PD-BBH 180

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete)

Amendment Number

DOCUMENT CODE: 3

COUNTRY/ENTITY: Somalia

3. PROJECT NUMBER: 649-0129

4. BUREAU/OFFICE: Africa — 6

5. PROJECT TITLE (maximum 40 characters): Shebelli Water Management 1

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 92

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 87 B. Quarter 3 C. Final FY 91

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 87 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(2,512)	(1,026)	(3,538)	(22,600)	(13,580)	(36,180)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country						
Other Donor(s)						
TOTALS	2,512	1,026	3,538	22,600	13,580	36,180

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	140	070				2,512		22,600	
(2)									
(3)									
(4)									
TOTALS						2,512		22,600	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 060, 960, 030

11. SECONDARY PURPOSE CODE: 210

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BS	BR	RIAG
B. Amount			

13. PROJECT PURPOSE (maximum 480 characters)

To learn how to improve Shebelli River Basin water management and to establish the framework for larger scale irrigation rehabilitation in Phase 2.

14. SCHEDULED EVALUATIONS

Interim MM 06 YY 90 MM YY Final MM 12 YY 91

15. SOURCE/ORIGIN OF GOODS AND SERVICES: ~~000~~ 941 [X] Local [ ] Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

I concur in the methods of implementation and the financial arrangements under this project. Also in accordance with State 099662, the local currency accounting system at the Ministry of Finance, Domestic Development Division is adequate. See Section 6.2 for details.

Michael R. Bradley
Controller, USAID/Somalia

17. APPROVED BY

Signature

Title: Mission Director

Date Signed: MM 05 DD 10 YY 87

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

SHEBELLI WATER MANAGEMENT PROJECT

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Figure I

SOMALIA

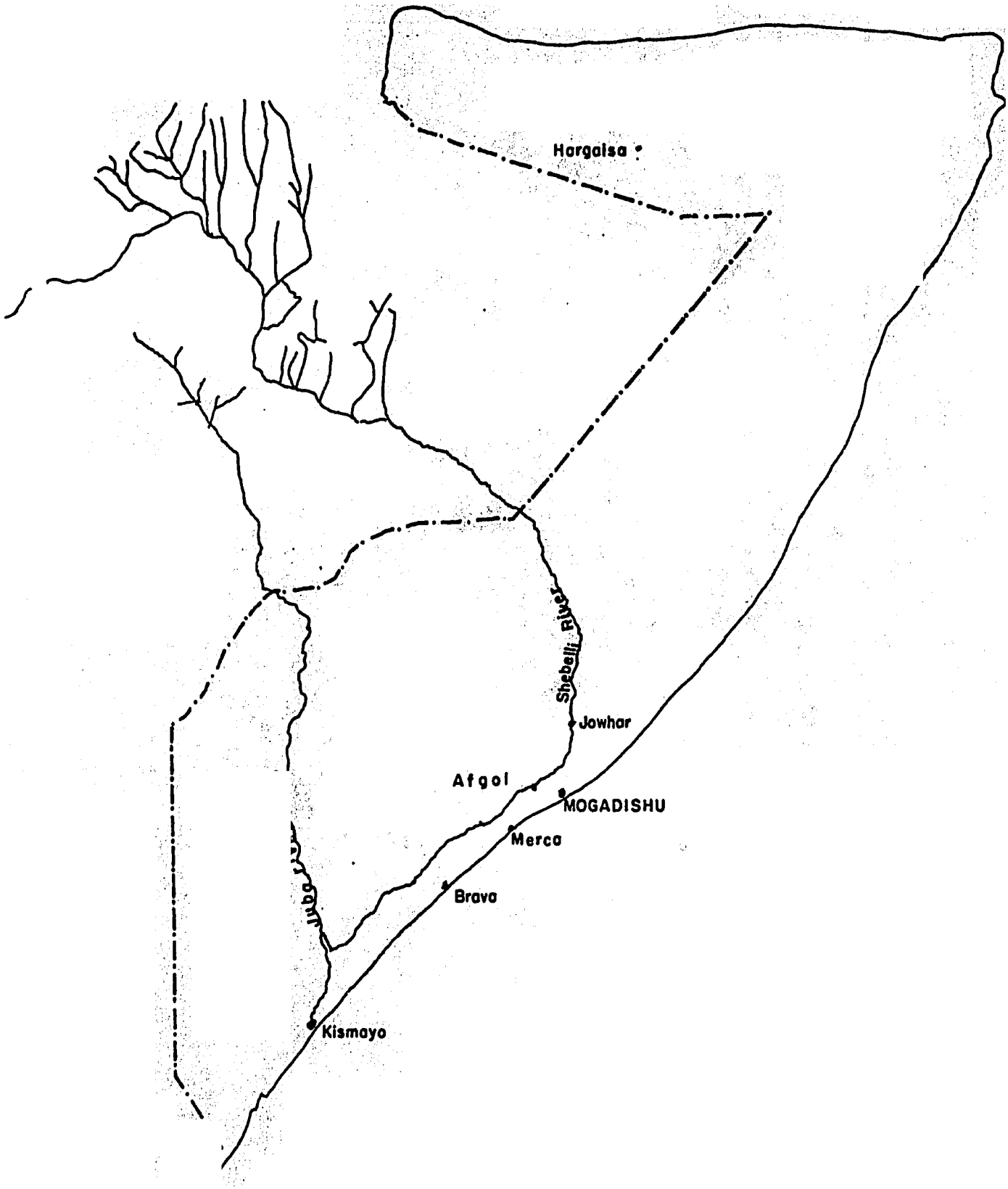

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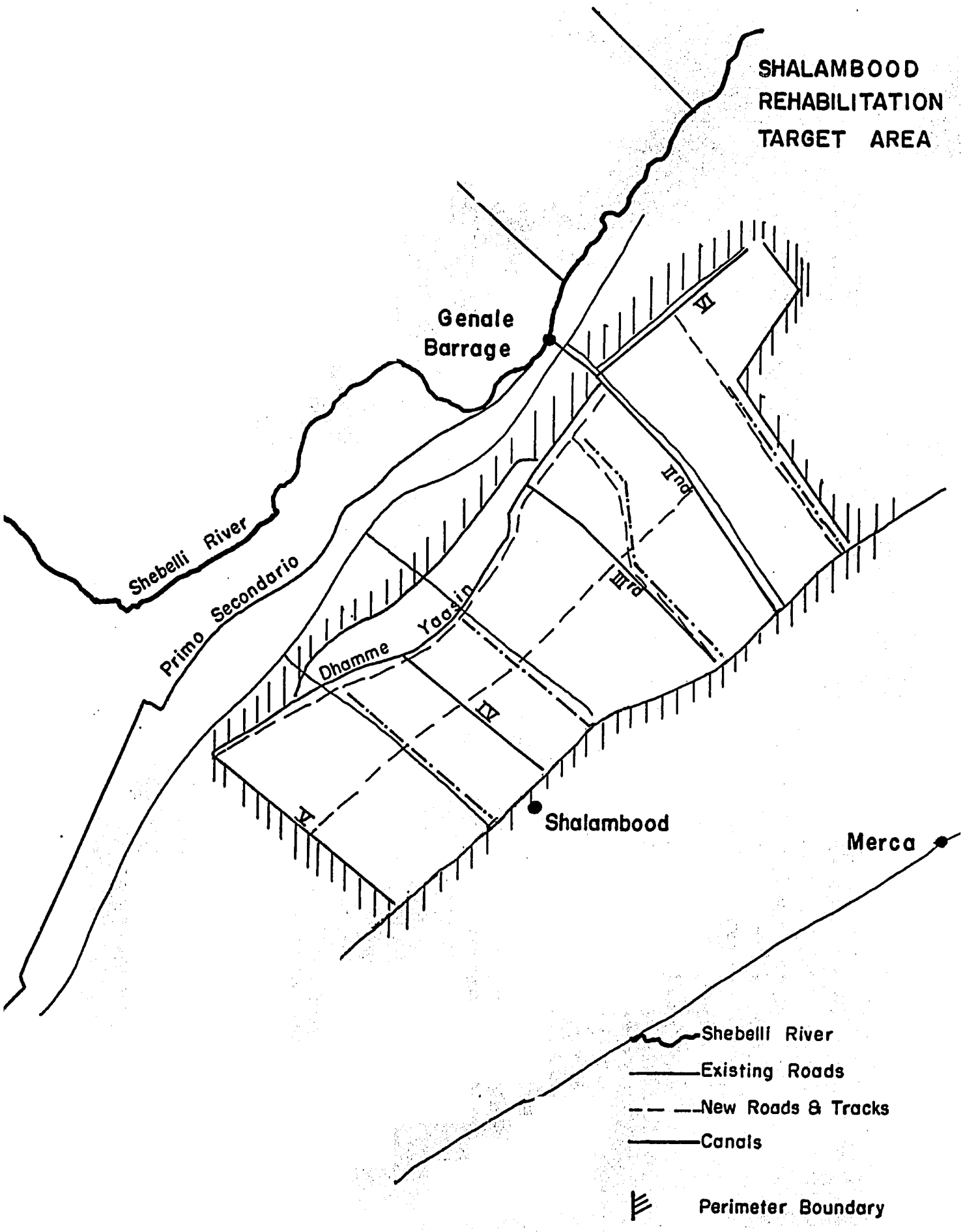
Figure 2



