1		1							7
22	1	1					1									3
23	1															1
25				1												1
26		2								1						3
27													1			1
28		1														1
31	2	5	1													8
32	1	2	1							1			1			6
33		1		5	1				3	1	2	2	2			17
34										1					1	2
35		1		4	2					1			2		2	12
36	1															1
37												1				1
38		1														1
43	3	3	2						1							9
44	1	1	1			1	1			1						6
45	5	1	1			2										9
47												1			1	2
50	3	7	2													12
52	1															1
72		1														1
75	1	7	2	8	3				1	4	1	1				28
77				1												1
78		3	2	5							2	3				15
79		1	2													3
80								1								1
81		2							1		1					4
82				1						1						2
85	1	8	1		1		2			2	1		1		1	18
87	26	185	48			5		13	5	27	7	13	10	3		342
88	1	4	1					2		2						10
89			1													1
92	1	2						1								4
93		1	1													2
95	4	9	5	2		2	2			5		1	2			32
96		1														1
98				1	1				1					1		4
99		1														1
100		3								1			1			5
102		1											1			2
103		1		1												2
104	2	5	2	2						2						13
ALL	82	300	99	33	8	11	17	17	18	52	15	28	21	7	6	714

NORTHEAST SHAPED TOOLS AND CORES BY TECHNO-STAGE AND TYPE

TYPE	TECHNO-STAGE 1	2	3	4	5	8	14	16	24	25	26	35	36	245	ALL
1		1											1		2
5	5		4	1	2	3	1	1		3	2		2		24
6		1	1			1			1	2			1		7
7	2	1	3						1	1	2				10
8	2	1	1			1		1		1					7
10	2		2						3	3	1		1		12
11			1						1		2				4
13		1	4	2		2	2		2	3		2			18
15			1		1		1		2	2		1	2		10
16										1					1
18	1	2	3		1		1			3					11
19									1	2		1			4
20		3			1		1		2	2					9
22			2		1	2				2					7
23			1	1		1			1	3	1	1			9
24			1			5				1			3		10
25					1										1
26					1						1				2
28					1										1
29					1										1
31		1	2			1					1		1		6
32		1	1		1	1			1	2	1				8
33			2		1		1	1	1	9	1		1		17
35					2	1			3	2		1			9
36					1					1					2
41									1						1
43			1			1	1								3
44	1		2												3
45										1					1
46									1	1					2
47									1	1					2
48										3					3
50	2	2	5			6			1	3	1				20
51										1					1
75				1	5	3				7		1	1	1	19
76														1	1
77			1							1					2
78		1	2			1	1		1	2					8
80			1							1					2
81					1				1	1					3
82									3						3
85		1	2						2	2	1			1	9
87	2	12	29	1			2		7	21	3	1			78
88			1							1				1	3
93							1								1
95			2			2			1	2					7
98		1	1		1								2		5
101												1			1
102			1												1
104		1	3			2			3						9
ALL	17	30	80	4	22	33	12	3	41	91	17	9	15	4	380

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TABLE 1:CENTRAL SECTION SITE DATA (VARIABLES USED IN ANALYSIS ARE UNDERLINED)

SITE	SITENAME	STLENGTH	STWIDTH	H2ODIST	MLU	NLITH	WTLITH
1	CE010	150	75	0	20	11	15
2	CE011	207	136	0	10	36	110
3	CE044	350	100	10	20	10	33
4	CE045	65	45	10	10	4	9
5	CE046	60	45	10	10	1	15
6	CE131	125	35	50	10	13	122
7	CE146	90	60	700	20	10	23
8	CE147	200	75	400	10	21	25
9	CE148	175	110	300	10	18	38
10	CE149	120	65	400	10	23	67
11	CE150	280	160	300	10	14	21
12	CE151	130	95	350	10	17	41
13	CE154	115	65	30	10	17	51
14	CE155	70	45	0	10	12	80
15	CE156	120	65	250	10	13	39
16	CE157	65	40	850	20	13	41
17	CW002	6	4	14	10	11	64
18	CW003	60	16	0	10	25	75
19	CW004	16	11	0	10	9	25
20	CW005	65	40	0	10	34	127
21	CW006	425	135	0	10	22	37
22	CW007	190	80	0	10	14	93
23	CW008	45	40	100	10	9	130
24	CW012	200	80	150	10	4	25

SITE	AREA	AVEWTLTH	DIST	STATE	PRED	RESID
1	11250	1.3636	near	fresh	15.0162	-4.016
2	28152	3.0556	near	dstrbd	15.0162	20.984
3	35000	3.3000	near	fresh	14.9822	-4.982
4	2925	2.2500	near	dstrbd	14.9822	-10.982
5	2700	15.0000	near	dstrbd	14.9822	-13.982
6	4375	9.3846	near	dstrbd	14.8459	-1.846
7	5400	2.3000	far	fresh	12.6313	-2.631
8	15000	1.1905	far	dstrbd	13.6534	7.347
9	19250	2.1111	far	dstrbd	13.9941	4.006
10	7800	2.9130	far	dstrbd	13.6534	9.347
11	44800	1.5000	far	dstrbd	13.9941	0.006
12	12350	2.4118	far	dstrbd	13.8237	3.176
13	7475	3.0000	near	dstrbd	14.9140	2.086
14	3150	6.6667	near	dstrbd	15.0162	-3.016
15	7800	3.0000	near	dstrbd	14.1645	-1.164
16	2600	3.1538	far	fresh	12.1202	0.880
17	24	5.8182	near	dstrbd	14.9685	-3.969
18	960	3.0000	near	dstrbd	15.0162	9.984
19	176	2.7778	near	dstrbd	15.0162	-6.016
20	2600	3.7353	near	dstrbd	15.0162	18.984
21	57375	1.6818	near	dstrbd	15.0162	6.984
22	15200	6.6429	near	dstrbd	15.0162	-1.016
23	1800	14.4444	near	dstrbd	14.6755	-5.676
24	16000	6.2500	near	dstrbd	14.5052	-10.505

TABLE 1 (cont'd)

SITE	SITENAME	STLENGTH	STWIDTH	H2ODIST	MLU	NLITH	WTLITH
25	CW013	500	150	60	20	22	88
26	CW014	350	100	750	10	2	14
27	CW015	300	100	350	10	6	17
28	CW017	140	100	100	10	10	27
29	CW018	100	30	40	10	12	49
30	CW019	150	80	200	10	7	35
31	CW020	100	60	600	10	10	54
32	CW021	80	60	600	10	9	45
33	CW022	130	80	400	10	7	45
34	CW023	130	90	700	10	9	33
35	CW027	500	300	150	20	14	37
36	CW028	620	190	1500	10	1	9
37	CW029	210	210	900	20	6	17
38	CW030	280	175	0	10	19	82
39	CW031	600	300	2000	10	11	47
40	CW032	280	130	150	10	7	14
41	CW033	250	150	1000	20	12	21
42	CW035	45	40	5	20	8	10
43	CW036	120	75	25	20	32	98
44	CW038	45	30	15	20	6	5
45	CW039	85	35	5	20	5	18
46	CW040	55	40	5	10	2	15
47	CW041	400	70	5	10	4	22
48	CW042	400	200	15	10	29	86

SITE	AREA	AVEWTLTH	DIST	STATE	PRED	RESID
25	75000	4.0000	near	fresh	14.8118	7.188
26	35000	7.0000	far	dstrbd	12.4609	-10.461
27	30000	2.8333	far	dstrbd	13.8237	-7.824
28	14000	2.7000	near	dstrbd	14.6755	-4.676
29	3000	4.0833	near	dstrbd	14.8799	-2.880
30	12000	5.0000	near	dstrbd	14.3348	-7.335
31	6000	5.4000	far	dstrbd	12.9720	-2.972
32	4800	5.0000	far	dstrbd	12.9720	-3.972
33	10400	6.4286	far	dstrbd	13.6534	-6.653
34	11700	3.6667	far	dstrbd	12.6313	-3.631
35	150000	2.6429	near	fresh	14.5052	-0.505
36	117800	9.0000	far	dstrbd	9.9056	-8.906
37	44100	2.8333	far	fresh	11.9498	-5.950
38	49000	4.3158	near	dstrbd	15.0162	3.984
39	180000	4.2727	far	dstrbd	8.2020	2.798
40	36400	2.0000	near	dstrbd	14.5052	-7.505
41	37500	1.7500	far	fresh	11.6091	0.391
42	1800	1.2500	near	fresh	14.9992	-6.999
43	9000	3.0625	near	fresh	14.9311	17.069
44	1350	0.8333	near	fresh	14.9651	-8.965
45	2975	3.6000	near	fresh	14.9992	-9.999
46	2200	7.5000	near	dstrbd	14.9992	-12.999
47	28000	5.5000	near	dstrbd	14.9992	-10.999
48	80000	2.9655	near	dstrbd	14.9651	14.035

TABLE 1 (cont'd)

SITE	SITENAME	STLENGTH	STWIDTH	H2ODIST	MLU	NLITH	WTLITH
49	CW047	45	30	300	20	9	49
50	CW048	90	80	350	20	7	32
51	CW049	100	55	350	20	8	23
52	CW050	40	30	400	20	7	40
53	CW053	45	15	300	20	6	23
54	CW054	55	25	250	20	16	49
55	CW056	60	50	300	20	9	25
56	CW058	170	75	400	20	4	15
57	CW059	160	140	250	20	7	20
58	CW060	75	40	100	20	8	19
59	CW061	55	40	400	20	7	14
60	CW062	25	15	800	20	0	0
61	CW063	130	90	500	20	13	24
62	CW064	150	100	350	20	40	66
63	CW065	220	80	300	20	10	39
64	CW066	175	150	5	10	12	38
65	CW069	20	19	60	10	1	8
66	CW079	76	55	10	10	115	489
67	CW134	160	75	45	10	13	40
68	CW135	200	175	50	10	31	53
69	CW136	55	35	700	20	11	19
70	CW137	350	100	300	20	29	87
71	CW139	120	110	300	10	8	11
72	CW140	250	175	400	20	14	30

SITE	AREA	AVEWTLTH	DIST	STATE	PRED	RESID
49	1350	5.4444	far	fresh	13.9941	-4.994
50	7200	4.5714	far	fresh	13.8237	-6.824
51	5500	2.8750	far	fresh	13.8237	-5.824
52	1200	5.7143	far	fresh	13.6534	-6.653
53	675	3.8333	far	fresh	13.9941	-7.994
54	1375	3.0625	near	fresh	14.1645	1.836
55	3000	2.7778	far	fresh	13.9941	-4.994
56	12750	3.7500	far	fresh	13.6534	-9.653
57	22400	2.8571	near	fresh	14.1645	-7.164
58	3000	2.3750	near	fresh	14.6755	-6.676
59	2200	2.0000	far	fresh	13.6534	-6.653
60	375	.	far	fresh	12.2906	-12.291
61	11700	1.8462	far	fresh	13.3127	-0.313
62	15000	1.6500	far	fresh	13.8237	26.176
63	17600	3.9000	far	fresh	13.9941	-3.994
64	26250	3.1667	near	dstrbd	14.9992	-2.999
65	380	8.0000	near	dstrbd	14.8118	-13.812
66	4180	4.2522	near	dstrbd	14.9822	100.018
67	12000	3.0769	near	dstrbd	14.8629	-1.863
68	35000	1.7097	near	dstrbd	14.8459	16.154
69	1925	1.7273	far	fresh	12.6313	-1.631
70	35000	3.0000	far	fresh	13.9941	15.006
71	13200	1.3750	far	dstrbd	13.9941	-5.994
72	43750	2.1429	far	fresh	13.6534	0.347

TABLE 1 (cont'd)

SITE	SITENAME	STLENGTH	STWIDTH	H2ODIST	MLU	NLITH	WTLITH
73	CW141	110	80	550	20	23	35
74	CW142	110	70	400	20	19	52
75	CW143	300	100	85	20	13	54
76	CW167	85	45	1400	10	8	25
77	CW168	100	50	0	10	8	137
78	CW169	150	100	2000	10	12	22
79	CW170	150	120	1000	10	14	44
80	CW171	240	200	70	10	5	11
81	CW172	260	250	1700	10	10	38
82	CW173	250	180	70	20	7	9
83	CW174	100	80	1500	20	6	22
84	CW175	140	55	2000	20	8	9
85	CW192	195	130	800	10	21	44
86	CW194	100	80	80	10	7	12
87	CW195	220	100	1500	10	34	122

SITE	AREA	AVEWTLTH	DIST	STATE	PRED	RESID
73	8800	1.5217	far	fresh	13.1423	9.858
74	7700	2.7368	far	fresh	13.6534	5.347
75	30000	4.1538	near	fresh	14.7266	-1.727
76	3825	5.1250	far	dstrbd	10.2463	-2.246
77	5000	17.1250	near	dstrbd	15.0162	-7.016
78	15000	1.8333	far	dstrbd	8.2020	3.798
79	18000	3.1429	far	dstrbd	11.6091	2.391
80	48000	2.2000	near	dstrbd	14.7777	-9.778
81	65000	3.8000	far	dstrbd	9.2242	0.776
82	45000	1.2857	near	fresh	14.7777	-7.778
83	8000	3.6667	far	fresh	9.9056	-3.906
84	7700	1.1250	far	fresh	8.2020	-0.202
85	25350	2.0952	far	dstrbd	12.2906	8.709
86	8000	1.7143	near	dstrbd	14.7437	-7.744
87	22000	3.5882	far	dstrbd	9.9056	24.094

TABLE 2: STATISTICAL RESULTS

Variable=NLITH

Moments

N	87	Sum Wgts	87
Mean	13.68966	Sum	1191
Std Dev	13.92948	Variance	194.0305
Skewness	4.781033	Kurtosis	32.33461
USS	32991	CSS	16686.62
CV	101.7519	Std Mean	1.493397
T:Mean=0	9.166787	Prob>|T|	0.0001
Sgn Rank	1870.5	Prob>|S|	0.0001
Num ^= 0	86		

Quantiles(Def=5)

100% Max	115	99%	115
75% Q3	16	95%	34
50% Med	10	90%	29
25% Q1	7	10%	4
0% Min	0	5%	2
		1%	0
Range	115		
Q3-Q1	9		
Mode	7		

Extremes

Lowest	Highest
0	34
1	34
1	36
1	40
2	115

Variable=H2ODIST

Moments

N	87	Sum Wgts	87
Mean	389.3563	Sum	33874
Std Dev	500.0917	Variance	250091.7
Skewness	1.815505	Kurtosis	2.855303
USS	34696946	CSS	21507890
CV	128.4406	Std Mean	53.61546
T:Mean=0	7.262016	Prob>|T|	0.0001
Sgn Rank	1501.5	Prob>|S|	0.0001
Num ^= 0	77		

Quantiles(Def=5)

100% Max	2000	99%	2000
75% Q3	500	95%	1500
50% Med	250	90%	1000
25% Q1	15	10%	0
0% Min	0	5%	0
		1%	0
Range	2000		
Q3-Q1	485		
Mode	0		

Extremes

Lowest	Highest
0	1500
0	1700
0	2000
0	2000
0	2000

TABLE 3: GENERAL LINEAR MODELS PROCEDURE

Dependent Variable: NLITH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	249.66965349	249.66965349	1.29	0.2590
Error	85	16436.9510362	193.37589454		
Corrected Total	86	16686.6206897			