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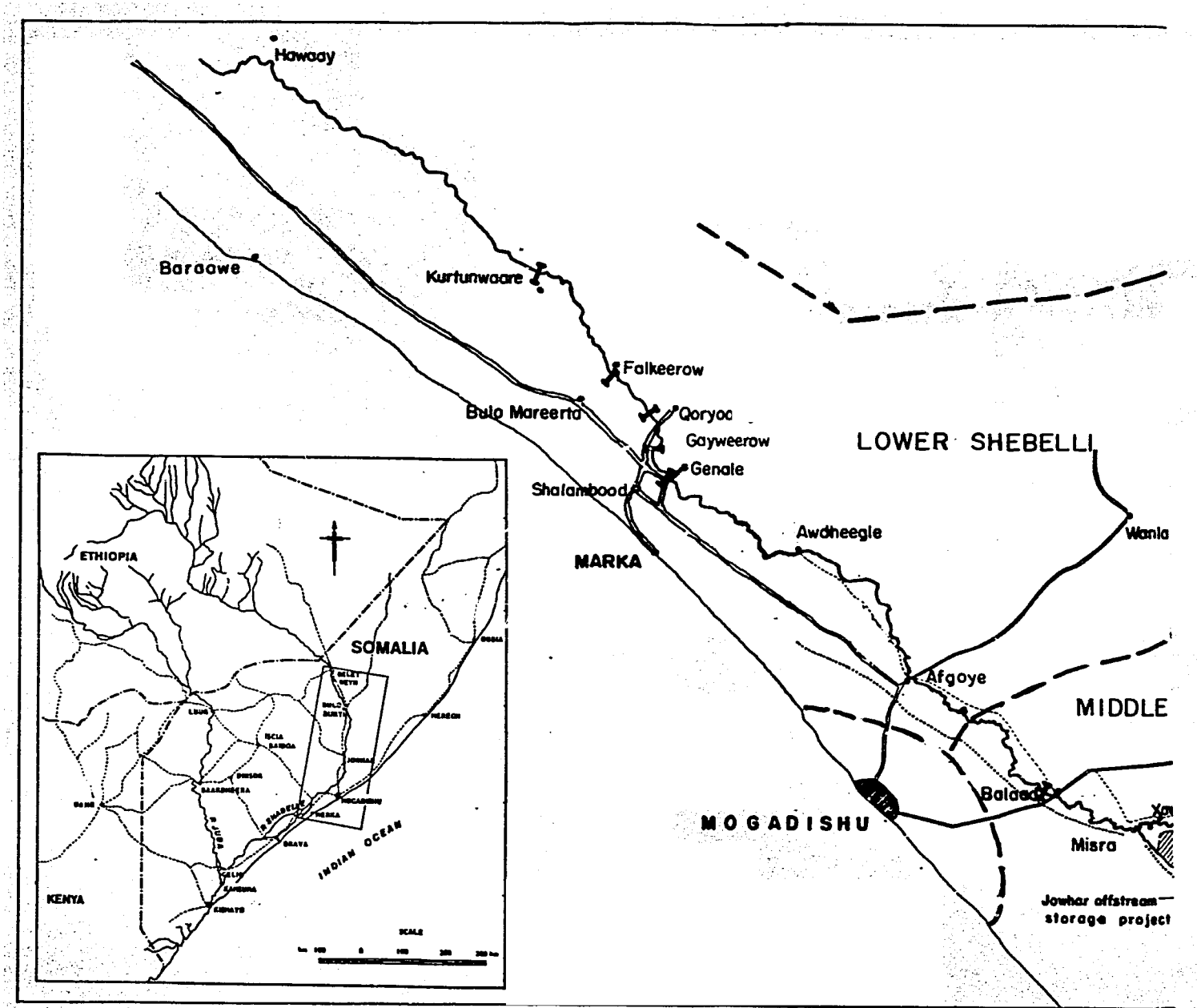
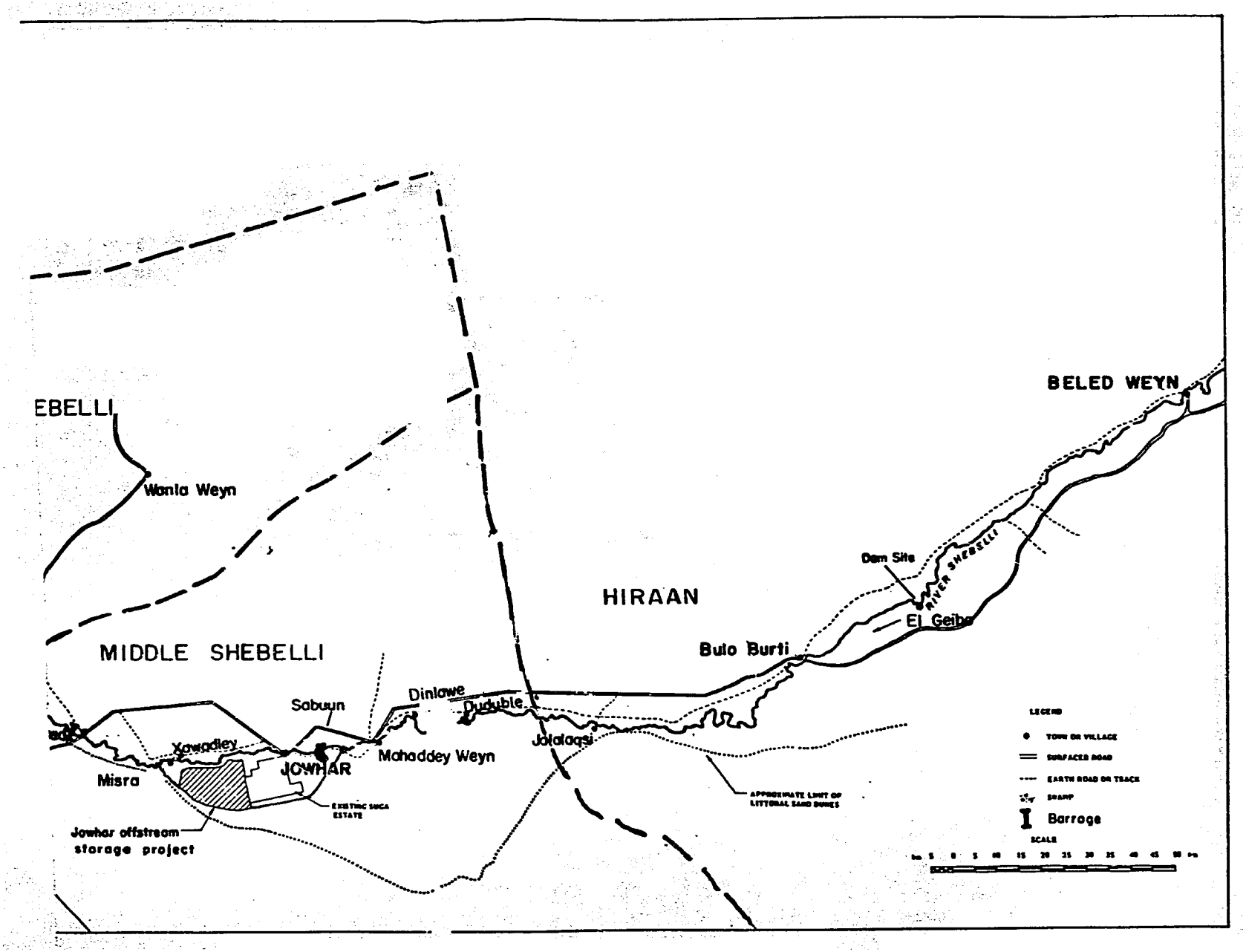

Hawaay
Baraawe
Kurtunwaare
Falkeerow
Bulo Mareerta
Qoryoo
Gayweerow
Genale
Shalambood
LOWER SHEBELLI
Awdheegle
Wanla
MARKA
Afgoye
MIDDLE
Baidoa
MOGADISHU
Misra
Jowhar offstream storage project
ETHIOPIA
SOMALIA
KENYA
INDIAN OCEAN
SCALE

Figure 3



SHEBELLI RIVER

GLOSSARY OF TERMS

ADB	African Development Bank
ADC	Somali Agricultural Development Corporation
ADF	African Development Fund
AID	U.S. Agency for International Development
AID/W	AID/Washington
A/E	Architectural and Engineering
AFMET	Agriculture Farm Management and Extension Training Project
BRADP	Bay Region Agricultural Development Project
CARS	Somali Central Agricultural Research Station
CF	Contact Farmers
CIF	Cost-Insurance-Freight
CIMMYT	International Center for Maize, Wheat and Barley
CIPL	Somali local currency generated by the AID Commodity Import Program (CIP) and PL-480 Program
CRSP	Collaborative Research Support Project (AID)
CSBS	Commercial and Savings Bank of Somalia
DDB	Domestic Development Budget
DDD	Domestic Development Division of Ministry of Revenue
DEO	District Extension Officer
Der	Season of minor rains in Somalia, approximately October-December
DILU	Directorate of Irrigation and Land Use
DLWR	Department of Land and Water Resources (MOA)
DSF	Demonstration State Farm
ECPR	AID Africa Bureau's Executive Committee for Project Review
EDF	Economic Development Fund of EEC
EEC	European Economic Community
ETC	Extension Training Center, Genale
F&A	Department of Finance and Administration, DILU
FAA	U.S. Foreign Assistance Act
FAO	Food and Agriculture Organization
FEA	Field Extension Agent
FF	Follower Farmer
FOA	Faculty of Agriculture, Somali National University
FX	Foreign Exchange (U.S.$)
GDP	Gross Domestic Product
GNP	Gross National Product
GSDR	Government of the Somali Democratic Republic
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit GMBH (German Agency for Technical Cooperation)