R-Square	C.V.	Root MSE	NLITH Mean
0.014962	101.58011	13.905966	13.68965517

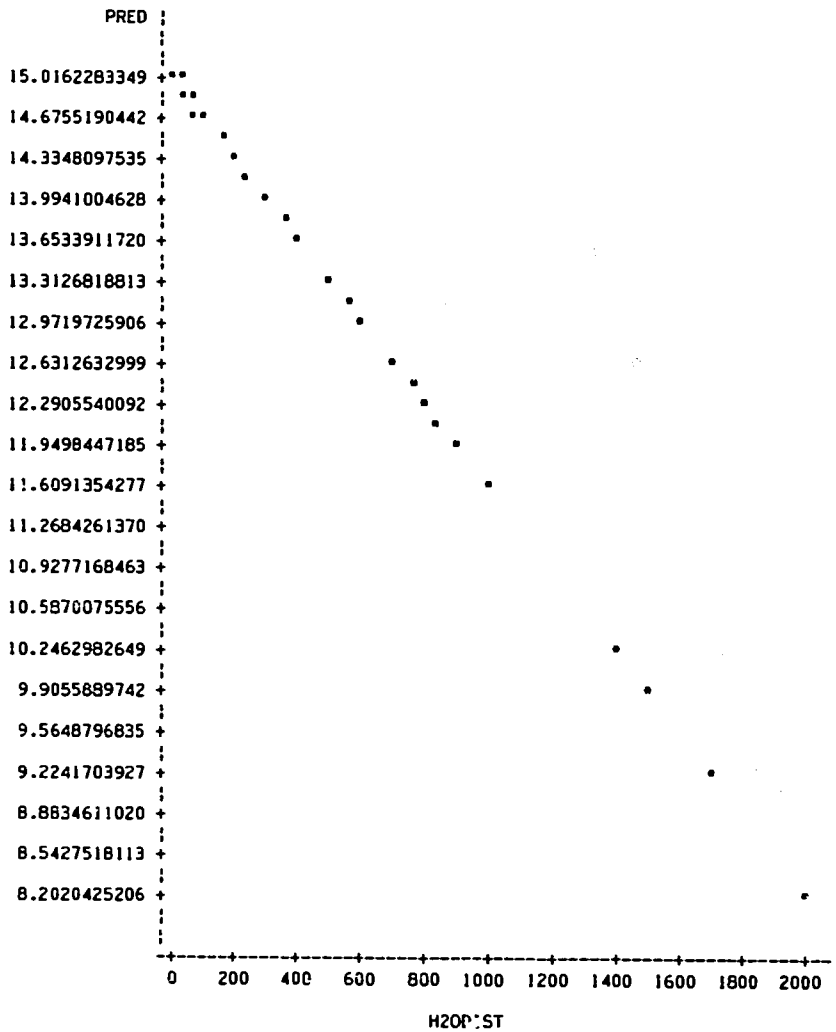
Source	DF	Type I SS	Mean Square	F Value	Pr > F
H2ODIST	1	249.669653	249.669653	1.29	0.2590

Source	DF	Type III SS	Mean Square	F Value	Pr > F
H2ODIST	1	249.669653	249.669653	1.29	0.2590

Parameter	Estimate	T for H0: Parameter=0	Pr > |T|	Std Error of Estimate
INTERCEPT	15.01622833	7.93	0.0001	1.8936000823
H2ODIST	-0.00340709	-1.14	0.2590	0.0029984877

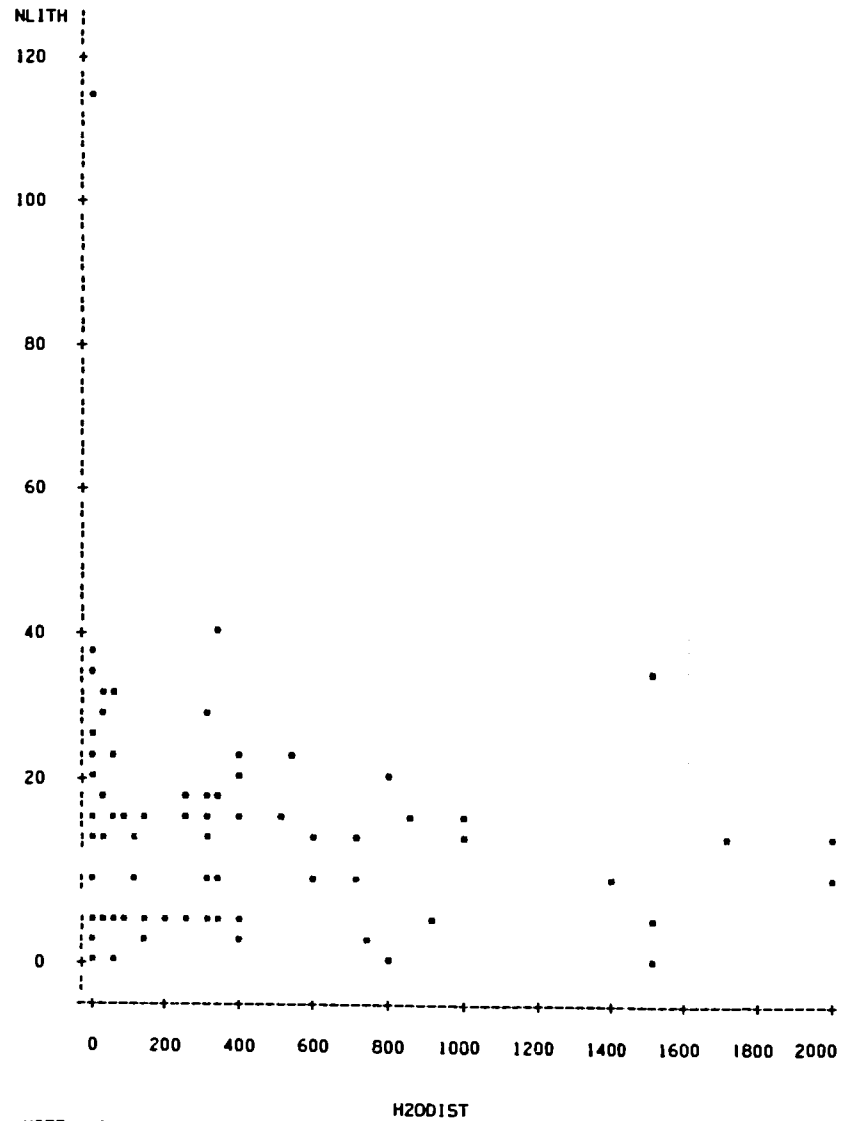
Sum of Residuals	-0.00000000
Sum of Squared Residuals	16436.95103617
Sum of Squared Residuals - Error SS	-0.00000000
First Order Autocorrelation	-0.09303831
Durbin-Watson D	2.14977606

FIGURE 1:PLOT OF PRED*H2ODIST



NOTE: 62 obs hidden

FIGURE 2: PLOT OF NLITH*H2ODIST



NOTE: 19 obs hidden

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Frequency of Pottery Sherds by Site and Section - Appendix E1

Key to headings:

SI = Site Number
ST = Techno-Stage
DECB = Decorated Body Sherds
DECR = Decorated Rim Sherds
NONS = Imported Non-Earthenware
PLRM = Plain Rim Sherds
PLNB = Plain Body Sherds
WT = Weight of All Sherds

SOUTHWEST SITES

SI	ST	DECB	DECR	PLRM	PLNB	ALL	WT
16	26	12			10	22	31
17	2	1	1			2	11
25	2	3			2	5	17
29	6	6				6	33
41	2	2	1		5	8	44
42	4				2	2	3
46	8				1	1	3
53	4		1			1	19
63	3		1			1	5
64	3	1				1	2
65	8	16		1	7	24	75
67	8	1	2		1	4	24
76	8				1	1	4
79	24		1		1	2	6
80	14	2	2		1	5	26
81	3				2	2	4
ALL		44	9	1	33	87	

SOUTHEAST SITES

SI	ST	DECB	DECR	PLRM	PLNB	ALL	WT
2	5	2				2	7
20	15	1			1	2	1
31	2	6	2	1	3	12	55
32	25	3			3	6	8
34	36	2	1		1	4	11
38	3	3	1			4	2
46	26	1	1			2	7
53	8	6				6	101
58	1	2			1	3	10
ALL		26	5	1	9	41	

CENTRAL WEST SITES

SI	ST	DECB	DECR	PLRM	PLNB	ALL	WT
15	3		1			1	10
26	9	3	1		25	29	74
27	9	6	2			8	20
28	8	29	20		3	52	479
34	9	22	2	5	37	66	94
37	9	25	1	2	9	37	82
38	24	8		2	14	24	37
52	2			1	1	2	4
54	2	30	1		90	121	363
57	9	15			51	66	109
59	4	13	3	1	18	35	134
62	6	5	1			6	30
74	3	3			6	9	61
138	9	16	11			27	186
142	25		1			1	8
ALL		175	44	11	254	484	

CENTRAL EAST SITES

SI	ST	DECB	DECR	PLRM	PLNB	ALL	WT
10	35	26	1	2	26	55	215
43	9	15			10	25	46
44	35	5	8	4	5	22	157
123	5				6	6	16
132	35	12				12	
145	9	18	6		7	31	
149	45	34	5		1	40	139
153	8	21			31	52	79
158	6	5	1		26	32	58
160	3	3	6		6	15	186
220	8	3	6	7	1	17	103
221	8	15			41	56	95
223	8	13	1		11	25	234
227	3	13				13	
236	36	23	3		35	61	
278	3	19	2		9	30	
282	24	39	6		18	63	269
ALL		264	45	13	233	555	

NORTHWEST SITES

SI	ST	DECB	DECR	NONS	PLRM	PLNB	ALL	WT
88	2	21			3		24	106
110	3	20				5	25	94
125	4		1			4	5	27
131	9	6				1	7	17
132	4	12	1			9	22	82
154	24	1			1	4	6	32
156	9	5	4	2		7	18	103
179	2	4	4		2	4	14	105
193	8	4	1			4	9	78
196	24	3	1			1	5	34
197	2	1					1	2
203	9	9	10	3		3	25	157
204	9	5	2			5	12	96
208	9	1	1			5	7	27
209	9	1	2			10	13	130
210	1	4		3		3	10	22
211	8					3	3	7
213	9	7	4			1	12	79
214	9	3				5	8	62
215	2	1	2	1		2	6	79
ALL		108	33	9	6	76	232	

NORTHEAST SITES

SI	ST	DECB	DECR	NONS	PLRM	PLNB	ALL	WT
61	8	1	1				2	37
71	3	1	2				3	49
88	8	19			2	18	39	87
90	5	1	1				2	7
106	25	6	2			2	10	38
124	2		1				1	8
126	3	2	1			30	33	195
129	2		1				1	9
130	8	68	4			56	128	342
135	5			1			1	1
143	25	1	2			3	6	25
145	25	2	1				3	23
165	1	1					1	28
168	2	15	5			1	21	106
169	2			1		8	9	66
179	25	1					1	5
183	3		2		1	4	7	57
187	9	14	11			15	40	220
189	9	3	10			11	24	331
190	9	5				2	7	37
191	3					3	3	18
192	8	1	2		1	2	22	70
193	5					1	9	34
ALL		165	46	2	4	156	373	

Key to Headings:

SI = Site Number

WEA = Weathering: 1 - Little
2 - Moderate
3 - Heavy

COL = Firing Color:

1 - Buff/Brown-Grey/Black-Red
2. Red-Buff/Brown-Red
3. Buff/Brown-Buff/Brown-Buff/Brown
4. Red-Grey/Black-Red
5. Grey/Black-Buff/Brown-Grey/Black
6. Buff/Brown-Buff/Brown-Red
7. Buff/Brown-Grey/Black-Grey/Black
8. Grey/Black-Grey/Black-Grey/Black
9. Grey/Black-Grey/Black-Buff/Brown
10. Buff/Brown-Buff/Brown-Grey/Black
11. Grey/Black-Buff/Brown-Buff/Brown
12. Red-Buff/Brown-Grey/Black
13. Grey/Black-Grey-Black-Red
14. Buff/Brown-Grey/Black-Buff/Brown
15. Red-Red-Red
16. Red-Buff/Brown-Buff/Brown

PIT = Evidence of Pitting: 1-Yes

SOO = Evidence of Sooting: 1-Yes

#VE = Minimum Number of Partially Reconstructable Vessels

VET = Vessel Form:

1-Cooking pots
2-Incense burners
3-Braziers
4-Coffee pots

RMT = Most Common Rim Type:

1-Straight walled/outcurved lip
2-Straight walled/incurved lip
3-Converging walls/rounded lip
4-Straight walled/rounded lip
5-Incurvate/rounded lip
6-Baydhabo
7-Converging walls/outcurved lip

MRD = Minimum Rim Diameter

MXR = Maximum Rim Diameter

ARD = Average Rim Diameter

MRT = Minimum Rim Thickness

MXT - Maximum Rim Thickness

ART = Average Rim Thickness

MBT = Minimum Body Thickness

MXT = Maximum Body Thickness

ARB = Average Body Thickness

SOUTHWEST SITES

SI	WEA	COL	PIT	SOO	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
16	2	5			1									4.7	5.2	5.0
17	2	2			1		1	7.5	7.5	7.5	7	7	7	8.6	8.7	8.7
25	2	3			2									6	6.3	6.2
41	2	5			1		2				13	13	13	7	8.4	7.7
63	2	6			1		4	5	5	5	8.9	8.9	8.9	7	7	7
64	2	6			1									6.5	6.5	6.5
65	1	7			4		1	6.5	6.5	6.5	6	6.3	6.2	4.4	6.6	5.5
67	3	2			2		3	11	11	11	8.2	11	9.4	7.4	7.4	7.4
79	2	9			1		4				5.4	5.4	5.4	7.4	7.4	7.4
ALL								5	11	7.4	5.4	13	8.2	4.4	8.7	5.9

SOUTHEAST SITES

SI	AGE	WEA	COL	PIT	SOO	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
31	1	1	1			6		1	6.5	9.5	7.8	7.4	12	8.9	5.1	8.9	6.9
32	1	2	9			1									6.4	6.4	6.4
38	1	1	4			2									4.8	6.1	5.6
53	3	3	3			1	3					13	13	13	6.1	15	8.5
58	1	1	4			1									7.5	7.6	7.6
ALL									6.5	9.5	7.8	7.4	13	9.7	4.8	15	7.3

CENTRAL WEST SITES

SI	WEA	COL	PIT	SOD	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
15	1	4			1									5.2	5.2	5.2
28	3	3					1				7.4	20	13	4.6	11	6.8
34	2	11				1	1	8.5	9	8.8	8.2	9.4	8.8	2.4	8	4.6
37	1	3			3		1	8.5	8.5	8.5	7.1	7.1	7.1	6	6.9	6.3
38	1	3			3		1	9	10	9.5	7.2	7.5	7.4	3.7	7.2	4.8
54	3	3	1				5							3.3	7.1	4.5
57	2	3												3.7	5.7	4.6
59	2	6		1			1	7.5	11	8.7	9.3	20	14	4	8.5	6.1
62	1	3			1		1				6.7	6.7	6.7	5.5	5.5	5.5
138	2	4			1		1	5.4	7.5	6.4	6.8	16	11	4.9	7.8	6.3
142	1	13			1		1	7	7	7	8	8	8			
ALL								5.4	11	8.0	6.7	20	12	2.4	11	5.4

CENTRAL EAST SITES

SI	WEA	COL	PIT	SOD	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
10	2	5		1		3					4.4	4.4	4.4	3.1	7.3	4.8
43	1	8			1									3.2	4.7	4.0
44	2	4			4	1	1	8.5	9.5	9	6	11	7.6	4.2	7.3	5.1
123	2	8			1									5.4	5.4	5.4
132	1	3			1									4.6	5.6	5.1
145	1	9			4	2	1	4.5	5	4.7	8.1	12	10	4.3	8.6	5.6
149	1	3		1	2	1	1	7	7	7	7.5	7.7	7.6	2.9	6.8	4.5
153	2	10			2									3	4.5	3.8
158	1	3			5		1	6.8	6.8	6.8	7.4	7.4	7.4	3.4	6.9	5.1
160	1	14		1	1	1	1	5.5	5.5	5.5	7.1	7.1	7.1	6	7	6.6
220	2	5			3		1	5.5	8	7	7.4	0.6	7.8			
223	1	8		1	1	1	1	6.8	6.8	6.8	11	11	11	6.5	6.5	6.5
227	1	5	1	1	1									4.8	7.1	5.9
275	2	10	1				1	7	7	7	5.5	7.5	6.5	3.7	6.5	5.4
278	2	8		1	1									4.1	5.3	4.6
282	1	14			2	1	1	7.5	7.5	7.5	6.1	7.9	7	3.1	5.1	3.9
ALL								4.5	9.5	7.3	4.4	12	7.8	1.2	9.7	4.8

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NORTHWEST SITES

SI	WEA	COL	PIT	SOO	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
88	1	13			3		1	6	8	7	6.1	7.2	6.7	3.1	7.7	4.7
110	1	13			1									2.9	5	3.9
131	2	5			3									4.1	5.6	4.9
132	1	4		1	2		4				6.3	6.3	6.3	4.1	6.5	5.0
146	3	1			2		4				11	12	12	8.4	8.4	8.4
154	2	2			3		4	5	6.8	5.9	8.7	10	9.4	6.8	8.5	7.7
156	1	4					1	5.8	6.5	6.1	8.2	15	12	4.5	8.6	6.9
179	2	1					1	6	9.8	7.9	8.6	11	9.9	5.7	8.5	7.3
193	2	1			4		1	5	5	5	11	11	11	4.4	7.5	6.0
203	2	14	1				1	6	11	7.8	5.6	10	13	5.6	8.5	7
204	2	9			5		2	4.5	5.8	5.2	10	11	10	4.4	8.4	6.7
208	1	13			1									3.9	3.9	3.9
209	2	2			3		1	6.5	6.5	6.5	11	11	11	6.3	7.1	6.7
210	1	3			2									5.9	8.3	7.1
213	1	8			2		1	6	6.4	6.3	6.7	7.4	7.0	3.3	4.5	3.6
215	2	4			2		1				12	12	12	6	7.7	6.9
ALL								4.5	11	6.6	5.6	18	11	2.9	8.6	5.5

NORTHEAST SITES

SI	WEA	COL	PIT	SOO	#VE	VET	RMT	MRD	MXR	ARD	MRT	MXT	ART	MBT	MXB	ABT
61	2	16			2	3								13	18	15
71	1	13			2		1				6.5	7.3	6.9	6.1	7.2	7.2
106	3	6					3				7.4	15	11	5.1	7.3	5.9
126	2	13			2		4	6	6	6	11	11	11	7.5	9.8	8.7
129	1	2			1		1				5.5	5.5	5.5	6.2	6.2	6.2
130	1	3	1		2		3	6.8	10	8.6	6.8	16	13	3.7	16	0.7
143	1	3			2		1				5.3	6	5.8	4	7.4	5.4
145	1	13			2		1				8.8	8.8	8.8			
165	2	8			1									8.3	0.3	8.3
168	1	2					1	5	7.5	6.1	7.5	14	10	4.7	6.4	5.5
179	1	14			1									5.1	5.1	5.1
183	3	11			3		4	9.4	10	9.7	8.9	17	12	5.3	6	5.7
187	1	7				4	1	5	8	6.6	4.3	11	8.5	3	9.6	6.6
189	2	3	1		4	2	1	3.4	7.4	5.9	6	17	11	5.3	14	8.0
190	2	1					4							4.4	7.7	5.8
192	1	3					4				9.3	10	9.8	4.2	8.5	5.8
ALL								3.4	10	6.7	4.3	17	10	3	18	7.3

Key to coding values is presented in Appendix B3, except for "Pattern" (Ware) which is as follows:

1-Hawal Dheeri

2-Bardaale

3-Buur Dinsor

4-Buur Xakaba

5-Baydhabo

6-Jilib/Jamaame

Examples:

21 = Incised Halbad Jooge motif on the body

102 = Incised Xariijin motif on the rim

223 = Stamped Honey Comb motif on the lip

SOUTHWEST SITES

		TYPE, LOCATION, AND PATTERN OF DECORATION													
		21	61	101	102	103	121	122	141	161	201	211	212	ALL	PATTERN
S	16			8										8	
I	17				2									2	
T	25	1				3								4	
E	41			2								1		3	
	63		1											1	
	64											1		1	
	65	5		10	1			1						17	1,2
	67		1										1	2	
	79									1	1			2	5
	ALL	6	2	20	3	3		1		1	1	2	1	40	

SOUTHEAST SITES

		TYPE, LOCATION, AND PATTERN OF DECORATION													
		11	21	61	62	69	89	101	102	112	121	211	215	ALL	PATTERN
S	31		2					2	2					6	3
I	32	1						1						2	
T	38	1	2	1										4	
E	53				1	1	1	1		2	4	4	1	15	6
	58		2											2	1
	ALL	2	6	1	1	1	1	4	2	2	4	4	1	29	

CENTRAL WEST SITES

TYPE, LOCATION, AND PATTERN OF DECORATION

		11	12	15	16	21	22	25	32	51	52	61	62	63	101	102	121	122	141	151	161	171	172	201	211	212	213	215	221	231	241	ALL	PATTERN
S	15					1									1						1				1							4	
I	28	2	2		1	4	3	1	1			4	3		13	15	5	1	2			1	4		5	12	1			1		81	
T	34					19									4		2							3	4							32	5
E	37	2	1							2	1				2	1					1											10	
	38					2	2								6	1					1				4							16	1
	54					1									29	1			5							2						38	6
	57					12									2		6				1											21	1
	59	5				1	1	2				2	1		9	1	4				1	1			1			1				30	2
	62	1												1	1	1											1					5	
	138	9		2	2	6						1			21	3	7			6					2				1		2	62	
	142															1																1	
	ALL	19	3	2	3	46	6	3	1	2	1	7	4	1	88	24	24	1	7	6	5	2	4	3	17	14	2	1	1	1	2	300	

CENTRAL EAST SITES

TYPE, LOCATION, AND PATTERN OF DECORATION

		11	21	61	62	101	102	121	122	151	161	162	211	212	216	222	ALL	PATTERN
S	10	1	4			15		7			4		7		1		39	1,6
I	43		12			2		12					1				27	2
T	44	1	1		1	4	1	1				5	2				16	3
E	123							1									1	
	132							3									3	
	145	5	4			7		2			1		2			1	22	2
	149	4	21			12		4					7				48	5
	153		12	2				3			1						18	2
	158	1	2			1		4					1				9	
	160		5				2										7	2
	220				2		7							5			14	2
	223					1											1	2
	227	2	9			5		1									17	2
	278	9				5		1									15	2
	282		28			1		5		3	5		6	6			54	1
	ALL	23	98	2	3	53	10	44		3	11	5	26	11	1	1	291	

NORTHEAST SITES

TYPE, LOCATION, AND PATTERN OF DECORATION

	11	12	15	16	18	21	22	25	61	62	63	101	102	103	104	112	113	121	122	131	141	142	161	162	171	172	173	201	211	212	213	214	219	221	241	ALL	PATTERN
S 61						1						1																									
I 71				1								2	1										1						1							4	
T 106	2					4				1		3	1						1						1				1	1						8	
E 126	1								1			2									1															12	
129	1											1																								4	
130	15		9			76			8		4	25	1					28			1		15		1			6	1							2	
143	1					4				2		1	2					1					2													190	1,2
145												1																		1						14	1
165																																				1	
168			2			4	1					11	1			1		1																		1	
179																		2			1		1		2				1	1						28	
183	1																						1													1	
187	2	2	1			7						1																								2	
189	1		5	1		8		1	1			8	3	1				2		1			1	1	2	1			2	1	1					36	
190	2		3			6			1			12		1			1	4	3			1	1		2		1		1	1	1	1	1		1	49	3,6
192	2		3		1			1	2			7						1																		20	
ALL	28	2	23	2	1	110	1	2	13	3	4	15			1			12					1						1					1		40	1
												90	9	2	1	1	1	51	4	1	3	1	23	1	8	1	1	6	8	5	2	1	1	1	1	412	

NORTHWEST SITES

TYPE, LOCATION, AND PATTERN OF DECORATION

	11	12	15	21	25	26	61	101	102	121	122	141	161	163	171	211	212	ALL	PATTERN
S 88				10						9			3					22	1
I 110				13				5		2								20	1
T 131					1			4		1			1					7	
E 132	4			3			1	3	1	1	1		2					16	
154	1			1				2		1						1		6	
156								2	3	1						3		9	
179			1		1	1		4	2						1			10	
193	1			2	1			3		2								9	4
203	3				1		1	9		3		1	1	1		1		21	5
204	1	1						1	1	2								6	
208				1														1	
209							1	1	1								1	4	
210	2							2										4	
213	2							5	2				2			4	2	17	
215				1														1	
ALL	14	1	1	31	4	1	3	41	10	22	1	1	9	1	1	9	3	153	

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Pastoral Economy and Seasonal Livestock Movements in the Jubba Valley

prepared by
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Dr. Jörg Janzen, pastoralism specialist, carried out field investigations in Somalia from 2 January to 24 February 1988. Research included two aerial reconnaissance surveys of the Jubba Valley and intensive, on-ground follow-up investigations and interviews with pastoralists in the valley.

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1. EXECUTIVE SUMMARY

This report deals with the importance of nomadic pastoralism in the greater Jubba River Valley in southern Somalia (see Figure 1 at the front of this volume). More than 50 percent of the population of Somalia practice mobile livestock-keeping, partly for subsistence but with a steady transition to semi-commercial activities. This portion of the population has an estimated 40 million head of livestock.

Pastoral activities are influenced by local and regional soil and climatic factors. Movement is generally north-south, depending on the season, which determines the geographic availability and quality of fodder and feeds. Ephemeral (rainfed), perennial (river), and artificial (man-made) water sources also determine migration routes and concentrations, as well as the locations of livestock markets and services.

Droughts in the 1970s and 1980s and loss of livestock export markets have resulted in many pastoralists adopting the more sedentary livelihood of agro-pastoralism.

An evolution of traditional pastoral practices and covenants and recently introduced government-sponsored regulations and development have resulted in changes in the socioeconomic relationships between the settled population and nomadic pastoralists. While these changes are, in general, mutually beneficial and accommodating, conflicts have erupted due to the loss of traditional dry-season pasturing areas, which may be "locked-up" by agriculturalists or charcoal producers.

Three major changes have affected traditional migration patterns, having both positive and negative effects. These changes are:

- formal abolition, in 1971, of clan boundaries and their grazing and watering rights, as well as nationalization of lands not regularly cultivated;
- development of numerous high-capacity deep wells and water catchments (government/development agency financed and privately/cooperatively owned); and
- expansion of irrigated and rainfed agriculture along the river.

These changes improve carrying capacity for livestock but lead to overgrazing and overstocking as pastoralists flock to the new areas. Also, traditional pasturing areas along the banks of the Jubba are being lost to large- and medium-scale agriculture of mainly export-oriented crops. These effects may be exacerbated by the closure of the Baardheere Dam and subsequent development of the Jubba Valley.

The development of the dam and valley will have additional effects on mobile livestock-keeping, including:

- loss of traditional watering points in the reservoir area and downstream;
- limitation of river-crossing points to bridges, as the higher water level will hinder the animals' movement across the river;
- reduced dhesheeg (seasonally inundated depression) watering as a result of flood control;
- reduced access to the river as riverine areas are taken up by intensified agriculture;
- loss of good grassland to irrigated and/or rainfed agriculture;
- increased tsetse, malaria, and bilharzia infestation due to an increase in irrigated land;
- potential loss of fodder with the shift to export-oriented crops;
- more tsetse and biting flies in the reservoir area and increased propagation of crocodiles due to increased habitat; and
- loss of river-crossing points between Baardheere and Luuq to the Baardheere Reservoir.

The following steps are recommended to protect the economy and well-being of mobile livestock-keepers when planning the development of the Jubba Valley:

- construction of riverine watering facilities at strategic locations along the river and in the reservoir area;
- construction of new bridgesand/or establishment of ferry crossings, based on locations of traditional crossing points;

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- preservation of most important dhesheeg watering points by constructing small canals to create artificial floodings;
- creation of strategically placed corridors, several hundred meters in width, through agricultural land, to give livestock access to the river;
- creation of dry-season pasture/fodder reserves in selected good grassland areas in the river's floodplain and coastal plain;
- intensification of eradication/control programs for tsetse, malaria, and bilharzia;
- development of a well-planned agricultural mix of traditional staple crops and export crops; and
- compensation to agro-pastoralists for land lost to the reservoir.

II. INTRODUCTION AND STATEMENT OF PROBLEM

A. Economic Significance of the Livestock Sector for Somalia

Somalia belongs to those countries in the dry belt of Africa where the highest proportion of the population is engaged in mobile livestock-keeping. According to estimates for 1986, Somalia had about 40 million head of livestock–18.9 million goats, 11.2 million sheep, 6.1 million camels, and 4.5 million cattle (see Table 1). The total number of livestock is slowly increasing.

Livestock-keeping is mainly carried out by herders leading a mobile way of life, well-adapted to the arid and semiarid environmental conditions of the Horn of Africa. According to 1987 estimates, based on the 1975 census, approximately 24 percent of the current population of 5.5 million are urban, 45 percent are pastoralists/nomads, and 31 percent are farmers and agro-pastoralists settled in rural areas (MNP 6/1987:2). A high percentage of the settled population own livestock, although their number is smaller than the nomads. This is particularly true in areas away from the river, where some families, having recently settled in villages, lead a seasonal nomadic life with their livestock. According to observations made by the author, the percentage of the population practicing mobile livestock-keeping is still more than 50 percent.

Table 1. Livestock Distribution in Somalia (1986)

REGIONS	CATTLE	CAMELS	SHEEP	GOATS
		(in thoudands)		
Northern				
West Galbeed	164.34	680.06	2,671.30	2,719.20
Togdheer	49.87	359.10	1,091.10	1,072.06
Sanaag	83.90	230.05	1,809.82	835.50
Nugaal	13.60	173.94	265.34	2,636.11
Bari	17.00	269.33	1,647.99	769.00
Sub-Total	328.71	1,712.48	7,485.55	8,031.87
Central				
Mudug	385.37	842.78	1,351.77	3,452.70
Galgaduud	274.09	443.27	699.65	2,181.87
Hiraan	192.68	517.33	341.49	1,458.35
Sub-Total	852.14	1,803.38	2,392.91	7,092.92
Southern				
Middle Shabeelle	432.97	230.05	386.71	905.96
Lower Shabeelle	433.47	328.80	107.09	251.65
Benaadir	24.93	1.12	7.14	23.90
Bakool	113.34	215.46	94.00	344.77
Bay	289.02	406.24	65.44	241.59
Sub-Total	1,293.73	1,181.67	660.38	1,767.87
Trans-Jubba				
Gedo	598.45	879.81	594.94	912.26
Middle Jubba	414.84	246.84	29.75	905.97
Lower Jubba	975.89	249.13	83.29	159.80
Sub-Total	1989.76	1375.78	707.98	1978.02
National Total	4,463.76*	6,073.31	11,246.82	18,870.69

**The national total of cattle including the influx of cattle with the refugees in the late 1970s is estimated to be 5487.00. Source: MLFR 11/1987:18*

Although the majority of Somali livestock is kept to satisfy the subsistence needs of the rural population, the sale of livestock plays an increasingly important role. Three main factors have led to a more market-oriented production:

- rapid population growth (three percent annually) combined with rapid urbanization, leading to increased demand for meat in the internal markets;
- a large increase in livestock exports to the Arabian Peninsula, Saudi Arabia in particular, since the mid-1960s; and
- rapid increase in prices for basic foods and simple consumer goods, forcing nomads to sell livestock to satisfy this need.

While no statistical data are available on domestic consumption of livestock in Somalia, the export statistics underscore the importance of the livestock sector in the Somali economy. Livestock exports represent the main source of foreign exchange for Somalia, with annual revenue during the last 15 years ranging between 70 and 90 percent of total foreign exchange (Janzen 1986c:43). Statistics show goats and sheep are Somalia's main livestock exports. Camel sales have fallen since 1980, and the May 1983 Saudi Arabia ban on Somali cattle caused a considerable decrease in cattle exports (see Figure 2).

Due to the significance of the livestock sector for the national economy, the spatial and environmental requirements of the mobile livestock keepers have to be taken into consideration–more than in the past–when dams and large agricultural development projects are planned; and the livestock economy and spatial utilization of the natural resources of the Greater Jubba Valley (GJV) will have to be part of future economic, social, and environmental planning.