Gu	Season of major rains in Somalia, approximately April-June
Haggai	Season of light rains in Somalia, approximately June-July
IARC	International Agricultural Research Centers
IBRD	World Bank, International Bank for Reconstruction and Development
ICRISAT	International Center for Research in the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IFB	Invitation for Bid
IGAAD	Inter-Governmental Authority Against Drought
IITA	International Institute for Tropical Agriculture
IQC	Indefinite Quantity Contract (AID)
jibal	Somali unit of measure for one-sixteenth of a hectare
Jilaal	Dry season in Somalia, December-March
KFW	Kreditbank fur Wittenschaft (German credit bank for development)
LBII	Louis Berger International, Inc.
LC	Local Currency
LEU	Department of Land Evaluation and Use (DILU)
LI	Lahmeyer International
LOP	Life of Project
LT	Long term
LTC	Land Tenure Center, University of Wisconsion
MJRA	Somali Ministry of Justice and Religious Affairs
MMP	Sir M. MacDonald & Partners, Ltd.
MLFR	Somali Ministry of Livestock, Forestry and Range
MMWR	Somali Ministry of Mineral and Water Resources
MOA	Somali Ministry of Agriculture
MOA/DLWR	Somali Ministry of Agriculture/Department of Land and Water Resources
MOI	Somali Ministry of Interior
MONP	Somali Ministry of National Planning
NES	Somali National Extension Service
NRA	Somali National Range Agency
OB	GSDR Ordinary Budget
O&M	Operations and Maintenance
ONAT	Somali Farm Machinery and Agricultural Services Organization
PCS	Project Coordination and Support
PID	Project Identification Document (AID)
PIO/C	Project Implementation Order/Commodities
PIO/P	Project Implementation Order/Participant Training services contract
PIO/T	Project Implementation Order/Technical Services

PM	Person Month of Contract Services
PP	Project Paper (AID)
PY	Person Year of Contract Services
quintal	100 kilograms
REO	Regional Extension Officer
RFP	Request for Proposals
RFTP	Request for Technical Proposals
RLA	Regional Legal Advisor (AID)
RWRA	Department of Regional Water Resources Allocation, DILU
SDA	Somali Settlement Development Agency (MOA)
SDB	Somali Development Bank
SDCC	Shebelli Donors' Coordination Committee
SIDAM	Somali Institute for Development Administration and Management
SMC	Somali Seed Multiplication Center at Afgoi
SMS	Subject Matter Specialist
SNU	Somali National University
SOMTAD	AID-funded "Somali Management Training and Development" Project
SoSh	Standard acronym for Somali Shilling
SOW	Scope of Work
ST	Short term
SWMP	Shebelli Water Management Project
TA	Technical Assistance
TAMS	Tippets-Abbett-McCarthy-Stratton
TDY	Temporary Duty (a short-term consultancy)
T&V	Training and Visit Extension System
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID/Somalia	AID Mission in Mogadishu
USDA	U.S. Department of Agriculture
WHO	World Health Organization

Exchange rate used: U.S. $1.00 = So.Sh. 90 unless otherwise stated

Executive Summary

The Shebelli Water Management I Project Paper establishes the context for the decade long AID commitment to the goal of increasing irrigated agricultural production in the Shebelli River basin, through an estimated AID commitment of $50 million over two phases. The purpose of the first phase of the Project is to learn how to improve Shebelli River basin water management and establish the framework for larger scale irrigation system rehabilitation in Phase 2.

Of Somalia's two major rivers that irrigate large hectarages, the Shebelli is closest to Mogadishu and holds the greatest production potential in terms of irrigable land. Approximately 32% of the country's population (2.1 million people) reside in the Shebelli Basin and are dependent directly or indirectly on its irrigation system for their income.

Irrigation efficiencies in the basin's 132,000 hectares of cultivated land are estimated at only 50 - 90 percent although two crop seasons exist. This is due to several factors: (1) inadequate regulation of water distribution; (2) lack of proper maintenance of regulating structures, barrages, and canals; and (3) low production technologies.

Phase 1 will address these three areas through the following three major project components: (1) River Basin Management, (2) Shalambood Irrigation System Rehabilitation, and (3) Adaptive Irrigated Agricultural Research.

The River Basin Management component will assist the Ministry of Agriculture (MOA) gain better control and management over the water resource. Legislation will be passed to help rationalize water allocation amongst competing users. A fee structure will be put in place in which water users will eventually pay the full cost of water delivery, maintenance of their irrigation systems, and river management. At the same time the ability of the Ministry of Agriculture to deliver these critical services and to maintain the irrigation systems will be improved. Phase 1 outputs will lay the groundwork for the eventual development of an integrated river basin management system operated by the MOA, which will regulate and allocate all of the water resource to competing users in accordance with national law. This management system will be further refined and strengthened in Phase 2.

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In the GSDR's overall Shebelli River Basin master plan, various donors have selected target irrigation districts or schemes to rehabilitate the river's control structures, canals, headgates, etc. USAID has selected 8,000 hectares below the Genale Barrage near Shalambood (approximately 100 km SE of Mogadishu). This is referred to as the Shalambood target area. The Shalambood Irrigation System Rehabilitation component will fund long over-due maintenance on the Genale Barrage, the irrigation district's main feeder canal (Dhame Yassin), and the Fourth Secondario canal. This will enhance improved irrigation delivery in the entire 8,000 hectares and will specifically increase the MOA's ability to deliver water to a large group of small holder farmers along the Fourth Secondario canal. The increased water delivery to this target group of small holders will allow the agricultural researchers to develop better on-farm water management practices and to learn how to improve water use efficiencies at the farm level. From the knowledge and experience gained from the rehabilitation in Phase 1, any necessary modifications can be identified before completing the irrigation structure rehabilitation of the remaining area during Phase 2.

The Adaptive Irrigated Agricultural Research component will focus its efforts to improve on-farm water management and increase crop technologies with the farmers near the Fourth Secondario canal. This component will transfer crop specific production practices which have already been developed and proven in other countries, adapt these "tech paks" to Somali conditions, and extend them to farmers. Because of the very low technology levels used by farmers at present, significant production gains can be realized through a transfer of proven technology to Somali farmers. From the experience gained in working with this target group, in Phase 2 these production technology packages will be refined and disseminated to all farmers in the Shebelli Basin.

The Project is a culmination of three years of discussion between the GSDR, USAID/Somalia, and AID/W. When the PID was approved in May, 1986 for a total funding level of $50 million over two phases, it was expected that the first phase would be a test phase with a much higher level of funding in Phase 2 than Phase 1. This was based on several assumptions including:

(i) assumed lack of private or public institutional arrangements among water-users for the allocation of water and maintenance of canal delivery structures at or below the tertiary level;

(ii) assumed need for large capital investments for irrigation infrastructure improvement to bring the system up to an acceptable level of efficiency; and

(iii) assumed lack of any system of cost recovery for maintenance of any part of the system.

During project design, mission has learned that water users are well organized at the local level and have well established rules to allocate water and maintain their delivery structures and canals below the tertiary level. The Shebelli rehabilitation target area will not involve heavy construction, realignment, or lining of canals as originally envisioned, but will involve long over-due heavy maintenance of the system, costing much less than initially estimated. The user groups and farmers recognize the water as their most critical production input and have established a system by which they pay for water delivery services by their labor to maintain their local canals, and by contributing money to the MOA to purchase fuel for maintenance equipment and to pay the operator of the equipment. Because these three assumptions have not proven valid, many of the activities originally anticipated in Phase 2 have now been moved into Phase 1.

Project Inputs by Component

	AID $(thousands)	GSDR LC ($ equivalents in thousands)	Project Totals ($thousands)
River Basin Management	7,264	6,480	13,744
Adaptive Irrigated Research	5,365	4,916	10,281
Shalambood Irrigation Rehab	6,890	1,529	8,419
Project Coordination and Support	3,081	655	3,736
Grand Totals	22,600	13,580	36,180

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1. BACKGROUND

The Shebelli Water Management Project (649-0129) has evolved from previous multi-donor project efforts in Somalia's agricultural sector, and more recently from an Integrated Agricultural Sector Strategy Study (prepared under the direction of the World Bank with AID, other donor, and GSDR support), and an AID/W and Mission Agricultural Strategy proposal which was reviewed by AID's Africa Bureau in January, 1986. The subsequent Project Identification Document (PID) proposed a 10 year project that would address:

- System-wide Irrigation Water Management;

- Adaptive Irrigated Agricultural Research; and

- Irrigation System Rehabilitation.

In June, 1986 the Africa Bureau approved the PID, with Executive Committee for Project Review (ECPR) guidance (see Annex A) that established design parameters including:

(i) an overall commitment for 10 year life of project funding of at least U.S.$ 50 million;

(ii) a balanced approach which integrates the three components listed above;

(iii) two phases, with FY 87 Project Paper (PP) design of Phase 1 (up to 5 years) to initiate all three components on a modest scale as a learning process. During Phase 1 implementation, larger scale Phase 2 interventions will be designed.

Hydrological studies and master planning for the Shebelli basin's rehabilitation began in the late sixties, funded by the GSDR and other donors, and these studies were updated in 1978 by the U.K. firm of Sir M. MacDonald & Partners (MMP). An IBRD-funded study by Tippetts-Abbett-McCarthy-Stratton (TAMS) of the Faraxaane and Shalambood sub-areas (identified as priorities for irrigation rehabilitation in 1978) was completed in October, 1986, and German-funded basinwide studies by Lahmeyer International (LI) were completed in September, 1986. Subsequent AID-funded study teams (Associates in Rural Development, WMSII/CH2M HILL, and the University of Wisconsin Land Tenure Center) have provided additional information which has resulted in revision of some basic assumptions upon which the PID was prepared. PID assumptions which are no longer valid are as follows:

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(i) assumed lack of private or public institutional arrangements among water-users for the allocation of water and maintenance of canal delivery structures at or below the tertiary level;

(ii) assumed need for large capital investments for irrigation infrastructure improvement to bring the system up to an acceptable level of efficiency; and

(iii) assumed lack of any system of cost recovery for maintenance of any part of the system.

Contrary to what appeared to be the case during PID preparation, Shebelli water users' groups (informal associations) not only exist, but function to regulate water delivery, as well as levy labor charges for organized maintenance activities. Study teams' reconnaissance of the project area produced the hypothesis that the observed and recorded heavy silt load in the Shebelli system has, in effect, established an irrigation environment that plays no favorites, requiring both head-enders and tail-enders to equally participate in maintenance activities to guarantee water delivery to their parcels. Labor levys are informally charged to individual parcel owners by water users' groups; in many respects these charges set the stage for future establishment of water fee assessments.

Although initial PID expectations called for considerable funding for capital improvements, study of the two project site options (Faraxaane and Shalambood) suggests that the two require rather different approaches to irrigation rehabilitation in the Lower Shebelli, and indicate that the Shalambood site (which has been selected by USAID) predominantly requires heavy maintenance rather than the canal realignment, structural barrage repairs, canal lining and other more major improvements originally anticipated. Thus, with the exception of improving drainage, considerable improvements can be made to the Shalambood target area with repair of gates, improved canal cleaning and maintenance. This decrease in the assumed level of funding for capital improvements allows emphasis to be shifted to the other two components (namely, systemwide water management and adaptive irrigated research), and to upgrading of the Genale barrage, a main stem water control structure, within AID's Phase 1 infrastructural rehabilitation component (since this barrage controls water delivery to the Shalambood target area).

Table 1: Areas Irrigated from the Shebelli River

Irrigated Zone	Gross Area in ha.	Mode of Service
Upstream from the zone of influence of Sabuun Weir	11,000	67 pumps 22 small canals
From Sabuun Weir	23,100	Sugar Estate canals, Baarow Weyne, etc.
Downstream from Sabuun Weir to Mahaddey Weyn and N. of Jowhar	3,600	20 pumps
From Balad Barrage	7,300	General Daud canal
Above Afgoi, and down to zone of influence of Genale Barrage	21,000	210 pumps + Sigaale and Giddu canals
From Genale Barrage	24,000	Dhamme Yassin Canal, Asaile Canal, Primo Secondario
From Gayweerow Barrage	12,200 *	
Downstream from Gayweerow Bridge, above Qorioley	7,200 *	Wadajir Canal
From Qorioley Barrage	11,400 *	Faraxaane
From Falkeerow Barrage	12,700 *	
From Kurtenwaare Barrage	6,000	Kurtenwaare Sablale Brava
Hawaay Scheme	4,000 ±	13 pumps
Total Gross Area:	150,000 hectares	
Total Net Area:	132,000 hectares	

* The aggregate value of 43,500 hectares for these four areas is accurate. The breakdown between them is estimated.

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2. PROBLEMS TO BE ADDRESSED

2.1 Basinwide Shebelli Water Management

Currently, it is estimated that 132,000 hectares are cultivated by controlled, supplemental, and wild flood irrigation in the Shebelli River Basin, at only 50 to 90 percent crop intensities (less than one full crop per hectare annually). Optimal production intensity would be 200 percent, with land under controlled irrigation receiving adequate water supply for double cropping (harvests in both the March-June Gu and December through February Der seasons on all lands). The area from Afgoi to Hawaay (where the Shebelli ends in swamp lands) includes 98,500 of these hectares (see Table 1), but AID's consulting engineers have projected that average annual river flow at Afgoi, even if well regulated, could fully irrigate only 60,000 hectares over two growing seasons. When water is available for irrigation, the applied quantities are uncontrolled, and efficiencies and crop yields are quite low (an estimated 20 percent irrigation efficiency basinwide). There is at present no charge for irrigation water, and there is thus no incentive for conservation. At the same time, main stem irrigation works are little or not maintained, as government budget allocations for this purpose are grossly inadequate.

Clearly, a regulated water allocation system needs to be put in place within the Ministry of Agriculture, backed by hydraulic modelling, and a legal basis for the allocation of water between perennial and annual cropping systems. Of the total 132,000 hectares currently under cultivation basinwide, only 12,000 hectares are under perennial crops (principally bananas). Higher profits from perennial crops have supported investment in some tubewells which extract groundwater for supplemental irrigation. Current lack of a water pricing system for economically efficient allocation of the river's limited flow, however, has encouraged perennial (mainly large) farmers to draw most heavily on the Der season flows at the expense of annual cropping smallholders. Typically, during the January-April 1986 dry season, the critical period for Der season harvests, water abstraction from the river is permitted only for human and animal consumption and for irrigation of perennials and vegetables, to the exclusion of other (mainly smallholder) crops such as sesame.

The primary water control structures on the river include seven regulable (in theory) barrages, two fixed weirs, the Jowhar Reservoir, and the Duduble Flood Relief Channel (see Figure 3). In addition, 330 pumping installations extract water directly from the river to feed small irrigation schemes. In the future, German bilateral aid may support the construction of a second off-stream storage reservoir at Duduble; feasibility studies are still

on-going at this time. Existing obstacles to efficient and equitable water management along the primary stem of the Shebelli River include weak institutional capacity, lack of a legal basis for water allocation and pricing, fragmented institutional responsibilities, lack of trained personnel to fill needed positions, ambiguity in public/private sector split in operations and maintenance functions, and deteriorated or poorly designed infrastructural conditions. Each of these obstacles to be addressed by project activities are discussed more fully below.

Management of the primary stem's main water control structures is currently seated in the Department of Land and Water Resources (DLWR) within the Ministry of Agriculture (MOA). This department is handicapped in exercising its mandate by: (1) a chronic shortage of trained staff (especially irrigation engineers); (2) low salary structures which make it difficult to attract qualified and motivated personnel; (3) lack of a computerized river modelling data base which can be used for allocation decisions; (4) insufficient communications equipment to effectively control and link the barrage, reservoir, and flood relief structures; and (5) lack of regular channels of communication with water users' associations.

A National Water Law is needed as a basis for policies on the allocation and pricing of Shebelli River water, and the reinvestment of water users' fees in system operations and maintenance. The Law No. 77 of 1972 and Law No. 13 of 1966 (which the 1972 law repealed for the most part), are the two major water laws of Somalia. Many additional laws created water-related projects and autonomous agencies, without consolidating the functions of administrative entities, or even properly coordinating them through a national water policy and institutional framework. In 1984, with FAO assistance, a draft new National Water Law was prepared, and it is now under review by the Council of Ministers. Among the major flaws of omission and commission of the draft law are:

(1) Sectoral Water Allocation - The draft Law does not prescribe water allocation criteria which encourage water use efficiency, and the perennial sub-sector is assigned a higher priority claim on scarce water supplies than the annual crops needed for food self-sufficiency.

(2) Water Pricing Policy - The draft Law allows price discrimination, but does not provide adequate criteria for use of this mechanism to implement allocation policies, e.g. to favor efficient users and to discourage low priority uses. It limits the cost recovery rights of the state to a contribution only towards the capital development costs of water works, rather than allowing users' fees to be collected for recurrent costs of water delivery.

(3) Water Management Administration - The law would increase administrative duplication, inefficiency, and costs by creating a large administration without prescribing the principles and process for its restructuring.

17x

(4) Omissions - The proposed Law does not discuss several key issues, including the status of current water rights, water rights transfer, status of water users' groups, and the body of law which will guide adjudication and administration in cases of dispute.

The fragmentation of irrigation institutional responsibilities along the river is a major obstacle to rational systemwide management of this resource. Developments along the Shebelli are proceeding without any significant degree of coordination between projects. No single institution is responsible for coordinating surface and groundwater extraction, although both are used for irrigation purposes. Control and operation of the main control structures along the Shebelli is also fragmented, being housed within two separate ministries, each with its own agenda. Though the MOA's Department of Land and Water Resources controls most structures (five of the barrages, the weirs, the flood relief channel, and the Jowhar Reservoir), other governmental entities control two barrages -- the barrage at Balad (at a critical location upstream of most of the irrigated areas in the basin) is controlled by the Ministry of Industry, and the Kurtenwaare Barrage is still operated by the Settlement Development Agency of the MOA. Until these two barrages (particularly the one at Balad) are transferred to DLWR control, implementation of rational water allocation along the main stem of the river will be greatly hampered. The MOA proposes to elevate the DLWR to the status of a Directorate of Irrigation and Land Use within the MOA, but without technical assistance and training, the new Directorate will be unable to manage its land registration, water allocation, and operations/ maintenance functions in the Shebelli basin.

The ambiguous division of labor and financial responsibilities between public and private sectors also needs to be clarified through establishing a clearer role for water users' associations in system management, financing, and maintenance. Studies of the Shalambood target area financed by AID in 1986-87 have revealed that the area's 63 aziendas (plantations created under Italian colonial times which have since reverted to Somali ownership) have retained a communal water management system which has its roots in the traditional social systems of the interriverine areas. These norms and traditions have created the water users' groups now present in the Shalambood target area, who have de facto responsibility for irrigation infrastructure maintenance and water allocation at the levels of secondary and tertiary canals. Stronger linkages need to be established between the new Directorate and water users' groups, and policy on the allocation of operational, financial, and maintenance responsibilities along the secondary and tertiary canals needs to be defined and supported by training and communication networks. Additional work with water users' groups will be needed, and studies of other local organizations (e.g. Village Councils, inter-azienda committees, and other self-help organizations) to assess these local organizations' capacity for assuming broader financial and operational responsibilities, the strength of their leadership, and their openness to agronomic innovation.

Finally, the deteriorated physical condition and design inadequacies of the river's main control structures and canal systems are problems which need to be addressed. The Jowhar reservoir is the Shebelli's only facility for the storage of Gu and Der season floods which can then later be used to augment the river's low flows during the January-April dry season. A number of areas downstream from the reservoir depend upon high river levels for gravity diversion to their service canals, and in order to accommodate these interests, the DLWR has restricted diversions to the reservoir, a situation which is greatly constraining smallholders' Der season yields. Solutions to this problem, either by providing one or more pumping stations, or by constructing an uncontrolled low weir across the river to raise the water level, need to be developed, in order to maximize use of the Shebelli's basinwide irrigation system. Siltation in the Jowhar Reservoir is also extremely problematic. The reservoir's siltation rates need to be monitored and mitigated by design and maintenance, if its water storage volume is to be retained. Thus, design and management improvements for the Jowhar reservoir are a high priority. It appears that improved reservoir management could have more impact on Der season yields than any other single technical assistance effort.

During just one year of operation, 100,000 m^3 of sediment were deposited in the Duduble flood relief channel--a critical operational problem that also needs to be addressed. Technical assistance is needed to determine whether the flood channel will soon reach a regime equilibrium, or whether extensive and costly excavation will need to be carried out yearly in order to keep it operative.