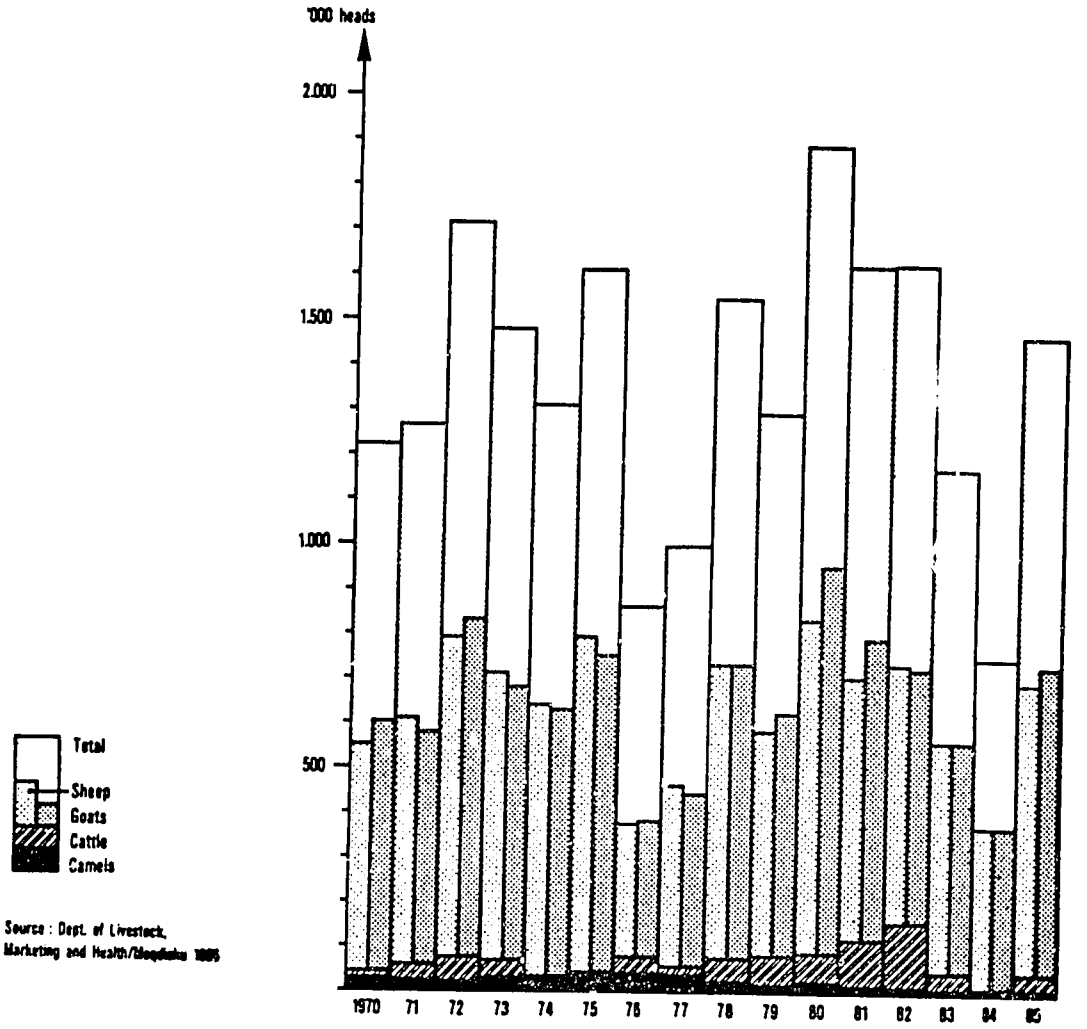

Figure 2. Livestock exports.

B. Scope of Work and Statement of Problem

The aim of the pastoral study in the GJV was to assess pastoral patterns and movements in relation to seasonal use of riverine resources. Patterns of pastoral production, their socioeconomic and temporal contexts, and the degree of economic dependance of the Jubba Valley were clarified.

A principal goal of this study was to increase knowledge of seasonal livestock movements and use of the resources of the riverine areas and adjacent zones. The traditional forms of economic and spatial behavior, as well as recent changes in the population groups involved in mobile livestock-keeping, were of principal interest. The study was based on the hypothesis that the Jubba River and the pasture and cultivation areas of the floodplain are a very important sphere of existence for the mobile livestock-keepers of the GJV, since these areas supply water and fodder throughout the dry seasons.

The mobile livestock-keepers' way of life and economy is optimally adapted to the existing natural, socioeconomic, and political-administrative conditions. Any massive external intervention in the existing structures of the Jubba Valley will inevitably lead to major changes in living and economic conditions for all inhabitants. The proposed construction of the Baardheere Dam is such an intervention.

For the pastoral economy, hindrance of the existing seasonal migration pattern is a major threat. It

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should be kept in mind that only maximum livestock mobility allows optimal use of existing resources and maintenance of the ecological balance. Disintegration or neglect of mobile livestock-keepers will lead to economic and social disadvantages for this particular group, which will increase pressure on the labile ecological balance and cause numerous conflicts with settled farmers and governmental executives, as well as among the mobile livestock-keepers themselves. Therefore, integration of the livestock-keepers into development planning and consideration of their needs are requirements for the success of the Jubba Valley Development Program.

To verify this hypothesis, the following questions have to be answered:

- When, how, and to what extent do the mobile livestock-keepers use the water and fodder resources of the Jubba Valley?
- What are their migration routes, and where do they live during the different seasons?
- Where and what are the names of their main wells, crossing points, and grazing areas?
- What is the structure of the pastoral economy, and of what economic importance are extra-pastoral activities?
- What economic contact is there between the mobile livestock-keepers and the settled population of the Jubba Valley?
- What are the main problems posed to the way of living and economy of the mobile livestock-keepers?
- what changes have taken place in the way of living and the economy of the mobile livestock-keepers over the last two decades, what was the origin of these changes, and what consequences to the use of the natural resources have resulted from these changes?
- What positive and negative changes for the pastoral economy of the GJV can be predicted as a consequence of construction of the Baardheere Dam?
- What development planning measures could minimize the expected negative consequences;? And,
- What potential economic development is there for the mobile livestock-keepers of the GJV as a result of future Jubba Valley development?

C. Methodology

The research work in Somalia consisted of investigations in Muqdisho, including library work, meetings with experts of various institutions and government officials, preparation of the field trips, and field work in the GJV. Five of the nearly eight weeks of this consultancy were spent in the field. Taking into account the relatively short study period, the fact that field work was done alone with the help of three Somali crew members, and that an area of more than 120,000 square kilometers had to be surveyed to obtain a coherent picture of the spatial pastoral pattern, time-saving methods had to be practiced. In this context, it should be mentioned that the work could not have been carried out successfully without the broad knowledge the author gained from field trips to the GJV in previous years.

During the two field-research periods, the following methodology was employed:

Aerial reconnaissance flights were seen as the best method to gain an overall orientation as to herd location, pastoralist concentration, and distribution of watering points.

All important settlements and most of the principal watering points for livestock were visited and informal interviews were conducted. To obtain reliable information, experienced people such as village elders and chiefs, government employees, and older nomads were interviewed.

Supplementary information about the socioeconomic situation was collected by interviewing pastoralists, using a standardized questionnaire. More than 40 interviews were conducted during the two field trips. As the number of interviews and the amount of information obtained are not sufficient for a quantitatively sound result, the standardized questionnaire was mainly used to cross-check information obtained from the informal interviews.

Information on land-use systems of the pastoralists, their spatial mobility pattern, important watering points on the Jubba River and inland, river crossing points, and principal grazing areas are illustrated in two thematic maps.

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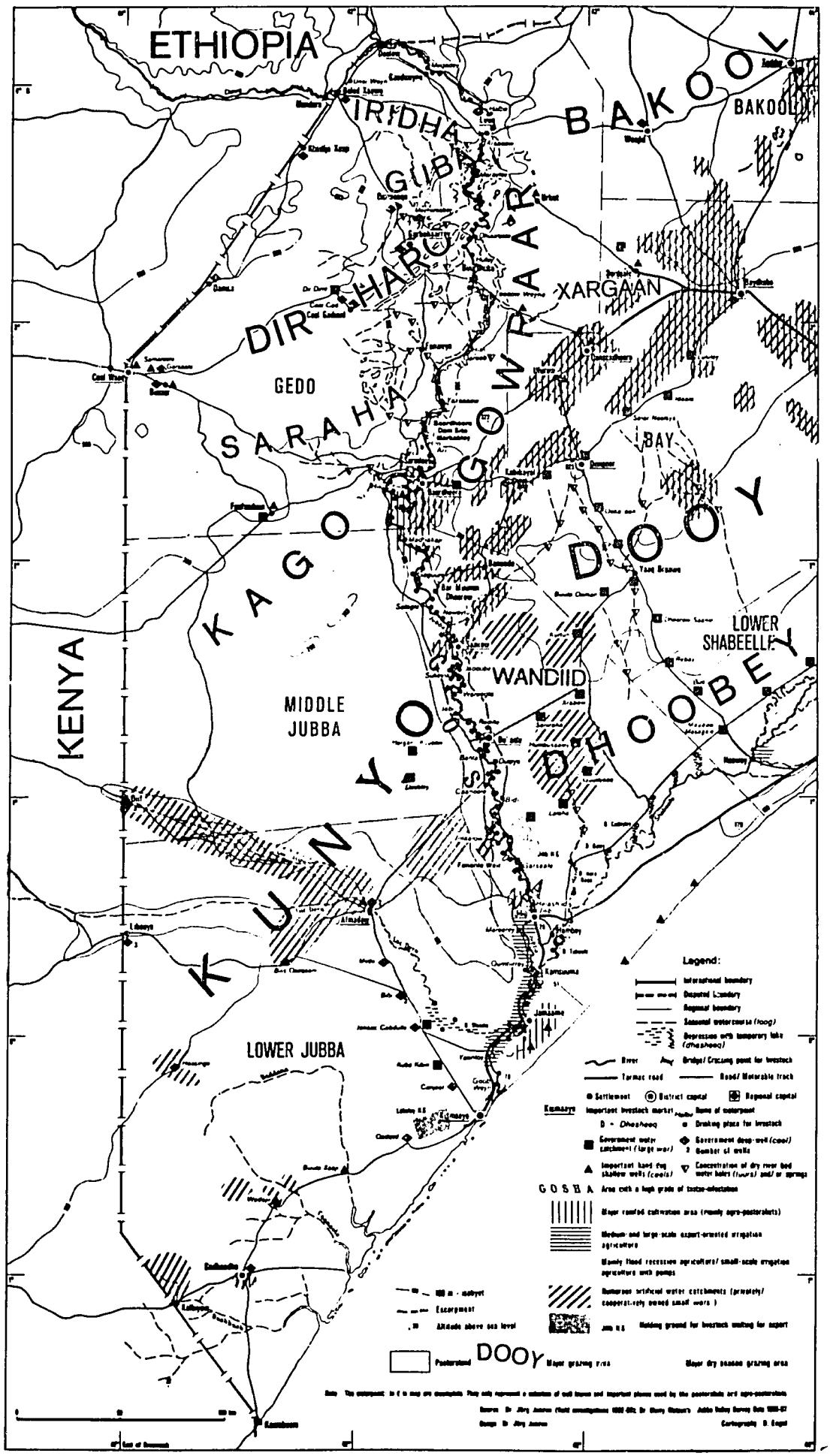
Map 1: The Greater Jubba Valley - Infrastructure, Land Use and Water Resources -



III. NATURAL CONDITIONS FOR LIVESTOCK-KEEPING IN THE GREATER JUBBA VALLEY

The pastoral land-use system of the GJV can only be understood and explained by taking into account the physio-geographic characteristics of the study area, including topography, climate, water availability, soils, and vegetation.

A. Topography and Landforms

As far as topography and landforms are concerned, the study area can be divided into two areas, northern and southern, with the boundary drawn approximately at the latitude of Baardheere. The northern area is characterized by mountainous plateau areas of Jurassic and Tertiary limestone formations, the highest points, in the Qansaxdheere District, reaching about 400 meters above sea level. The Jubba River has cut deep into these sedimentary formations, creating a gorge reaching from south of Luuq to north of Baardheere. The surrounding plateau zones show many large and small *toggas* (tributaries), mainly pointing towards the Jubba Valley (see Map 1).

The southern area is characterized by vast plains in the Middle Jubba and western Bay regions, slowly sloping down to the Jubba floodplain and the lowlands of the Lower Jubba Region. The floodplain of the Jubba, narrow between Baardheere and Saakow, widens further to the south, producing numerous dhesheegs. Near the Indian Ocean, the lowlands are bordered by a ridge of fossil sand dunes partly covered by recent mobile dunes.

B. Climate

The climate of the GJV can be characterized as arid to semi-arid and hot, with mean annual high temperatures reaching 30.6° C in Luuq, 28.9° C in Baardheere, and 27.7° C in Jilib. The mean annual precipitation is 309 millimeters, 384 millimeters, and 586 millimeters, respectively (see Figure 3). The bulk of the rainfall occurs in the gu' (April to June) and deyr (October to December) seasons. In xagaa (July to September), the short dry season, the so-called xagaa rains prevail in the coastal zone of Lower Jubba, occasionally also reaching the Middle Jubba Region. The long dry season beginning in December and lasting until March/April is called jiilaal. This part of the year, when there is almost no rain and very little pasture, is the hardest time for the pastoralists and their animals.

C. Soils and Vegetation

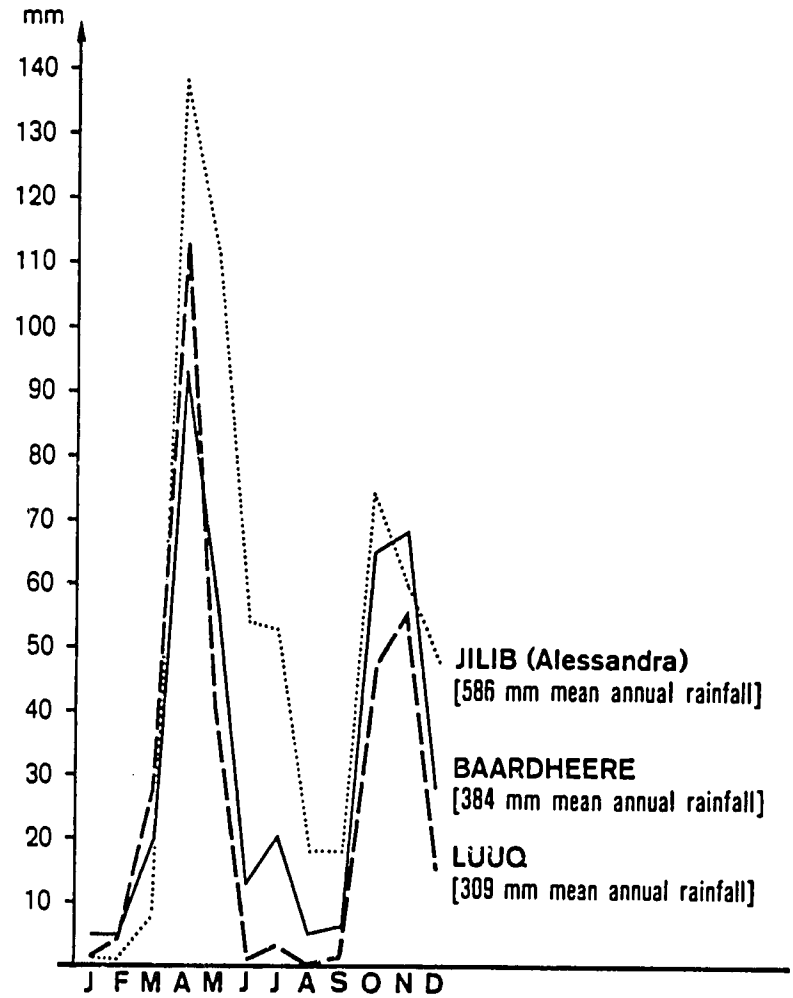
In the study area, the population classifies the soils into three main types:

- *carro gaduud (dooy)*–red soil;
- *carro cad/jabey (bakool)*–white soil; and
- *carro madow/adhable (dhoobey)*–dark/black soil.

While the red soil contains a high percentage of sand, the dark soils are mainly heavy clay. The white soils show similar characteristics to the dark soils and can often be found in transition zones between the red and dark soils. Red soils can be found mainly in the Bay Region, in the so-called dooy area east of Diinsoor to Buurhakaba, as well as from Diinsoor to south of Yaaq Baraawe. This soil also occurs in large parts of the Gedo Region, between Fafaaxdhuun, Ceel Gaddud, and Garbahaarey in the east and the Kenyan border in the west (see Map 1).

White soils can be found in the Bakool Region north of Berdaale, as well as in a transition zone to the dark clay soils south of the red soil areas. The dark clay soils are concentrated in the floodplain of the Jubba River and the vast alluvial plains of the Lower Jubba and Lower Shabeelle Regions.