Much of the mechanical equipment of the Genale Barrage (which serves the Shalambood area) is damaged or inoperable, rendering water control at this critical location extremely difficult. The Genale Barrage alone commands 24,000 hectares by way of the Primo Secondario and Dhamme Yassin canals, and also regulates the flow-through of water controlled by the downstream barrages, which serve an additional 43,500 hectares of irrigation. As such, the Genale barrage is a key control structure in the Shebelli River irrigation system, affecting over half of the area irrigated in the basin. The present impossibility of operating most of the gates at Genale, as well as the head regulators on the Primo Secondario and the Dhamme Yassin canals, severely impairs water control and management of the system. Because of these mechanical difficulties, flow through the Genale Barrage to downstream irrigation can only take place over the dam's spillways, discharging too little water toward downstream areas because too much is now diverted to the Primo Secondario and the Dhamme Yassin. This inequitable distribution of water to downstream users is limited only by poor maintenance of the Shalambood canals, which are unable to receive their design discharge because of siltation.

To a lesser degree, the same type of problems prevail at the Qorioley and Falkeerow barrages, increasingly disadvantaging

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downstream users. In addition to the ineffectiveness of the control mechanisms at the barrages from Genale to Falkeerow, the distribution systems (headworks, canals, regulators, turn-outs, etc.) are all in very poor condition. Because of low levels of system maintenance, large portions of the silts and clays suspended in the Shebelli's flow are being deposited in all of the basin's irrigation canals, greatly reducing their water-carrying capacity. For all of these reasons, basinwide management of water distribution is practically impossible, and irrigation takes place very inefficiently. The delivery of water to farmers' parcels is neither uniform nor timely, and crop yields are consequently low.

The status of land tenure arrangements in the Shebelli basin raise a number of equity issues. Under present conditions throughout the irrigation system, small farm holdings are located in the driest areas farthest from the main stem water flow. The large farm entities (plantations or large private farms, state farms, and large special interest cooperatives) are all located closest to the water source. In order to upgrade flows to small farm holders, basin wide water improvements will also improve water control to large farms.

Currently land tenure relations in Somalia are governed by the Agricultural Land Law (Number 73) of 1975 and subsequent decrees, notably Law Number 23 of 1976. The 1987 AID-funded Land Tenure Center report points out the following essential features of that law:

First, the law establishes State control over all the country's lands, with distribution, supervision and management of the land being the responsibility of the Secretary of Agriculture.

Second, access rights are on the basis of a 50 year lease for individuals or families, with no limit for cooperatives or public agencies.

Third, lease rights are inheritable by immediate kin.

Fourth, land ownership ceilings are specified for individuals (30 hectares irrigated, 50 hectares rainfed, and 100 hectares for banana plantations) with no limitations on sizes of areas that may be registered under the name of corporations or private organizations. Special entities of which the government is part owner, such as Somalfruit, a prominent presence in the Shebelli basin, are excluded from the provisions of the land law.

Fifth, the government may nationalize lands in excess of the limits, which fail to honor the terms of the lease or which are not cultivated over a successive two-year period. Individuals may register lands that they are farming or may wish to farm. According to the Land Tenure Center report, "the large number of farms currently unregistered are in a legal netherland."

Sixth, the land law establishes authority to tax land. Finally, land transfer or rental does not appear to be legal.

The potential effects on the production and security of farmers of all types in the Shebelli basin, with proposed multi-donor rehabilitation of the irrigation systems, are readily seen by all. Farmers interviewed noted that there is less water available to them each year, taking differences in rainfall into account, and they realize fully that the lower water availability is due largely to the deterioration of the canal system. Farmers also noted that lesser availability of water has led to increased inequities of distribution. Thirty-two percent of the farmers interviewed by the Land Tenure Center noted that both the timing and the amount of water received in the Gu season were inadequate. Only 11 percent of the farms reported having no problems. In the Der season 50 percent of the farmers reported inadequate timing and amounts of water available and only 4 percent reported having no problems.

Certainly another big issue from the point of view of farmers is their fear of a "land grab" phenomenon. Farmers sometimes rank this problem above that of irrigation according to the Land Tenure Report. A key informant noted that he was aware of the irrigation rehabilitation project and recognized that with improved water supply outsiders would be tempted to take advantage of the unregistered status of more smallholders' land in the Shebelli basin. In their survey of the Shalambood target area, the Land Tenure Center found that only 44 percent of the farmers enjoyed some measure of tenure security. Registration, therefore lies high on the farmer's agenda of needs. Farmers rightly feel that improved irrigation will do them no good if they lose their land.

There are several issues to resolve in a successful expansion of the registration process. Registration is a complicated, lengthy and expensive procedure. The problems of time and cost make it especially hard for small farmers to register their land. It was said that the entire land registration procedure costs a land holder So.Sh. 20-30,000 after transportation and gratuities are taken care of. Clearly registration of land is not for the poor smallholder.

Female-headed households have far fewer registered parcels than male-headed households and smaller parcels are seldom registered. Another problem is that the Land Law only permits a family to register one parcel, even though the Land Tenure Center Survey reports that 32.1 percent of those surveyed reported having more than one parcel.

A program of land registration on the aziendas needs to be carried out using greatly simplified low cost, on-site procedures in advance of the rehabilitation work to be carried out on the canal sytem to provide security for the small farmer.

The project also needs to address the problem of local participation. Among other things, we still lack basic knowledge of how local Village Councils and other village level institutions operate in the Lower Shebelli. Although the Councils themselves

may not present any obstacle to the project, our lack of knowledge as to their methods of operating and their own goals might deprive the project of a potential ally for helping to generate program effects. Knowledge about this and other local institutions might be particularly useful if the water users' groups prove ineffective in pilot programs.

Another Shebelli basinwide problem which must be addressed is the high incidence of water borne disease, particularly schistosomiasis (the incidence of which is estimated to be between 80-90 percent among workers on banana plantations in the lower Shebelli). Other water borne diseases are common as well; gastroenteritis, dysentary and typhoid. Malaria is also widespread, facilitated by vector breeding throughout the irrigation system. All of these diseases are highly debilitating, severely limiting the effectiveness of local labor. Water borne disease will have to be addressed if improvement in human resources is to match improvements in agricultural infrastructure and technique, and if irrigation rehabilitation is to reduce disease incidence basinwide rather than spread this problem.

2.2 Adaptive Irrigated Agricultural Research

In October 1985, a five person team from AID/W worked together with USAID/Somalia to develop an agricultural strategy which was approved by AID/W in January 1986. This strategy determined that adaptive irrigated agricultural research was needed in Somalia to support an increase in Shebelli River basin production, and that this should be practical applied research focussed on overcoming specific constraints on yields and production of import substitution crops, especially staples with demonstrated potential for yield increases (such as maize).

The economics of crop production need to be monitored carefully. Since the marketing of grain by the private sector became legal during the early part of this decade, maize production increased by a factor of 3.5 reaching 380,000 MT for 1986. Due to excellent rains in 1985-86, sorghum production increased significantly, although marketing remained constant. There are indicators that the production of these cereals is approaching domestic self-sufficiency in meeting the needs of the non-refugee population. Although monthly nominal retail maize prices during 1985 and 1986 were about the same (both showing similar seasonal fluctuation), the real price was somewhat lower in 1986 because of inflation. A significant drop in farm-gate prices (to So.Sh. 9/kg) occurred in August and September 1986 after three good seasons of rain. With the drought of the Der season 1986, prices quickly reached normal rates (So.Sh. 20 - 24/kg). Growth in the demand for maize is likely to be no greater than overall population growth rate if uses for maize other than direct human consumption are not introduced. Thus, an annual increase in the national demand for maize is likely to be between 8,000 and 10,000 MT. This project assumes an increase of annual maize production in the Shalambood

target area of 8,600 MT by the tenth year. Increased maize output from this activity alone would thus have little effect on market prices. However, a supply/price problem could arise due to increased total production with the many rehabilitation projects in the entire river basin. The volume and types of concessionary food imported by all donors for refugee and non-refugee purposes can have a major impact also on the supply/demand situation, and this will need to be monitored carefully during Phase 1 policy dialogue.

Over the past five years, USAID has supported agricultural research efforts in Somalia through the Agricultural Delivery Systems Project (649-0112) and the Bay Regional Agricultural Development Project (649-0113). Through the Agricultural Delivery Systems Project, AFMET developed technological packages of recommended farm management practices for irrigated maize which were extended to farmers in the Shebelli basin. Included in these "tech paks" were recommendations such as time of planting, plant density, number and timing of weedings, and specifications for fertilizer and pesticide use. Farmers adopting these recommended practices (without fertilizer) have been able to double their traditional yields from 1,200 kilograms per hectare to 2,400 kilograms per hectare. Those farmers who are able to apply 100 kilograms of urea per hectare obtain yields of 4,000 kilograms per hectare. Since the researchers considered the economic viability of alternatives, and recommended only those practices which would yield a net increase in farmer profit, these technological packages have been readily adopted by farmers who have been trained in their use and in how to keep records to help determine which recommendations are profitable.

Although AID-supported yield increases in irrigated maize have been dramatic in the past three years, the improved yields from local varieties are still well below those of maize varieties developed in other countries, which could be grown in Somalia.

Though focussed on dryland or rainfed agricultural research, the Bay Region Agricultural Development Project (BRADP) has identified several promising oil crops that can also be grown in the Shebelli Basin. Several can be grown without irrigation or with minimal irrigation. The list includes soybeans, safflower, and sunflower. BRADP research has also worked with cowpeas, ground nuts, and mung beans as rotational crops to increase soil fertility. A significant research finding in BRADP was that phosphorus is the limiting soil nutrient in the Bay Region and further, that phosphorus placement is key to achieving higher yields. This discovery and/or other soil chemistry problems associated with irrigation, may explain why, under the Agriculture Delivery Systems Project, irrigated maize yields responded significantly to applications of 100 kilograms of urea per hectare, but increasing urea applications to 200 kg/hectare did not produce significant additional yield responses.

Salinity and soil management problems are major production constraints in the Shebelli basin (see Technical Annexes J and K). Most of the Shebelli soils are heavy clay vertisols and cambisols

that are easily water-logged through over-irrigation, leading to salt build-up in the soil profile. There is need to develop soil management practices which will minimize salinity problems, increase soil fertility, and improve soil structure. Inefficient water use, drainage, and waterlogging can be addressed through improved on-farm water management practices. It has been noted, in 2.1 above, that there is not enough water to irrigate the entire 130,000 hectares in the valley in both Gu and Der seasons. During the Gu season there is normally enough rainfall to produce a crop of maize with only minimal supplemental irrigation. However, if grown in the Der season, maize would rely much more on irrigation. Given undependability of Der season irrigation, most farmers choose to not grow maize, but rather to grow sorghum or oil seeds (especially sesame), which need only one irrigation to produce a harvest. Through adaptive research, AID hopes to recommend crop mixes that capitalize on the more plentiful Gu season water supply recommend crop mixes needing little irrigation during the Der season.

Recent data collected in the Shebelli basin indicate that crop intensity ranges between 50-90 percent on "irrigated" lands (50 percent for large farms and 90 percent average for small farms). This is very low for a river basin that has two crop seasons per annum. Improved cropping patterns, rotations, and diversification profitable to farmers are needed to increase crop intensity to well over 100 percent/annum, and thus generate irrigation users' fees adequate to support the recurrent costs of a more dependable irrigation system.

Somalia presently imports over 60 percent of its edible oil consumption. Previous USAID-sponsored agricultural research indicates that Somalia has the potential to produce much more edible oil with modest increases in irrigation use.

During the past three years, a rapid increase in vegetable and fruit production has been seen in the Shebelli basin. Quality varies greatly and domestic market potential for expanded production is unclear. Until increases in quality and quantity can be demonstrated, it is doubtful that export markets could be developed and sustained.

2.3 Shalambood Target Area Rehabilitation

AID (and other donors') investment in upgrading water control of the Shebelli will only be technically or financially effective if bottom-up information flows and recurrent cost support are built into the basin's administrative and financial structure. A controlled "test site" for working with water users' groups needs to be developed, where selective infrastructural investments can increase water available to a pilot group of smallholders, to measure their willingness to accept adaptive research findings, and to increase their share of an improved system's financial and management costs.

In September 1986, USAID/Somalia chose Shalambood as its "test site" on the basis of three factors:

(i) Shalambood has an existing irrigation system in need of rehabilitation, as opposed to the Faraxaane site which requires major realignment and new construction.

(ii) It has established and active water users' groups which fund secondary canal maintenance and perform tertiary/quarternary maintenance and water allocation functions; and

(iii) It is contiguous to the Genale Extension Training Center (ETC) which provides an excellent locus for practical demonstrations and training for farmers.

The site (ref. Figure 2) identified as "Shalambood" in the MMP and TAMS reports was an area of 5,280 hectares gross, with a cultivable area (gross hectarage less canals, roads, settlements, etc.) of 4,148 net hectares. At the suggestion of the WMSII team, USAID and the GSDR have expanded the target area to encompass a much larger population of smallholder farms. The Shalambood target area, as now redefined in this Project Paper, has approximately 10,200 hectares (gross), or 8,000 net hectares of cultivable land.

The physical system is composed of:

(i) the Genale barrage, the condition of which is described in 2.1 above;

(ii) the Genale off-take structures, feeding the Dhamme Yassin Canal and the Primo Secondario (the latter, in spite of its name, is a primary or main canal serving areas other than Shalambood, and it is mentioned here only because it shares the Genale off-take structures);

(iii) the Dhamme Yassin main canal, serving the Second to Sixth Secondarios (secondary or branch canals);

(iv) the Second to the Sixth Secondarios, which serve numerous distribution canals (tertiaries), through turn-out gates, with smaller gates to laterals (quarternaries) on the farms.

Almost all gates at all structures are either rusted in place, broken, or missing, so that regulation of flow is impossible. There is no drainage system, so that if improved practices were to lead to increased water availability and use, soil salinity hazards would be great. As mentioned in 2.1 above, canal siltation levels are very high, resulting in high annual maintenance costs. Although no major change in canal layout or

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alignment is indicated, physical rehabilitation of the system and installation of drainage and desilting facilities are required to improve operation and maintenance and the system's sustainability overall.

Although oral history suggests that the land has been cultivated for centuries, the original development and current management of the irrigation system has its roots in the colonial azienda (plantation) structures. At independence, many Italian owners left, and a variety of holding patterns have since evolved. Table 2 estimates current shares for each type of land tenure in the Shalambood perimeter.

Table 2: Farm Types in the Shalambood Target Area

Independent Smallholders (who individually hold and cultivate the land)	46.4 %
Smallholder Agricultural Cooperatives (made up of individual smallholders, but often with group registration, where smallholder assistance with inputs may be available, but sometimes to only a few farmers on a priority basis)	13.7 %
Large Cooperatives (administered by the National Union of Cooperatives for a small number of investors)	14.0 %
State Farms	10.2 %
Large Private Farms (which include some owned by remaining Italians as well as Somalis)	15.2 %

Source: Land Tenure Center Report, 1987

These holdings support an estimated 27,000 people, of which approximately 20,000--or 3,000 households--are smallholders who cultivate between one-tenth and two hectares of land. Approximately 45 percent of the holdings are legally registered. An additional 7,000 people (about 1,000 households) are landless laborers on the large private and state farms. Most of these people still associate their holdings and/or employment with the name of the azienda on which the land was located in colonial times.

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Most aziendas are fed by three or four tertiary canals. While the Government (now DLWR) is supposed to maintain and operate the Genale barrage down through the Secondarios and their gates, the local inhabitants are informally organized into azienda and inter-azienda based users' groups to operate and maintain the secondaries (when Government cannot), tertiaries and subsequent parts of the system. Through the azienda-level groups, people are encouraged to maintain the section of canal(s) that run along or through their parcels. These groups also collect land taxes and perform other functions for the municipalities. The inter-azienda level groups appear to have representatives from each of the azienda-level groups, including large and small farmers. When public consensus demands it, the leader of the inter-azienda group goes to leaders of each azienda-level group to collect an assessment. The leader then goes to the Genale headquarters of DLWR to arrange for machinery and labor to clean the Secondario in question. The Ministry lends the equipment at no charge (when it is available), but the group uses the money collected to pay for fuel and for an incentive for equipment drivers.

Little is known about the scope and pervasiveness of these water users' groups within the target area, e.g. in terms of their linkages with other local institutions (such as village councils), their basic organization and membership, relationships between large and small farmers, leadership, or skills. While they appear to be able to carry out certain problem-solving functions well, it is unclear whether they will be able to assume the broader role needed to systematically allocate water and collect higher fees on a regular basis.

All Shalambood reconnaissance to date (ARD, TAMS, LTC, and the PP design team) has found that farmers express a willingness to do more and pay more in the management of the system. It is clear that the farmers--large and small--are willing to pay for improved services, if such payments assure greater water supply and more reliability in water delivery.

In order to test these critical assumptions, the physical system must be rehabilitated apace with development of new management practices at the government and non-governmental level to assure sustainability over time.

Equity issues related to assuring land tenure for smallholders and the phasing of physical infrastructural investments are issues that will need to be carefully planned into the design, monitoring, and evaluation of Phase 1 and the design of Phase 2. Large farm owners are not the intended project beneficiaries, yet if one looks at the placement of these large farms, one notices that they are grouped along the Dhamme Yassin primary canal and the most heavily served supplied secondary canals, especially the Second and Third Secondarios. (ref. Figures M-1 and M-2 in Annex M).

The most serious adverse effects of the project might involve those whose land tenure is not very secure, particularly if the irrigation improvements in the Shalambood target area set off a "land grab." The problem and its potential solutions are discussed more fully in the Social Soundness Analysis (Annex M). Corollary to this is the danger of too rapid an expansion into banana as a crop. Apparently, even with the rehabilitation, there is not likely to be enough water for the entire area to become monocropped in bananas, a process that could not be supported with systemwide water supply constraints, but which is a risk if smallholders' tenure is not protected. A continuing process of land appropriation in Shalambood might lead to a recreation of patterns of employment, land use and land control that would resemble those of the nineteenth century. Local residents would become increasingly dependent wage laborers on plantations if their own cultivation becomes increasingly marginalized.

Incidence of water borne disease in Shalambood (especially schistosomiasis and malaria) is one ancillary potential problem, about which little is known at this time. Environmental assessment activities will need to address this issue, and final design of canal improvements will need to mitigate this potential outcome of increased water supply delivery by ensuring that velocities and volumes of water delivered (m^3/sec) inhibit disease vectors.

Design of Shalambood civil works rehabilitation must recognize the need for nomads to use the project area as a place for watering their animals in times when water is scarce on the range. Since many Shalambood farmers have their own livestock under the care of nomads, and since sedentary farmers are themselves often related to nomadic families, the target area will continue to be used for livestock water despite the risk of livestock damage to canals. The need to accommodate livestock will require that water points be designed into the rehabilitation effort, as well as other features to minimize damage to canal works caused by animals.

2.4 Training

Most GSDR institutions suffer from a shortage of trained personnel. Past USAID funded projects sent participants to the U.S. for B.S. and M.S. training as well as short-term training programs. The agriculture projects to date have suffered from a 50 percent return rate. These high non-returnee rate plus the cost of U.S. training at $30,000 per year have forced USAID and the GSDR to reassess the value of external training.