The red sandy soil areas and the black clay soil areas are used by pastoralists in different seasons and for different animals, depending on the specific characteristics of each soil. This is an important factor in the location of seasonal grazing areas for the livestock. For example, the red soil area, particularly the dooy area of the interriverine zone, is favored by pastoralists and agro-pastoralists during the wet seasons. Because of the high proportion of sand in the soil it is not as slippery after rainfalls as the dark clay soils. Therefore, livestock, camels in particular, do not slip and injure themselves. Also, both man and livestock are far less bothered by insects on red soils compared to black clay soils, since pools, possible breeding places, are found less fre-



Source: Ministry of Agriculture, FEWSD-Agrometeorology, 1983

Figure 3. Mean monthly rainfall in the Jubba Valley.

quently. Therefore, during wet seasons fewer cattle and small ruminants are grazed on black clay soils.

Dark, alluvial soils are concentrated in the so-called dhoobey zone (see Map 1) and the floodplain of the Jubba and Shabeelle Rivers. They are the most important dry-season grazing areas in the GJV. The advantage of these soils is their abundant grass vegetation, which is the result of the fertility and moisture of the soil.

Apart from the grass vegetation, thorn bushes, and thorn trees, which cover the largest part of the GJV, are important as a fodder resource for the livestock. The bush and tree vegetation is mainly browsed by camels and goats, providing important complementary grazing to grasses, the main fodder supply for cattle and sheep. Harvest residues of the sorghum and maize production are of increasing importance as dry-season fodder, especially in the rainfed cultivation areas of the Bay Region and in flood recession agriculture zones along the banks of the Jubba River.

D. Water Availability

In the GJV, three sources of water are used by man and livestock–the Jubba River and dhesheegs in the floodplain; groundwater; and surface runoff. The perennial water-flows of the Jubba River are the most important sources of water for the majority of the people and livestock during the dry seasons, the jiilaal in particular.

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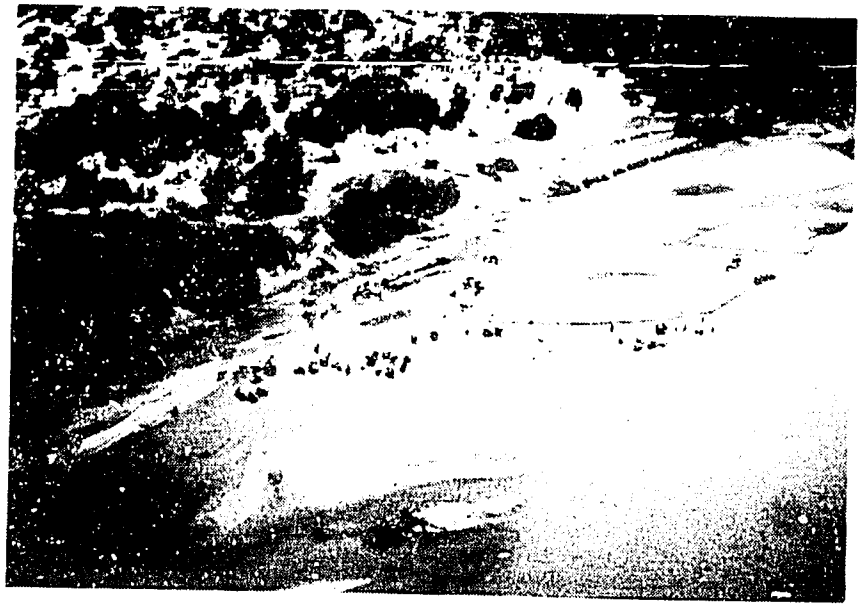

Typical Jubba watering place.

Groundwater is another very important source of water, but is mainly used in areas away from the Jubba River. In the togga of the plateau zone, the groundwater stream constitutes an important source for the pastoralists. They scoop the water from small holes which they dig in the sand and gravel of the dry river bed. In the escarpments of the plateau zone, there are a number of additional natural springs.

Water is also provided by a large number of hand-dug shallow wells. There are fewer in the plateau areas than in the lowlands of lower Middle Jubba and Lower Jubba Regions. In those parts of the Middle Jubba Region to the west of the Jubba River, where the groundwater table lies very deep, few shallow wells can be found.

Since the colonial period, and especially in the last 10 to 15 years, many new deep wells with motor pumps have been installed by the Government of the Somali Democratic Republic (GSDR) and development agencies. They are concentrated in the Gedo Region to the west of the Jubba, in the western part of the Bay Region, and in the western parts of the Lower Jubba Region (see Map 1).

In addition to groundwater, surface runoff plays a major role in water supply for man and livestock. There are thousands of small, private or cooperatively owned *wars* (man-made water catchments) in the areas further from the Jubba River. These are concentrated in the western parts of the Bay Region and the eastern part of the Middle Jubba Region. In the Lower Jubba Region, they form the main water source between Afmadow and Diif and Badhaadhe (see Map 1).

Besides these small wars, the GSDR and development agencies are building large wars, providing water for more people and livestock. These are concentrated in the southeastern part of the Bay Region south of Diinsoor, and are found mainly in the fertile, dry-season grazing areas with dark clay soils, the dhoobey area of the southern Middle Jubba and Lower Jubba Regions. These wars make possible the use of the surrounding good grazing areas until the middle of the jiilaal season, after which the pastoralists have to use water from the Jubba River and the dhesheegs in the floodplain or move to the Shabeelle swamp area (see Maps 1 and 2).

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A watering place in a dry river bed near Yaaq Baraawe.

A small, private war in the Banaada cultivation area.

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E. The Tsetse Problem

A very important constraint to livestock-keeping in the Jubba Valley is the tsetse fly, whose main habitat stretches along the Jubba River in a zone called gosha (see Map 1). *Gosha* can be translated as "dense forest infested with tsetse fly and unsuitable for pasture" and is the name applied to the lower and middle Jubba Valley, from Kamsuuma in the south to around Saakow in the north. However, the tsetse fly is found in other parts of the riverine zone and around Dhesheeg Waamo as well. The tsetse danger is less in the gorge area of the Jubba north of Baardheere and up to the Ethiopian border.

Because of the tsetse fly problem, considerable areas of very good grazing land close to the river cannot be fully utilized. The pastoralists only go there during the jiilaal season when grass becomes scarce in adjacent areas. An increasing number of nomads are vaccinating their animals to protect them from the tsetse flies.

IV. SOCIOECONOMIC STRUCTURE OF THE LIVESTOCK-KEEPING POPULATION OF THE GREATER JUBBA VALLEY

In order to understand the structure of the pastoral economy of the GJV, insight into the demographic, ethno-social, and historio-political circumstances, as well as knowledge of the ecological conditions, is necessary.

A. Demographic and Ethno-Social Characteristics

According to estimates of the Ministry of National Planning and Jubba Valley Development (MNPJVD), based on the 1975 census, about a fifth of the Somali population–or 1.1 million people–live in the GJV, *i.e.*, the regions of Gedo, Middle Jubba, Lower Jubba, and the most western parts of Bakool, Bay, and Lower Shabeelle. This part of the population is officially divided into approximately 45 percent nomads, 39 percent settled farmers and agro-pastoralists, and 16 percent urban. However, these figures do not convey the fact that the nomadic population in the northern part of the GJV, about 60 to 65 percent, is by far larger than in the south, where nomads make up only 40 to 45 percent (MNP 6/1987:2) of the population.

The ethno-social structure of the pastoralists and agro-pastoralists of the GJV is organized in kin-based groups. Descent within agroups is patrilineal, the members of the group claiming origin from a sometimes fictional tribal progenitor. Traditionally, political matters within a clan were dealt with democratically. During the last 20 years, governmental influence on the way of living and economy of the pastoralists, *e.g.*, nationalization of all pasture ground,and the extension of infrastructural institutions of the central executive, has increased considerably. However, traditional group structures and their leaders are still of considerable importance.

A watering place in a dry river bed near Yaaq Baraawe..

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The population in the GJV can be divided roughly into three groups: First, there are the nomadic groups which have moved from the more arid north to the climatically more favorable south in the recent past. The majority live on the western side of the Jubba River into Kenya and in the Ethiopian-Somalian border area. They mainly breed camels, but in the southwest, they breed cattle as well. Historically, they were known to be particularly militant and politically active.

Second is the population of the western interriverine area, mainly consisting of agro-pastoralists keeping cattle. The inhabitants of this region historically derive from the greater Bay Region.

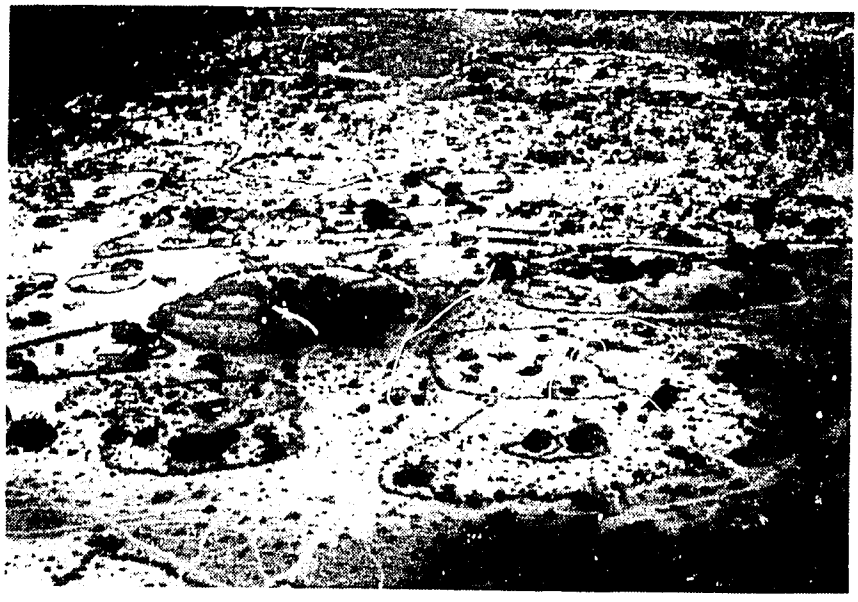
The third part of the population, although economically highly important, is a social and political minority. It consists of a farming population, deriving from Kenya, Tanzania, and other parts of East Africa and represents the majority of the inhabitants of most riverine settlements south of Saakow.

Consanguinity is almost entirely limited to the first two groups, seldom occurring between them and the third group.

The social structures of pastoralists and agro-pastoralists, the latter mostly former nomads who have settled in the recent past, are similar. For the agro-pastoralists, however, there is more division of labor, since cultivation as well as livestock-keeping must be done. Polygamous marriages with two or more wives are common for economic reasons. Generally, one wife and her children look after cultivation while another is responsible for livestock-keeping (cattle and small ruminants). According to economic necessity and inclination, the husband stays with a wife for a certain period of time or often engages in extra-pastoral activities such as collection of gums and resins and migrant work. Strong, unmarried young men are in charge of camel herding. On their long, strenuous migrations, away from their families for several months at a time, they rely completely on themselves.

B. Types of Livestock-Keeping

The livestock-keeping population of the GJV lives closely adapted to the natural conditions and the ethno-social and political circumstances described previously. Their economic strategy is one of "risk diversification" or "risk minimization." It is a strategy of survival, dealing with frequent droughts, animal diseases, increasing prices for basic needs, etc. Consequently, the average livestock-keeping



An agro-pastoralist settlement at the western rim of the dooy area in the rainfed cultivation area of Banaada.

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family tries to maintain a large herd, consisting of different species of livestock. Rainfed farming and other extra-pastoral activities provide additional sources of income, strengthening the economic basis of the family.

It is not easy to classify the different livestock-keepers of the GJV because of the many transitional forms between "pure" nomadism and a sedentary lifestyle. In general, there are three major groups.

The first group is the *pastoralists*, who live a highly mobile nomadic life, their animals being their only or most important means of existence. They exclusively use aqal (portable huts).

The second group is the *agro-pastoralists*, who possess a lot of animals and engage in marginal rainfed farming. The majority of members of the frequently polygamous families live a nomadic life, with only a few family members looking after the fields. This type of agro-pastoralism is found at the fringe of the rainfed cultivation areas and around new water points. Other agro-pastoralists who settled some time ago possess fewer animals and cultivate larger rainfed farms, agriculture being their main source of income. They live in *mundul* (permanent dwellings) and only a few family members lead a nomadic life.

The third group includes riverine farmers, whose existence is based on flood recession agriculture and/or pump irrigation and often also on rainfed farming, and *farmers in rainfed cultivation* areas of the Bay Region. The number of animals, if any, is small and they are kept in the settlement itself or nearby. In larger settlements, herders are hired to herd the animals, mainly on nearby pastures. It is also quite common for farmers to give their livestock to friendly nomads who look after the animals and use the animal products in return for this service.

C. Livestock Species and Spatial Distribution

The four main species of livestock kept in the GJV–camels, cattle, goats, and sheep–are of different economic values to the various livestock-keeping groups. Consequently, there is a regional pattern in distribution of the four species (see Map 2), corresponding with the distribution pattern of the livestock-keeping groups.

Analysis of the animal population of the different *degaan* (home areas), where the stock stay most of the year, shows that in the drier northern part of the GJV camels are economically most important, followed by goats and cattle. Whereas the number of camels has increased, the importance of cattle has decreased in this arid part of the GJV, due to large losses during the recent droughts.

Towards the south, the significance of cattle is increasing. In the Middle Jubba Region, and especially in the agro-pastoralists' production system of the Middle Jubba and western Bay Regions, cattle are of greater economic importance than camels and goats. In the Lower Jubba Region, the Afmadow District in particular, cattle are the most appreciated animals. In all parts of the GJV, sheep still play a minor role compared to other livestock, despite their increasing importance. Often, families keep just a few sheep to slaughter for religious purposes.

A further classification of the livestock in the GJV can be made, based on the varying environmental conditions of the regions and the economic needs of the livestock-keepers. Different species of camels, cattle, and goats are characteristic of different regions, (*e.g.*, breeds with higher milk production, particularly strong resistance to droughts and diseases, and/or a specific strength for long-distance migration [see Tables 2 through 4]).

Table 2. Types of Camels Kept in the Greater Jubba Valley

Somali names	gaaf soomaal maay	fiil	dacar (dacar gaduud)
Color	white-brownish	white	brown (reddish brown)
Milk production	medium	high	high
Other	very resistant to droughts and diseases very hardy on long-range migrations	less resistant to droughts and diseases	less resistant to droughts and diseases

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Table 3. Types of Cattle Kept in the Greater Jubba Valley

Somali name	maajaan	lo' gaduud	lo' caddey
Color	brown-spotted	reddish-brown	white
Regional distribution	Middle Jubba Region Bay Region	Lower Shabeellle	Lower Jubba Region
Size	small	medium	large
Milk production	small	high	medium*
Other	very resistant against droughts and diseases, very hardy on long-range migrations	less resistant than maajaan	less resistant than lo'gaduud

**The average daily milk production varies between 1.4 and 3.4 liters in the jiilaal, and 6.8 and 8.5 liters in the gu'. Up to 50 percent of the amount is normally needed for the calf.*

Table 4. Types of Goats Kept in the Greater Jubba Valley

Somali name	dhaga yarre (small ears)	dhaga weyne (big ears)
Color	white	white
Regional distribution	dooy (area with red sandy soils)	dhoobey (area with (dark clay soils)
Milk production	high, up to 0.85 l in the gu', and 0.425 l in the jiilaal per day	low (ca. half of the milk production of dhaga yarre)
Other	sensitive to tsetse fly and other insects, heat resistant	resistant against tsetse fly and other insects, not heat resistant

D. Economic Significance of Pastoralism and Agro-Pastoralism

Pastoralism and agro-pastoralism are the two main production systems in the areas of the GJV away from the farming riverine zone along the Jubba River. Whereas agro-pastoralism has become the dominant method of production and is still expanding in large parts of the Bay and eastern Middle Jubba regions, nomadic pastoralism is the only economically practical use of the other areas, due to aridity and variability of precipitation.

1. Subsistence Production

For the majority of the nomadic families, providing for subsistence needs is still the main goal. Milk, ghee, and meat are the major goods produced for family consumption. The range of self-produced goods of the agro-pastoralists includes sorghum, sometimes maize, cowpeas, and sesame. Products of the collecting economy, such as honey and wild fruits, can be added to the daily food supply. Any surplus is sold on the market.

In remote areas, barter is still common (mostly milk or livestock for sorghum), while currency is the dominant form of exchange in the larger marketplaces.