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In 1986 USAID sponsored a short term study to quantify the costs and losses of previous external training. The study recommended that USAID and the GSDR take serious steps to lower the high non-returnee rate or to consider curtailing external training altogether. USAID also sponsored a pilot training program under the Ag Delivery Systems Project (649-0112) in which four college courses were offered for credit in Somalia by a U.S. university. This pilot was successful and popular with the GSDR. The concept of offering U.S. university courses in Somalia has now been expanded under this project to form the basis of an M.S. program. This program will eliminate the non-returnee problem and will cost per M.S. degree will be less than half the cost of sending students to the U.S. Complete details follow in Annex N.

3. PROJECT GOAL AND PURPOSE

The goal of the Shebelli Water Management Project is to increase agricultural production in the Shebelli River basin. Measures of goal achievement will include:

- Measurable progress in use of the Shebelli River towards the end of Phase 2 goal of 130 percent crop intensity on about 130,000 hectares, with water measured and distributed in accordance with rational, pre-established allocation criteria by the end of Phase 1;

- GSDR research and extension systems providing assistance suitable for small, independent farmers that provides a real and measurable return to investment, with small farmer adoption of improved packages in Shalambood increased by 20 percent by the end of Phase 1;

- Cultivators of approximately 8,000 hectares of land in Shalambood target area utilizing irrigation water more effectively on a cost sustainable basis, with at least 30 percent of the area's smallholder farmers utilizing new water management techniques by the end of Phase 1.

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The purpose of the first phase of the project is to learn how to improve Shebelli River basin water management and to establish the framework for larger scale irrigation system rehabilitation in Phase 2. The following conditions will indicate that this purpose has been achieved:

- DILU and water users' groups' water management capacity will be strengthened;

- Production-oriented adaptive irrigated agricultural research will be underway; and

- Selected water control infrastructural needs of smallholders in the Shalambood target area will be addressed.

AID's ten year commitment to this effort is U.S.$ 50 million, with the GSDR estimated contribution at U.S.$ 30 million in Somali Shilling (So.Sh.) equivalents. Phase 1 contributions are estimated at approximately U.S.$ 36 million total, comprising U.S. $ 22.6 million from AID and U.S.$ 13.6 million So.Sh. equivalent from the GSDR.

Outputs and inputs of each of the components are described in the following sections.

4. OUTPUTS EXPECTED FROM EACH PROJECT COMPONENT

4.1 Basin-wide Shebelli Water Management

Phase 1 outputs are designed to make better use of the water of the Shebelli River--an essential resource, the limits of which are now (and will continue to be) a constraint to agricultural production in the basin, and to establish the institutional, experiential, legal and policy framework for larger scale Shebelli irrigation system rehabilitation in Phase 2. Resident long-term and short-term advisors financed by the Project will assist the MOA to produce the following outputs:

1) Establishment of a Directorate for Irrigation and Land Use within the MOA

The DLWR, now responsible for land registration, water allocation, control and maintenance of main stem water regulating structures (excluding the Balad and Kurtenwaare

Barrages), and primary and secondary canal maintenance (including desiltation) will be elevated to the level of a Directorate within the MOA, with broadened responsibilities for fee collection and reinvestment in system maintenance. This will require a Presidential Decree, and will thus be a condition precedent to the signature of SWMP's main technical assistance contract (expected during the second quarter of FY 88).

Project advisors will assist the MOA to define the staffing and organizational pattern for the Directorate, to assess its staff recruitment and training needs, and to offer on-the-job training.

In addition, project-funded intensive short courses offered in-country will train 16-20 irrigation engineers to staff the Directorate in a Master's degree program delivered on a turn-key basis for the Somali National University by faculty from a U.S. university. Because these short courses will be taught intermittently over a three year period, the Faculty of Agriculture (FOA) of the Somali National University will be able to offer, on a pilot basis, Master's degrees in Irrigation Science which will include a firm grounding in irrigated soils issues, water conservation, principles of hydraulics, irrigation principles and practice, drainage, river management, and environmental issues and their mitigation.

2) Enactment of a National Water Law

Project advisors will work through the MOA to assist in the refining of the draft National Water Law, to propose a water law which establishes principles for the rational and equitable use of the country's irrigation resources, both surface and groundwater. It is hoped that the final water law which would result from this assistance would: a) put an end to the unrestricted expansion of the area under irrigation; b) guarantee each farmer the right to a proportionate share of the surface water available in the river at any time, to be used beneficially; and c) give farmers an incentive to use groundwater (when salinity permits) for irrigation on high return perennials and vegetables during periods of low river flow (December-March), rather than giving perennials priority over annual crops for the use of surface water, as is now the case.

Somali legislative enactment of a national water law which creates a legal and institutional framework acceptable to AID will be a condition precedent to Phase 2 authorization and obligation.

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3) Production of Plans and Implementation Programs for Basinwide Irrigation Control and Water Allocation

a) Establishment of a Hydrologic Monitoring System and the Data Base Needed for Water Allocation. Project advisors will work with the DILU to establish a system for monitoring hydrologic data, and a computer simulation model of the river, as a basis for water allocation and policies which allocate water in the event of shortfalls.

Monitoring of meter measurements at the Beledweyn gauging station will be performed on a regular basis, to keep current the often shifting relationship between gauge height and discharge. Two recording gauging stations along the river will be re-established, and rated periodically, in order to monitor with precision the actual flow available at key locations along the Shebelli River. Proposed stations may be at Awdheegle and near Kurtenwaare; final locations will be decided during implementation. Sediment sampling will be carried out periodically at least at one of the stream-gauging stations. Also, the chemical quality of the water will be measured periodically, particularly salinity, in order to predict the date after which Gu season water can be safely used for irrigation.

A computerized simulation model of the Shebelli River from Beledweyn to Hawaay will be developed and tested to be used in the distribution of water for irrigation and other uses at the DILU in Mogadishu (ref. Figure 4). The model will reflect the operational rules for the Duduble Flood Relief Channel Project and the Jowhar Off Stream Storage Project. Using the simulation model, water budget studies will be conducted at periodic intervals according to the prevailing conditions of availability and demand.

The computer program will then provide instructions regarding required gate settings at each of the barrages and head regulators, in order to achieve a balanced distribution of the available river flow between all the main supply canals. If required to supply minimum practical flows in the main canals, the simulation model will provide rotation schedules.

The subject reach of the Shebelli is long, and it is known that flows take several days to proceed from the upstream barrages to downstream control structures. For the simulation model to reflect the hydraulic characteristics of the river, a generalized software for both monthly and shorter term simulation models will be adapted to the Shebelli River basin.

The simulation model will be flexible and capable of accommodating changes in operating assumptions and in water allocation policies. Releases and diversion decisions will be made sequentially both in time and in space (the next decision being a function of the previous). Weekly time

steps will be used for normal distribution sequences, but special subroutines will be provided to reflect flood control operations, and to simulate extreme drought conditions that require rotations between head regulators within periods shorter than a week.

The simulation model will include an upstream storage reservoir and off-take simulation which can represent the operation of the dam and irrigation currently in construction on the upper reaches of the Shebelli River in Ethiopia, when the characteristics of those projects are known.

As input into the computer model, data will be collected on the location, area, and type of culture of the irrigated parcels located with the command area served by each main canal. This data will be used to develop an allocation system consonant with the principles established in the Water Law. Eventually, a land use map covering the Shebelli basin will be developed through UNDP assistance to the DILU, to provide this data base, and to establish land ownership. However, land use map preparation will require a long lead time; for this reason, detailed land use field investigations are deferred for consideration during Phase 2 fine-tuning of the Phase 1 model developed by AID. Rather, as an interim measure in 1988-89, Phase 1 will produce aerial photographic coverage at a scale of 1:10,000, undertaken twice (at the height of both Gu and Der season crop stands) and rectified mosaics will be prepared and used (with selective field verification) to estimate the coverage of each main type of culture within the canals' command areas.

A survey of the pumping installations now extracting water directly from the Shebelli will also be completed, to collect data on the locations of pumping plants, pumping head discharge in m^3/h, engine capacity in HP, and other data needed for the computerized allocation model.

b) Plans for the Upgrading and Maintenance of Main Stem Water Control Structures. Project advisors will assist DILU staff to establish design standards, and maintenance and repair programs for the Shebelli's main water control structures. Design standards developed by AID advisors will include provisions to reduce water borne diseases (especially malaria and schistosomiasis) through assurance of irrigation velocities that inhibit vector breeding. AID-funded advisors will strengthen DILU staff capability to review and supervise barrage rehabilitation funded by AID and other donors. During Phase 1, the DILU will oversee rehabilitation of the Genale, Qorioley and Falkeerow barrages. These barrage repairs are essential if an equitable and predictable distribution of water is to be achieved to service both project sites and downstream users. Delaying the implementation of this work, especially that on the Genale Barrage, and to a lesser degree that on the Qorioley Barrage,