2. Market-Oriented Production and Trade

Over the last two decades, regular livestock sale by the majority of nomadic families in the GJV has steadily increased. However, this cannot be called market-oriented production, since livestock is sold mainly during the dry periods when feeding large herds becomes particularly difficult. The majority of livestock-keepers hesitate to sell their stock, as the animals are generally their only economic guarantee of survival.

The numerous local and regional droughts of the 1970s and 1980s have doubtlessly increased the trend towards livestock trade. Another incentive for animal trade is the high prices received in the marketplace, as shown in Table 5.

Table 5. Livestock Prices for Male Animals
(in Somali Shillings)

	CAMELS	CATTLE	GOATS	SHEEP, DONKEYS	
	Beled Xaawo	30-35,000	30,000	8,000	8,000
Baardheere	20-30,000	15,000	3,000	5,000	—
Qansaxdheere	25-30,000	10,000	3,000	4,000	7,500
Bu'aale	30-40,000	20,000	3-4,000	5-6,000	—
Afmadow	30-40,000	4-10,000	2-3,000	3-4,000	—

However, despite comparatively high prices, changes in the internal terms of trade have had negative consequences for the nomads in recent years. These changes include the high inflation rate and the increased costs of imported and local basic foodstuffs, on which pastoralists and agro-pastoralists are becoming more and more dependent. This is especially the case during drought periods. Milk production drastically declines at that time and is no longer

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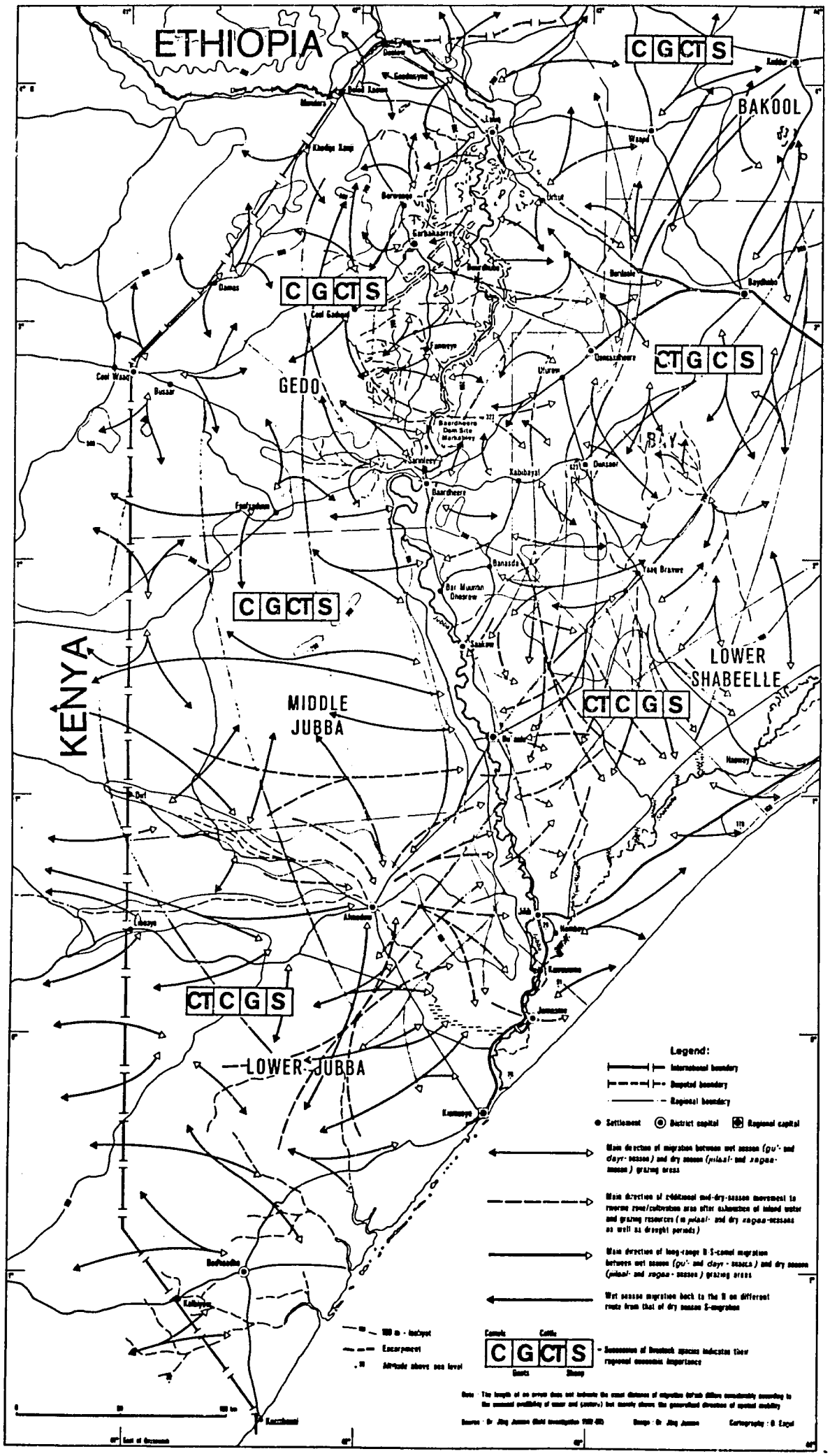
Map 2: The Greater Jubba Valley - Spatial Pattern of Seasonal Livestock Movements -



sufficient to supply the population, not to mention the young livestock.

Generally, there are three types of livestock trade. Livestock is sold directly to settled farming families (tax evasion is frequent), on the open livestock markets, or to traders or their middlemen, who are present in all markets and at all important water points, especially during the dry seasons.

Traders normally invest 150,000 to 200,000 SSh. to obtain a herd. The traders or hired drovers then take the livestock mainly to Muqdisho and Kismaayo, a journey lasting several weeks. Small ruminants are transported by truck.

The main Somali livestock markets from the north to the south of the GJV are Xuddur, Beled Xaawo, Luuq, Garbahaarey, Berdaale, Baydhabo, Qansaxdheere, Ceel Waaq, Diinsoor, Baardheere, Saakow, Bu'aale, Afmadow, Jilib, and Kismaayo (see Map 1). From the Gedo and Bakool Regions, large numbers of livestock are tended through the Ogaden area to the northwestern Somali markets, mainly to Berbera, but also to Djibouti.

Border-crossing to Kenya is common, as prices in the Kenyan markets are generally higher than in Somalia. The trade of Somali livestock in Ethiopia is marginal, since prices are higher in Somalia, the value of Ethiopian money is even lower than Somali currency, the range of goods offered on the Ethiopian markets does not reach the Somali standard, and livestock-keepers strongly disapprove of paying taxes to the Ethiopian government.

Prices for livestock in Somalia have shown a steady increase in recent years. In the mid-jiilaal of 1988, the price of camels headed the list, followed by cattle, goats, and sheep. In the GJV, prices for male animals ranged between 20,000 and 40,000 SSh. for cattle, from 2,000 to 8,000 for a goat, and from 4,000 to 8,000 for a sheep, according to age and quality (see Table 5). Prices for female animals were considerably higher than those for male livestock.

Prices were highest on the markets close to the Kenyan border (see Table 5, example Beled Xaawo), as Somali prices there are forced up by the better Kenyan prices and the high exchange rate for the Kenyan currency on the black market (1:10 for the SSh. in February 1988). At the same time, the lowest price for cattle was in Afmadow, due to the excessive number for sale during the dry season.

Towards the end of the jiilaal season, prices decline again as fodder supply for the livestock becomes increasingly difficult to find and pastoralists consequently tend to sell more animals.

3. Monetarization of the Pastoral Economy

Although barter is still common in nomadic areas away from marketplaces, monetarization has succeeded everywhere in the 1970s and 1980s. This is understandable since now the livestock-keepers, too, need cash for almost all aspects of life, including:

- purchase of basic foodstuffs, especially sorghum, sugar, and tea, and items for everyday use, *e.g.*, flashlights, batteries, and cooking devices (see Table 6);
- purchase of medicine for both people and livestock, and payment of medical treatment;
- payment for food and drink while staying in settlements and at water points;
- purchase of crop residues for livestock fodder in the dry seasons;
- payment of taxes imposed on the sale of livestock in the marketplaces (five percent of the price); and

Table 6. Goods on Sale and Prices at Shop in the Nomadic Settlement of Fafaaxdhuun. (January 1988)

ITEM	PRICE In SSh.	/quantity
Sugar	130	/kg
Maize flour	50	/kg
Wheat flour	50	/kg
Rice	70	/kg
Tea	400	/kg
Tomato paste	30	/75 gram
Washing powder	30	/small pack
Smoking-sticks (perfumed)	5	/1 stick
Torches	170	/1 piece
Batteries	100	/2 pieces
Matches	4	/1 box
Wicks	5	/ca. 15 cm
Razor-blades	5	/1 piece
Steel combs	60	/1 piece
Needles	5	/1 piece
Sandals (rom old tires)	100	/1 pair
Men's robes	1000-1400	/1 piece
Colored cloth for women	1600	/8 m length
Simple white cloth	100-110	/1 m length

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- payment of comparatively high and often arbitrary charges for the use of government water points, as well as partly private shallow wells and water catchments (see Table 7).

Table 7. Average Official Per Animal Water Prices at Government Water Points (January-February 1988/SSh.)

KIND OF WATER POINT	CAMEL	CATTLE	GOAT/SHEEP
Deep-well with motor pump (ceel)	2	1	0.5
Large water catchment (war)	3-5	2-3	1

Cash income and expenses are concentrated in the dry period when the major part of livestock trade is carried out and the majority of purchases are made.

It is mainly the settled merchants who profit from trade with the nomads. They either permanently live at the marketplaces or trade their goods as migrant merchants in remote parts of the nomadic living sphere. As a result, small hut settlements with shops and tea and snack bars have spread at almost all important water points along the Jubba River as well as away from the river. At the larger water points, blacksmiths can be found, forging objects such as axes (to cut branches during the dry season), daggers, arrows, and spears (for defense against an increasing number of lions and livestock thieves) for the pastoralists (see Figure 4).

Table 6 shows an overview of the range and price of goods available. Goods are not always offered for a reasonable price, but frequently are priced high above average. This is a definite disadvantage for the nomads, as they are dependent on these goods.

E. Extra-Pastoral Activities and Their Economic Significance

The main extra-pastoral activities of the pastoralists and agro-pastoralists of the GJV are farming and, particularly in the northern part, the collection of aromatic gums and resins and migrant work.

1. Farming

Farming is of increasing importance to the livestock-keepers in the GJV, especially to the agro-pastoralists, and particularly those groups who took up a sedentary lifestyle a few years or even one or two decades ago. This also applies increasingly to pastoralists attempting to enlarge their sphere of existence at least to produce more foodstuffs for themselves. The frequently recurring droughts, with resulting losses of livestock (mainly of cattle), and the rapidly increasing cost of living are responsible for this development.

Pastoralists taking up farming choose the areas at the fringe of the already existing cultivation zones and locations in the vicinity of water points. Areas away from the river are used exclusively for rainfed cultivation (see Map 1).

The settlement areas of the agro-pastoralists of the GJV are concentrated between Baardheere and Saakow on the Jubba River in the west and Diinsoor, Ufurow, and Qansaxdheere in the east, extending to the Baydhabo area.

The agro-pastoralists living along the Jubba River in the gorge area of the future reservoir between north of Baardheere and south of Luuq practice a mixture of flood recession and rainfed agriculture. The main crops cultivated under these conditions are sorghum, sesame, cowpeas, and watermelons. A minority of the agro-pastoralists irrigate small fields by means of motor pumps. On irrigated fields, concentrated north of Baardheere as far south of the future dam site as Markabley and near Buurdhuubo, onions, maize, tobacco, watermelons, and sesame are cultivated. In some places north of Baardheere, bananas and papayas are grown.

This small-scale irrigated agriculture is normally based on a sharecropping system, in which 50 percent of the yields are for the landowner and 50 percent for the owner of the pump. The pump owners are mainly businessmen from Baardheere or Garbahaarey. The pump owners draw the largest profit from this system because they normally also buy the landowner's share of the crop for the low local price and sell it for a profit in the big towns of southern Somalia.

The socioeconomic situation of many agro-pastoralists–more than 40 families in the Buurdhuubo area–has become drastically worse because those who allowed their land to be registered in the names of the pump owners have often been cheated by the latter. After the first quarrel, the outlawed agro-pastoralists were driven away from their land by force. The new landowners now cultivate with the help of cheap labor from the Buurdhuubo refugee camps.

The agro-pastoralists, after being deprived of their land, one of their important sources of income, now live a miserable life based nearly exclusively on the few cows and goats they still own.

Away from the river, the main rainfed crop is sorghum. During the deyr season, sorghum is cultivated exclusively because of its resistance to drought. During the more humid gu' season, maize and sometimes cowpeas are cultivated as intercrops in favorable locations, such as fertile depressions. Sesame is grown on smaller areas during the deyr season.

Grain is stored in underground pits in the settlements and amidst the fields. The grain can be stored in these pits for several years, providing a reserve for drought years.

Yields for sorghum during a normal gu' season with sufficient precipitation range between one to two quintals (loose kernel) and three to five quintals (with cobs) per square tacab (one tacab equals approximately 1,200 square meters). If there is no rain at the proper time, frequently the fields will not come into ear. In this case, the stalks are used as livestock fodder.

2. Collection of Gums and Resins

World-wide, Somalia leads in the production of frankincense and probably of myrrh as well. Whereas frankincense is mainly produced in northeastern Somalia, one of the largest areas cultivated with myrrh trees is situated in the northern part of the GJV. The collection of myrrh and other resins is carried out by quite a few nomads. Many resins have a function in the lives of the population (see Table 8).

Market-oriented gum and resin collection was developed by the Italians during the colonial period. With independence, there has been a decline in the production of gums and resins in the GJV. In recent years, however, attempts have been made to increase production, one reason being the lucrative export possibilities (see Table 8).

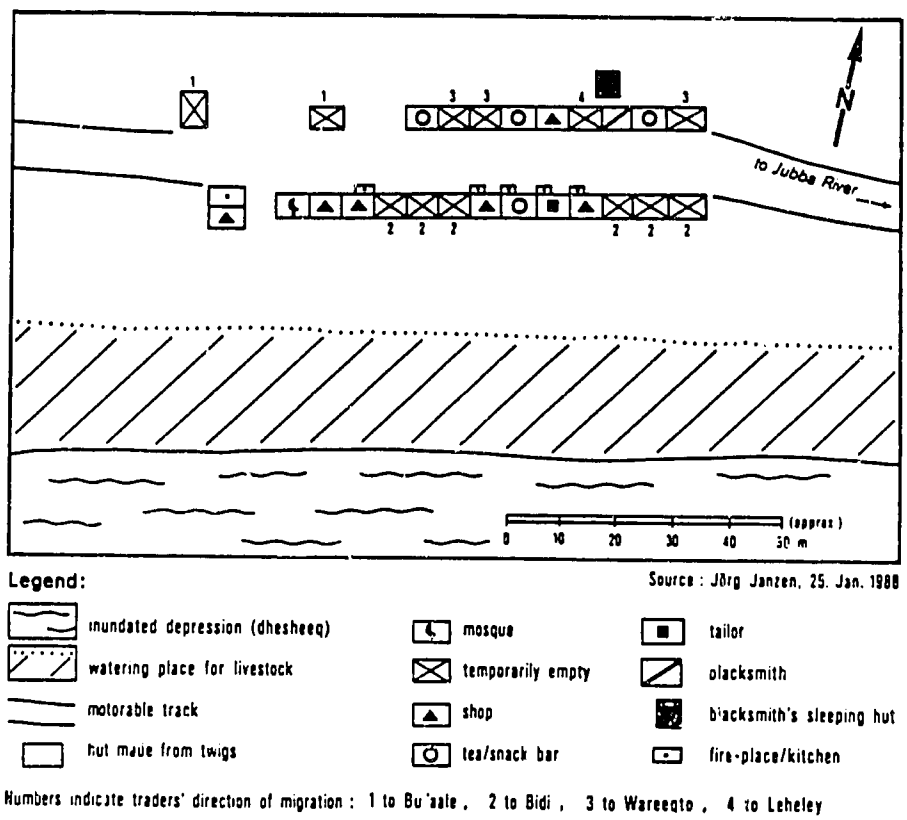

Figure 4. Desheeg Jabi–Dry season market for nomads (sketchmap–not to scale).

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Table 8. Gums and Resins Collected in Ceel Waaq District/Gedo Region (January 1988)

	myrrh	*xabaq xagar*	*xabaq cadaad*	*xabcq mugley*
Purchasing price in Ceel Waaq (in SSh/kg)	280	120	300	60
Selling price in Muqdisho (in SSh./kg)	350	200	350	120
1987 production (in tons)	120	15	80	10
Utilization	traditional medicine for all kinds of diseases burned to get rid of snakes basic material in the production of modern medicine	traditional medicine for wounds, abscesses and ticks	traditional medicine for stomach trouble chewing gum sexual stimulant	burned for its strong smell
Marketing	mainly for export markets	mainly for inland markets	export and inland	only for inland markets

Trade of resins in the GJV is carried out by nomadic collectors and private merchants in the marketplaces. There are a few private gum and resin cooperatives, *e.g.*, in Ceel Waaq and Fafaaxdhuun, where several hundred tons of resins, mostly myrrh, are collected per year. For the nomads, collection is an important source of income. In the 1988 jiilaal, producer prices varied between 60 and 280 SSh. per kilogram, according to the type of gum or resin (see Table 8).

Production of gums and resins, however, also implies a serious problem–unqualified "tapping" of the trees and production for short-term profit cause overuse of trees in easily accessible areas. For this reason, production has already been limited by the cooperatives after numerous trees were found to be seriously damaged. In future gum and resin collection, ecologically acceptable production methods should be practiced to prevent irreversible damage to valuable trees and maintain an important additional source of income for the pastoralists.

3. Migrant Work

Periodic migrant work is also quite common among the pastoralist and agro-pastoralist population of the GJV. The young men who engage in migrant work are attracted to the large towns of southern Somalia, mainly Muqdisho, and the oil-rich states of the Arabian Peninsula–Saudi Arabia and the United Arab Emirates in particular. Their remittances, either in cash or goods, are a very important source of extra income for their families in the rural areas. Families with relatives working out of the country often start small-scale businesses with the extra income and tend to live a more sedentary lifestyle.

Agro-pastoralists also work as short-term farm laborers in the cultivation areas of the Bay and Lower Shabeelle regions. The relatively high wages for farm laborers during peak seasons represent a profitable source of cash income.

F. Socioeconomic Relations Between the Settled Population and Nomadic Pastoralists

Various relationships exist between pastoralists and the settled population. In the case of different ethnic backgrounds, e.g., the settled farming population along the river and the nomads frequenting the riverine area during the dry season, contact is limited to economic exchange. During the dry seasons, the farmers supply their harvest residues as livestock fodder and their grain as foodstuffs for the nomads. In exchange, the nomads provide them with livestock and stock products, such as milk and ghee. More and more, this trade, traditionally based on exchange of goods, is being replaced by trade for cash.

The nomads have to face considerable expenses for harvest residue fodder during the dry seasons. In the jiilaal of 1988, the nomads had to pay up to 1,000 SSh. to the farmers along the river for permission to graze their livestock on a field of one square *darab* (one darab equals approximately 2,400 square meters). Frequently, the farmers offer sorghum and maize in small bunches, each stalk costing 0.5 to 1 SSh. As the natural pasture grounds are heavily grazed during the dry seasons, the nomads are highly dependent on crop residues, and the farmers take advantage of this by charging above average prices.

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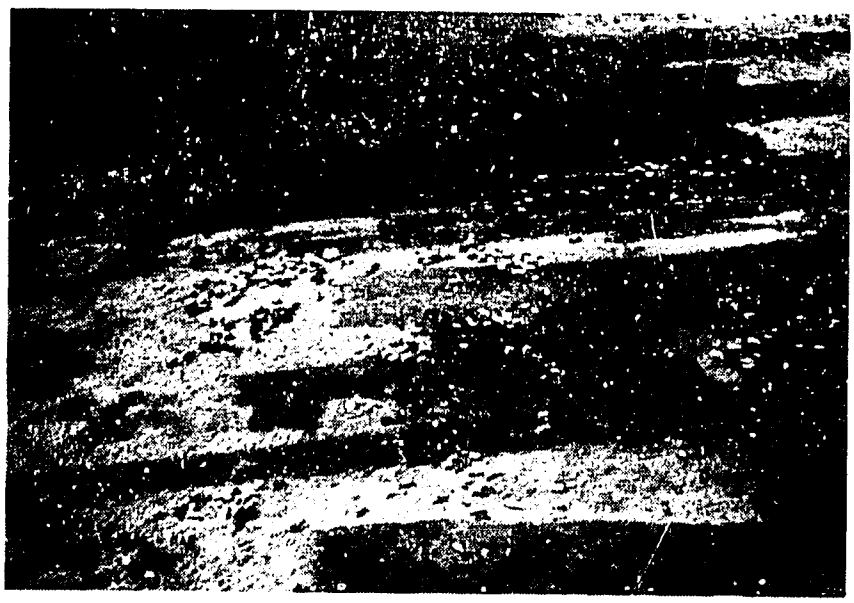
Relations between pastoralists and agro-pastoralists in areas away from the river are similar, although in addition to economic contact, close social links, often due to tribal relationship, can be found.

Harvest residues are largely used up by the livestock of the agro-pastoralists. Surplus is often given without charge to pastoralists of the same clan. In exchange, during the rainy seasons, the agro-pastoralists' livestock are often grazed with the pastoralists' livestock on their pasture grounds. In this case, the families of the agro-pastoralists benefit from the support and safety given by the pastoralists. This system is optimally adapted to the existing seasonal demands of both pastoralists and agro-pastoralists. This is also true for the relations between mobile livestock-keepers and settled farmers. These interrelations provide an example for future agricultural development planning in the Jubba Valley. As they show, there are few conflicts between the settled and the mobile population groups–contrary to frequent assumptions.

Conflicts do exist, however, occurring to a large extent if the nomads are deprived of their traditional dry-season pastures without an alternative, as happens when cultivated areas are extended. This problem exists throughout the Jubba Valley. At the lower course of the Jubba River, the area to either side of the river has been almost covered with large cultivated areas since colonization. There, land-use conflicts are frequent, especially when the nomadic livestock are driven through the cultivation grounds of the settlers on the way to water and in search of fodder.

There are land-use conflicts of a different kind between the mobile livestock-keepers and charcoal producers. Although charcoal production has already been limited drastically in most parts of southern Somalia, large areas are still used in the region of Diinsoor, Ufurow, Qansaxdheere, and Berdaale. Settlers from other parts of the country, rather than nomads, serve as seasonal workers. The numerous claims, stretching several square kilometers, are a considerable hindrance to use of pasture grounds by the nomads; their migration moves are also hindered by claims and camps. Furthermore, the cutting of the strong acacia trees for charcoal production is followed by a rapid growth of underwood, affecting growth of grass and causing the thorn-tree savanna to become more and more impenetrable for livestock. This causes frequent quarrels between livestock-keepers and charcoal burners.



Between Saakow and Bu'aule–
livestock using crop residues of irrigated agriculture in the floodplain of the Jubba River.

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V. SPATIAL MIGRATION PATTERN OF PASTORALISTS AND AGRO-PASTORALISTS IN THE GREATER JUBBA VALLEY

The existing physical, socioeconomic, ethno-political, and infrastructure conditions in the GJV (see Map 1) have led to an optimal migration pattern for pastoralists and agro-pastoralists (see Map 2), who are aware that only a highly mobile way of land-use guarantees the best economic use of the existing natural resources.

A. Traditional Structure and Modern Changes in the Migration Pattern

Traditionally, the economic use of the GJV was based on division of territory into units, each controlled by a clan and optimally adapted to the ecological conditions in its spatial outline. As a rule, the clan territories stretched from the east to the west, with the Jubba River as the eastern or western border. Accordingly, all clans living in the GJV had access to the water of the Jubba River, a necessity during the dry seasons and in drought periods. Only in an emergency, such as drought years, was the river crossed. Today, territorial division of the GJV as described here and the resulting land-use practices underlie considerable changes.

The mobility pattern in the GJV is highly differentiated according to the type of livestock-keeping and the species kept. The migration pattern is water- and pasture-oriented. In the dry seasons the migration routes are more fixed, while in the rainy seasons they vary, directed towards areas where rainfall is occurring. Furthermore, keeping different species of livestock normally means splitting up the family into subunits, each being responsible for one kind of livestock or for other economic activities, such as rainfed agriculture.

During the last 20 years, the land-use system as described has been subject to considerable changes. The droughts of the 1970s and 1980s have added to this, increasing the pastoralists' trend towards a more sedentary life as agro-pastoralists. Also, certain judicial and development/political measures carried out by the government have led to considerable changes in the regional mobility of both pastoralists and agro-pastoralists.

New, large government war northwest of Berdaale.
The water is pumped by hand pump from the basin to the troughts.

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Three major changes have affected the traditional migration pattern of the livestock-keeping population groups of the GJV:

- the formal abolition of clan boundaries and exclusive clan grazing and watering rights, and the nationalization (in 1971) of all land which has not been regularly cultivated;
- the installation of numerous high-capacity, deep wells and large water catchments built by the government and development agencies, and the construction in the last 15 years of thousands of new, privately and cooperatively owned smaller water catchments in areas with no watering facilities (see Map 1); and
- the expansion of irrigated agriculture in a narrow zone on both sides of the river and the expansion of rainfed agriculture in large areas away from the river.

As a result of the installation of water points, certain previously waterless areas with good pasture now can be used even during parts of the dry seasons. However, large numbers of livestock, in particular camels from the northern part of the GJV, leave their traditional grazing areas and move to the good pasture land around these new high-capacity watering points in the southern part of the GJV, leading to overstocking and overgrazing and causing considerable damage to the environment.

*Table 9. Well-Known Drinking Places and Crossing Points for Livestock along the Jubba River from North to South**

Obow	E	Hilo Kulun	E	Sigalow	W E (C)	Qoryaale	(D) W E
Megadey	W E	*Hilo Qareeb*	E	Qataa Qori	W E (C)	Raxoole	W
Barekale	W E	Hilo Dhuur	W E	Hakaka	W E	Shangaani	E
Jimaale	W E	Hilo Ari	E	Kaxaro	W E	*Jiilaalow*	W(C)
Deeraba	W E	Baar Badan	W E (C)	Horogle	E	Geed Ful	W E (C)
Shiidle	W E	Faanweyn	W	Leheley	W E (C)	Manaane	E
Halbe (Luuq)	W E (C/B)	*Yaxaasow*	W E (C)	*Sukeyla*	W E (C)	Tarba	E
Araasow	W E	Saanweyne	W E	*Wareegta*	W E (D)(C)	Kaytooy	W
Bakooley	W E	Markabley	W E (C)	Goljano	W E	Malenda/Fanoole	W E (C)
Dhaydheere	W E	*Hilo Ari*	W E	*Jabi*	(D) W E (C)	Qaranrey	W
Marayley	W E	Magdile	W E	Dujuuma	E	*Garsaale*	W E (C)
Halaqa	W E	Mardha	E	Tateey	(D) W	Cusmaan Mooto	W
Hilo Mareer	W E (C)	Sarinleey	W E (C)	*Radille*	E (D)	*Hiloshiid*	E (C)(CA)
Dhuurole	W E	Baardheere	W E (C/B)	Reebay	W E	Buulo Balley	E
Keligube	W E	*Hiloshiid*	W E (C)	Bu'aale	W E (C/B)	*Jilib*	W E (C)
Hufey	W E	Mansuur	W E (C)	Geele	(D) W	*Mareerey*	(AR) W
Buurdhuubo	W E (C/B)	Kukat	W E	*Banta*	(D) W	*Qumtiirrey*	W
Dangalmuyow	E	*Madhakaji*	W E (C)	*Duqiya*	E	Riqato	(D) W
Gari Dubeyle	W E (C)	Caanoole	W E	Arbow	(D) W	Sunguuni	W (X)
Teesow Weyne	W E (C)	Waabo	W E (C)	*Waamo*	(D) W	Buulogadund	W
Teesow Yarre	E	*Gaguure*	W E (C)	Manamoja	W (X)	Yoontoy	W
Haduunley	W E (C)	Gesiile	W E	Bangeeni	W (X)	Hiloweylod	W
Leheley	E	Kotey	W E (C)	*Jamaame*	E (C/B)	*Goob Weyn*	W E
Ceel Baar	W E (C)	Kaysaney	E				
Salagle	W E (C)	Hangoodle	E				
Diiriye	E	*Caanoole*	(D) W E (C)				
Dhaydheere	E	Gunaafo	W				
Naweyiu	W E (C)	Kafiinge	W E				
Buulo Batuulo	W E (C)	*Bidi*	E (D)(C)				
Gurmeyso	E	Afgooye	E				
Saakow	W E (C)	Kaskey	W E				
Goolame	W E (C)	Farbiito	W E				
Qaboobe	E (D)	Urufle	W E				

W=on the western bank E=on the eastern bank
W/E=on both sides of the river (C)=well-known crossing point
(B)=bridge/very important crossing point
(D)=dhesheeg (AR)=artificial reservoir (CA)=canal
(X)=important drinking place until 30 years ago/seldom used now
Radille=very important dry-season drinking place

*The exact geographical location (N-S sequence) of the drinking places in the northern and central reach of the Jubba Valley cannot always be guaranteed.

Source: Names according to pastoralists' information during the January to February 1988 field trips through the Greater Jubba Valley, from the Ethiopian border to the Indian Ocean.

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The indreasing occupation of the riverine zone of the Lower Jubba Region by large- and medium-scale agriculture, mainly of export-oriented crops, has led to important grass reserves and traditional watering points along the river being lost to the livestock-keeping population (see Map 1; Table 9).

These changes have affected the migration pattern of the mobile livestock-keepers in different ways. The contemporary migration pattern in the different parts of the GJV are outlined in the following sections (see Maps 1 and 2 and Table 9).

B. Northwestern Greater Jubba Valley

In that part of the Gedo Region west of the Jubba River to the Kenyan and Ethiopian borders and over to the Fafaaxdhuun area in the south, the migration pattern is mainly determined by the Jubba River, a few important toggas with a good groundwater stream, hand-dug shallow wells, and a considerable number of new deep wells with motor pumps. During the jiilaal season, livestock are concentrated in the vicinity of these watering places or in the riverine zone. Small ruminants are normally grazed at a distance of up to three to five kilometers, the cattle up to 10 kilometers, and the camels up to 30 kilometers around the water points or away from the toggas or the river, respectively.

In the gu' season, the animals use those pastures more distant from the watering places. The pastoralists also migrate beyond the Kenyan border and even through the military positions into Ethiopia. The migration patterns in the xagaa and deyr seasons are similar to those of the jiilaal and gu' seasons, respectively (see Maps 1 and 2).

As the main livestock kept in Gedo is the camel, the pastoralists usually undertake long-range migrations south as far as the Middle and Lower Jubba Regions, the Afmadow and Bu'aale Districts in particular, where pasture conditions are much better during the dry seasons than in the more arid northern part of the GJV. During these migrations, they not only move south on the western side of the river, but frequently cross the Jubba River to the eastern side (see Table 9) and then rapidly migrate to the south

Unsi Weyn–important watering place at the Dawa River.
The palm trees on the other side of the river are in Ethiopian territory.

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in a narrow, approximately 10-kilometer-wide strip along the floodplain of the river. South of Saakow, they either cross the river again and move in the direction of Afmadow or continue to the western dhoobey area between Bu'aale and Jilib and the Shabeelle swamp area. At the beginning of the gu' or deyr rains, the Gedo camel herders slowly move back to the north, far inland from the Jubba. The majority use the western side of the river (see Map 2).

C. Northeastern Greater Jubba Valley

This area includes the eastern part of the Gedo, the western part of the Bakool and the northwestern part of the Bay Regions. The migration system on the eastern side of the Jubba River is similar to that of the western side. But as there are few deep wells with motor pumps here, the pastoralists depend to a higher degree on the Jubba River as a water resource (see Map 1).

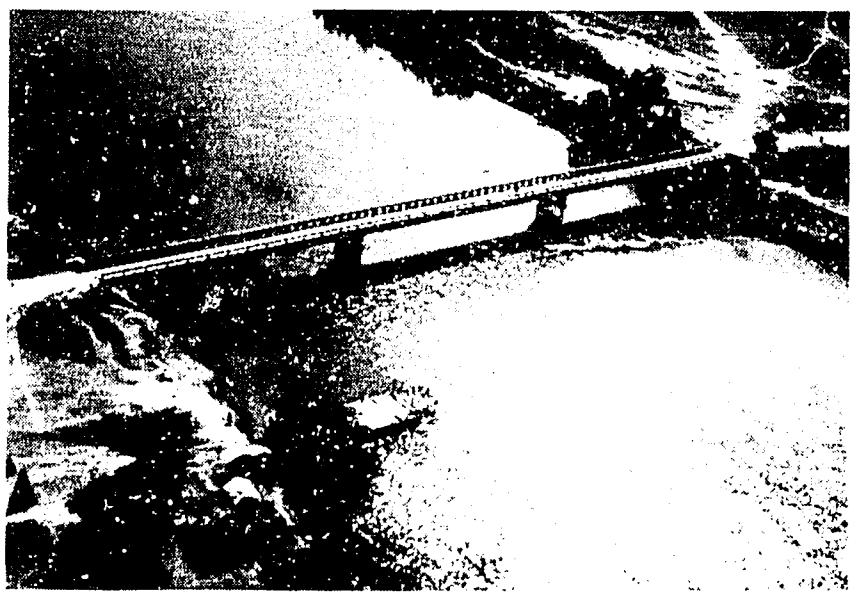
As a consequence of close ethnic relationships with the agro-pastoralist population of the Bay Region, the jiilaal and xagaa movements are focused on the rainfed cultivation areas around Baydhabo and Qansaxdheere in particular. Here the pastoralists use the wars and crop residues of relatives and friendly families during the jiilaal and xagaa seasons (see Maps 1 and 2).

The pastoralists rarely cross the Jubba River towards the west because, in normal years, the grazing conditions are much better on the eastern side. Furthermore, there are only a few ethnic relations with the population to the west of the river.

Especially in the gu' season, large numbers of livestock migrate to the dooy area between Diinsoor and Buurhakaba because the red soils of this zone present very favorable grazing conditions during the rainy seasons. There are fewer insects and animal diseases than in the dark clay soil areas, and the ground is less slippery and therefore less dangerous for the camels. During the jiilaal season, camel herders from the Bakool and Bay Regions also migrate down to the very good, dark-soil grazing areas of the dhoobey area in the southern part of the Middle Jubba and in the Lower Jubba Regions on the eastern side of the river, as well as to the western part of the Lower Shabeelle Region northwest of Haaway (see Maps 1 and 2).

D. Western Central Greater Jubba Valley

The migration pattern of this area is highly influenced by a lack of inland watering points. Whereas during the rainy seasons the pastoralists use the more distant pastures on both sides of the Kenyan border, during the dry seasons they are forced to stay close to the Jubba River and the



Buurdhuubo Bridge, an important river crossing point in the northern Jubba Valley.

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A high-capacity deep well in Afmadow. This well provides sufficient water throughout the year.

A watering place at Dhesheeg Cadeyley.

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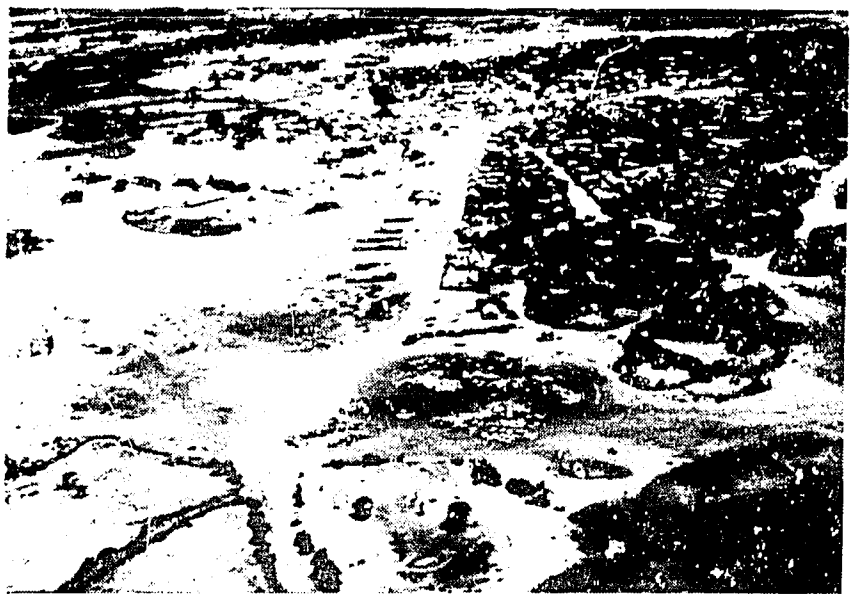

The town of Afmadow–the most important center for the namads of the Southern GJV.

flooded dhesheegs, where the livestock is concentrated in a strip of approximately 30 kilometers west of the river. At this time, cattle and small ruminants mainly use the zone 10 to 20 kilometers away from the water.

A high percentage of the pastoralists–camel and cattle herders–also moves south to the Afmadow District, where they use the wells around Afmadow and the numerous small private wars between Afmadow and Diif on the Kenyan border.

In very dry periods, like the 1988 jiilaal season, crossing the Jubba River to the Saakow, Bu'aale, and Jilib grazing areas on the eastern bank of the river is also very common.

A narrow strip along the western bank of the Jubba River is used by camel herders from Gedo for transit to the south.

E. Eastern Central Greater Jubba Valley

The migration pattern of this area, the eastern part of the Middle Jubba and the western part of the Bay Regions, is determined by the water availability of the Jubba River and the dhesheegs; by the many wars and wells in the cultivation areas of the agro-pastoralists around Qansaxdheere, Ufurow, Diinsoor, Xabibayal, and Banaada; the toggas between Diinsoor and Yaaq Baraawe; and the new government/EEC wars south of Yaaq Baraawe and east of Bu'aale.

Furthermore, two main grazing zones–the red soil dooy area around Diinsoor and Yaaq Baraawe and the dark, clay soil dhoobey area between Bu'aale-Jilib in the west, the Lower Shabeelle Region in the east, and the Shabeelle Swamps in the south–are very important destinations for livestock movements. In the second half of the jiilaal season, livestock is concentrated in a zone up to approximately 30 kilometers on both sides of the river. The Bu'aale-Jilib area, the most important dry season watering place in the Jubba Valley presumably represents the highest concentration of stock, after the Afmadow District and Dhesheeg Radille. (see Maps 1 and 2).

The high livestock concentration is due to the fact that all the wars have been emptied, forcing the herders to move either to the areas mentioned above, which offer very good grazing conditions, or to migrate to the south to the Shabeelle Swamps. Whereas these migrations are undertaken primarily with camels and to a lesser extent with cattle, the goats and sheep are mainly kept near the permanent settlements around the togga in the Diinsoor District and near the Jubba River.

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In the gu' season, the large majority of the livestock move to the red soil dooy area between Diinsoor and Buurhakaba. The livestock of the riverine farmers and agro-pastoralists of the Banaada area use the grazing lands between the dooy area and the tsetse-infested strip along the Jubba River. Generally, the mobility of agro-pastoralists with agriculture as a main source of income is far less than that of the pastoralists.

In the xagaa and deyr seasons, the migration pattern is similar to that of the jiilaal and gu' seasons (see Maps 1 and 2).

F. Southern Greater Jubba Valley

In the Lower Jubba Region west of the river, livestock movements show the following pattern. In jiilaal, cattle–the most important livestock in this area–are concentrated around several new deep wells with motor pumps, hand-dug shallow wells, and thousands of privately owned wars, mainly concentrated in the Afmadow District. Two other areas of concentration are around Dhesheeg Waamo and between there and the cultivation zone of the lower Jubba River. As it is difficult for the pastoralists to get access to the river bank to water their animals, Dhesheeg Waamo and the artificial watering places are very important. The high livestock concentration is increased by immigration of large numbers of camels from the Gedo Region. If pasture becomes scarce, pastoralists also cross the Jubba River between Jilib and Bu'aale to the east side (see Maps 1 and 2).

In the gu' season, pastoralists graze their animals in the areas to the north, south, and west as far as Kenya. The riverine pastures of the gosha are not used during the wet seasons because of the high degree of tsetse infestation. At the beginning of gu', camel herders from Gedo and Bakool move slowly northward (see Maps 1 and 2).

The spatial migration patterns during the xagaa and deyr seasons are similar to those of the jiilaal and gu' seasons, respectively. However, if there are xagaa rains, the animals do not have to stay close to the watering points, as they do during jiilaal.

G. Southeastern Greater Jubba Valley

This area includes the lower Jubba Region east of the river as far as the Indian Ocean. The livestock-keeping population consists of pastoralists and agro-pastoralists. The latter live in permanent settlements parallel to the irrigated cultivation zone. The livestock movements of both groups take place in a west-east direction between the cultivation area and the Indian Ocean. The dune zone along the seacoast, densely grown with trees, represents a very important grazing area, although grazing is officially forbidden because of the danger of soil erosion. The coastal zone is used throughout the year, but especially in the wet seasons. In the rainy seasons, livestock is also concentrated between the Shabeelle Swamps and the dune belt. During the dry seasons, the animals are watered at a number of dhesheegs in the Hombooy and Shabeelle Swamps and on the Jubba River. In addition, hand-dug wells are used near the coastline (see Maps 1 and 2).

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VI. EFFECTS OF DAM CONSTRUCTION ON LIVESTOCK-KEEPING IN THE GREATER JUBBA VALLEY

The evolution of the pastoral economy and the migration pattern of the livestock-keepers of the GJV has shown that every intervention into the livestock-keeping system has led to numerous, often negative, socioeconomic, and ecological changes.

A. Major Possible Effects on Livestock-Keeping

The construction of Baardheere Dam and the resulting regulated water flow in the Jubba River, as well as expanding agriculture between Jilib and Baardheere, could have a number of negative effects for the livestock-keepers. The following problems can be foreseen for the middle Jubba between Jilib and Baardheere:

- The majority of traditional watering points (see Map 1 and Table 9), situated on shallow river banks or on sand banks where the animals can be watered without danger of slipping into the deep water, will disappear.
- Crossing points will be limited to existing bridges (see Map 1 and Table 9) because the considerably higher waterflow will hinder the animals' ability to move through the water.
- Many of the favored dhesheeg watering points, *e.g.*, Bidi and Jabbi (see Map 1and Table 9), will not receive the same amount of water as before, as there will be no natural flooding from the river. Dhesheegs will be fed mainly by rain and surface runoff. Consequently, these dhesheegs will become smaller or dry out completely.
- New cultivation areas could hinder access to water if insufficient space is left between cultivation areas.
- Extending cultivation into good floodplain grassland , an important fodder reserve during jiilaal, will be lost for livestock grazing.
- Tsetse infestation, malaria, and bilharzia wil-could increase as a result of expanding irrigation affecting pastoralists to a much higher degree than at present.
- A possible one-sided expansion of export-oriented crops other than grain would not contribute to improved fodder availability for livestock during the dry seasons.

In the gorge area where the Jubba's water would be stored in a deep reservoir more than 100 kilometers long, a number of additional problems will occur:

- The agro-pastoralists who possess agricultural land within the gorge area will lose an important source of income. There would be no more riverine cultivation in this area, and the crop residues used as additional dry-season fodder reserve for the livestock would be lost.
- The nomads interviewed, who use the river in the gorge area for watering their animals, emphasized that in the future the livestock would be afraid of the big lake and the deep water, making watering of livestock very difficult.
- The interviewed nomads also expect more insects (*e.g.*, tsetse flies, biting flies) and crocodiles along the banks of the reservoir than along the present river.
- Crossing the reservoir would be impossible, causing a long detour via Luuq or Baardheere.

B. Recommendations to Minimize Negative Effects

In accordance with the list of possible negative effects in the previous section, the following recommendations are made:

- At those points where traditional watering is no longer possible, *the GSDR should construct watering facilities* (*e.g.*, level river banks, construct troughs and mechanical facilities for lifting the water).
- *The number of bridges should be increased, taking into account the locations of traditional crossing points when planning future*

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bridge construction. It would be advisable to build new bridges at Jilib and Saakow, to at least partly maintain the traditional migration pattern.

- *Those dhesheegs traditionally used as watering points, and others which could be used, should be attached to the river by small canals for artificial flooding.*
- *Between new cultivation areas, a sufficient number of corridors of at least several hundred meters in width should be kept open to facilitate livestock access to the riverbanks,* thereby avoiding conflicts between pastoralists and farmers over damage to crops and irrigation canals.
- *A certain number of areas with good grass in the floodplain and coastal plain should be maintained as livestock fodder reserves for the dry seasons.*
- *Programs eradicating tsetse fly, malaria, and bilharzia should be part of development programs, and should directly consider the pastoral population and their livestock.*
- *A one-sided expansion of export-oriented crops should be avoided.* A spatial pattern of mixed cultivation including sufficient staple crops, *e.g.*, maize, sorghum, and possibly rice, should be the goal.

Along the future reservoir area, the following measures would be desirable:

- *The small amount of land for potential cultivation on the plateaus along the reservoir area should be developed to substitute for the loss of arable land on the river banks of the gorge area.* Compensation of the agro-pastoralists with new agricultural land further south at the river in the Middle Jubba Region should be considered.
- *At favorable places in the bays surrounding the reservoir, adequate watering facilities in shallow water should be constructed and protective measures against crocodiles should be undertaken,* e.g., *fences built.*
- *The reservoir area should be included in a possible tsetse-eradication campaign, as well as in programs for the abolition of malaria and bilharzia.*
- *GSDR should assist in the establishment of one or two ferries to permit crossing the proposed reservoir between Baardheere and Luuq, with priority given to traditional crossing locations.*

VII. FINAL DISCUSSION AND PERSPECTIVES

This report has pointed out the high economic significance of the Jubba Valley for mobile livestock-keepers during the dry seasons. Mobile livestock-keeping will continue after the construction of Baardheere Dam, despite changes in environmental conditions. The river will continue to be an essential lifeline for the majority of pastoralists and agro-pastoralists, particularly during jiilaal. The same applies to the fodder supply provided by the riverine pastures and crop residues from the cultivation zone along the river. Crop residues will increase in importance with the increase in the number of livestock.

At the same time, the economic strain of livestock on the remaining dry-season pastures will increase due to an expansion of the cultivation areas. The negative consequences for people, livestock, and the environment could be considerable.

The recommendations given for consideration of the mobile livestock-keepers' needs after constructing Baardheere Dam should be the basis for further discussions on the socioeconomic integration of pastoralists and agro-pastoralists into Jubba Valley development.

A few basic aspects should be emphasized. These would have to be considered after the construction of the Baardheere Dam if socioeconomic development favorable to the mobile livestock-keepers of the GJV and the nomadic community is to be introduced.

- The freedom of movement of the mobile livestock-keepers should be maintained through regional planning measures making optimal use of natural resources, while avoiding too strong a concentration of livestock in small areas, such as along the river and around watering points.
- In spite of the demand for freedom of movement, it would be advisable to restrict the large-scale, dry-season immigration of camel herds from the north to the south, since this poses considerable ecological strain and introduces many animal diseases to the southern part of the valley.
- A restriction on building new government and private wells and water catchments in the main grazing areas should be considered to limit further increases in the livestock population and resulting degradation of vegetation.
- Traditional use and legal claims of the mobile livestock-keepers to areas on the river banks and in the floodplain will have to be considered in future development planning; in case of loss of claims, adequate compensation for the mobile livestock-keepers should be provided.
- Planning exclusively from "above" should be avoided, since this prevents the direct participation of pastoralist and agro-pastoralist representatives in decision-making.
- When distributing agricultural lands along the middle course of the Jubba River, preferential consideration should be given to agro-pastoralists, and possibly also to pastoralists from the GJV who are willing to settle.

The mixed economy of the agro-pastoralists, based on cultivation and mobile livestock-keeping, offers a particularly favorable opportunity to minimize the dry-season shortage of fodder by increased feeding with crop residues, but the extension of rainfed farming should be restricted to the physically most favorable areas.

If these recommendations are considered in the future regional development planning of the GJV, it seems possible to keep to a minimum the negative effects of the Baardheere Dam and future agricultural development measures in the Jubba Valley, for the sake of the mobile livestock-keepers and for the economic benefit of Somalia.

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