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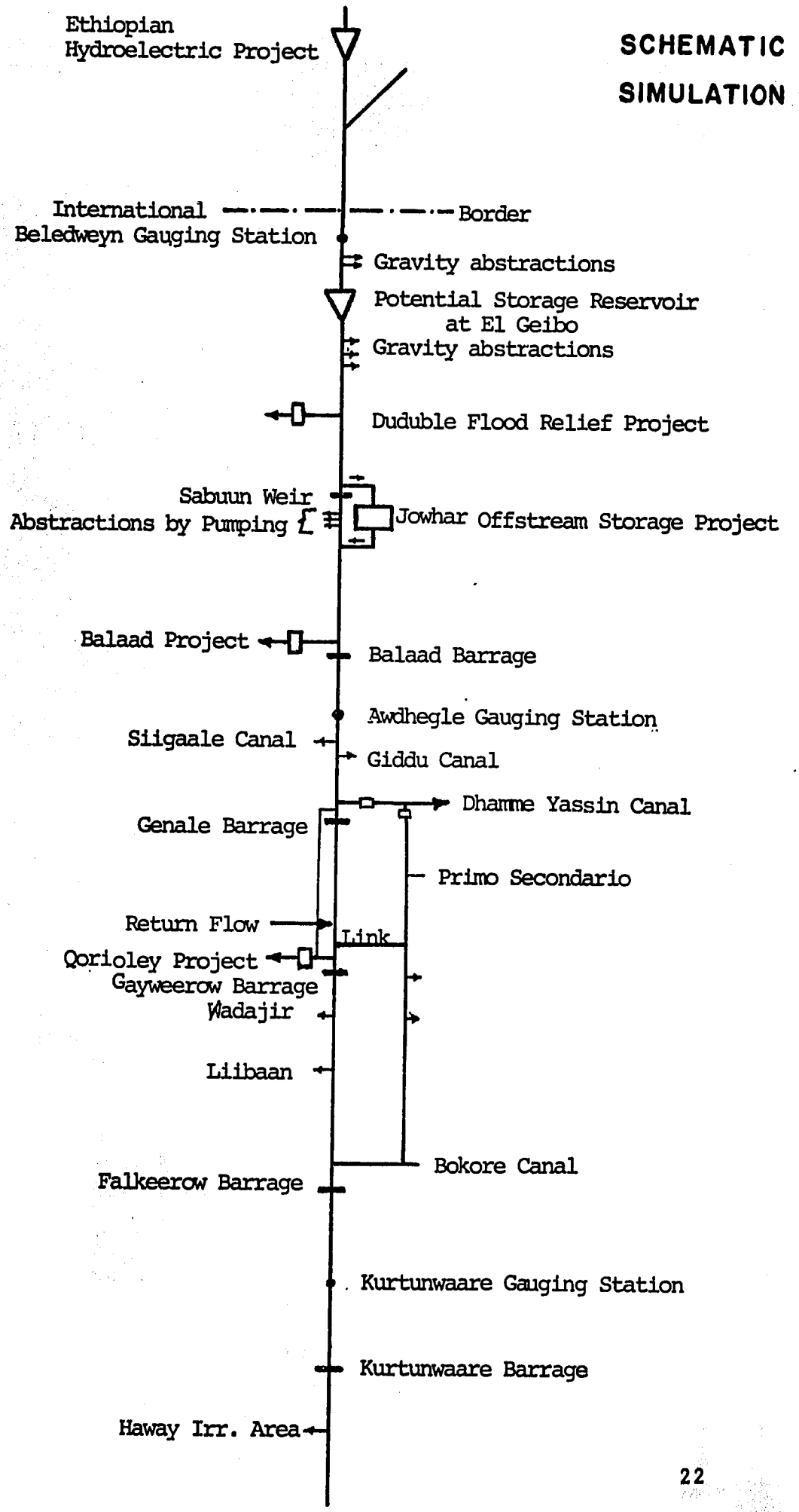
Figure 4

SCHEMATIC FOR SIMULATION MODEL



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will correspondingly set back the DILU's ability to manage the Shebelli's water resources, since 24,000 hectares are dependent on diversions at Genale, and 43,500 more hectares located downstream are tributary to flow-through from that barrage. Repairs to the Genale Barrage will be funded by AID, while upgrading of the other two barrages will be sponsored by IBRD.

AID's advisors will also assist the DILU to program the repair of all head regulators located on the main canals, and their refitting with operating sluice gates, so that water deliveries can be made to the various command areas, in the desired quantities, and at the appointed times established in the computerized water allocation model above.

After the barrages and head regulators have been renovated, project advisors will assist the DILU with their recalibration, so that relationships between differential head values, gate openings and discharges are re-established. These ratings will be set first on the basis of theoretical calculations, but field calibration for all structures will be undertaken before they become operational.

AID-funded advisors will work with the DILU to complete a pre-feasibility study of the option of increasing the storage capacity at the Jowhar reservoir by raising the present level of the reservoir by approximately one meter. AID advisors will also complete a study with recommendations to determine how water abstraction downstream from Jowhar can be protected while diversions take place toward the reservoir.

c) Establishment of a Communication System for Water Control. The DILU will be located in Mogadishu. Frequent communication with points as distant as Duduble and Kurtenwaare will be necessary for acquiring data regarding water availability and on-going water distribution, and for issuing instructions to the barrage and regulator operators regarding modifications to gate settings. The corresponding distances are on the order of 150 kilometers. Project advisors will assist the DILU to establish a radio communication network for this purpose.

AID-funded advisors will work with the DILU to plan for the use of public radio transmissions, on a regular daily schedule, to inform Shebelli basin water users of the timing and allocation of programmed irrigation releases.

35x

Project advisors will collaborate with the DILU to design a bottom-up communications system that will collect information from water users' groups on irrigation volumes needed, and feed this data into the central water allocation process. Establishment of regular communication channels between water users' groups and the DILU will minimize the deliveries of excessive amounts of water that would have to be released to already insufficient drainage facilities, and will minimize the deposit of silt in the canals.

This communication system will be used to establish a schedule of operations for the head regulators and turnouts, to authorize district offices to deliver the required flow through the head regulators, and to manipulate barrage gates so as to pass through all the unused flow to downstream users.

Project advisors will also assist the DILU to regulate water pumping from the river, and to establish a communication procedure for confirming pumping schedules for farmers who irrigate directly with their own pumps.

d) Plans and Training for Public/Private Sector Split in Responsibilities for Secondary and Tertiary Canal Maintenance, Operations, Recurrent Costs, and Water Allocation. Under the authority of the new Water Law, project advisers will work with the DILU, the Ministry of Revenue, and water users' groups (especially those in the Shalambood target area, as "test site") to define the responsibilities of each entity in secondary canal operation and maintenance, recurrent cost financing, and operational aspects of fee collection and reinvestment in maintenance. Water users' groups will continue to be responsible for tertiary canal and farm ditch maintenance, as they are now, but project advisors will assist the DILU to train user groups in improved maintenance practices, especially ones that discourage the breeding of water borne disease vectors.

The new DILU will assume ex-DLWR responsibilities for the maintenance of the primary and secondary irrigation canals "Desilting Project". This activity will continue to be organized in regions and districts corresponding to the existing administrative subdivisions. DILU will interface with existing water users' groups to provide services as requested, and technical assistance related to the maintenance of water courses (tertiary canals) and farm ditches (quarternary canals).

Project advisors will review existing maintenance methods and DILU equipment needs (see Annex O for design team recommendations on heavy maintenance equipment needs). The advisors will recommend improved methods for siltation control and canal maintenance where needed, and

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will assist the DILU to develop equipment procurement proposals for consideration by the Shebelli Donors' Coordinating Committee (SDCC). Meeting DILU equipment and ancillary fuel needs is seen as an issue for multi-donor collaborative effort. AID's contribution to this procurement effort is minimal during Phase 1.

e) Plan for Pricing Water Delivery Services. Project advisors will work with the DILU to develop a plan for pricing water delivery services which will take into consideration the following factors:

- Seasonal water shortage which may require differential seasonal pricing to encourage water use efficiency;

- Policy decisions on allocation to perennial versus annual crops in times of water shortage, which may need to be reflected in differential water pricing, and MOA licensing to control any proposed expansion of the area under perennial tree crops;

- The higher profitability of perennial crops, which can thus bear the cost of supplemental groundwater irrigation; differential pricing could be used to favor annual crop farmers, and thus, motivate perennial farmers to finance their own groundwater irrigation wells and pumps (where salinity permits);

- Smallholder farm budgets (provided by SWMP research outputs).

Users' fee collection will come on line during Phase 1 apace with improved reliability of DILU water supply deliveries, to maintain the credibility of the user fee system.

4) Phase 1 Policy Dialogue on Basinwide Land Tenure Issues and Land Registration Procedures

SWMP advisors will work with the DILU to establish new simplified, low cost, on-site procedures to be used in land registration on multi-donor rehabilitation sites throughout the Shebelli basin. These procedures will be refined after testing in the Shalambood target area (see 4.3 below). SWMP advisors will propose ways that Somali Land Laws and Contract Laws can be revised to ensure that contract laborers have an enforceable right to be assigned subsistence plots as part of their contracts with large land holders. Further, SWMP advisors will assist the DILU to develop and implement a land use monitoring system (which will be tested in the Shalambood target area), so that provisions of the 1975-76 Land Laws regarding nationalization of land not cultivated over a two-year period can be equitably enforced. These Land

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Law provisions, if properly enforced, will reduce de facto absentee landlordism (and thus rent-taking at the expense of small farmers) in the Shebelli basin, so long as monitoring ensures that land recovered in this way is assigned to smallholders who actually plan to farm the land themselves.

4.2 Adaptive Irrigated Agricultural Research

In keeping with January 1986 AID/W Agricultural Strategy decisions, the research strategy for this project will focus on import substitution in Phase 1, particularly increasing maize yields and oil crop production during years 1-3. Following the development of tech paks for maize and oil crops, the research emphasis will shift to rotations, forage, and vegetables. AFMET will work with researchers in the development of these technological packages, and then extend them to farmers to increase yields, profitability, and production. The end of Phase 2 objective is to increase cropping intensity in the target area to at least 130 percent (from current intensity of 50-90 percent).

Specific Phase I outputs are as follows:

1) Seasonal Economic Data

Crop yields, marketing, and prices will be monitored throughout this project by the long term agricultural economist, especially for maize. If the research component is successful, production will increase, and alternative crops and/or markets will need to be promoted. The project will provide a long term U.S. agricultural economist, resident in Somalia, who will work with the other U.S. research advisors to monitor the crop market prices, and to ensure that the tech paks are economically viable and increase profitability and decrease risk for farmers, especially smallholders.

2) Technical Packages

a) Maize Tech Pak. The research component will develop an economical tech pak to be recommended to farmers to increase yields and profits per hectare. The project will provide a long term resident U.S. agronomist who will work with CIMMYT, IITA, or other maize breeding organizations to identify selected maize varieties that hold promise for increasing Somali yields. Through a linkage arrangement with CIMMYT and other organizations, which will provide seed and short term technical assistance, the long term TA agronomist, and counterparts from CARS and AFMET will test these selected maize varieties on the CARS station for at least one season.

After selecting the one or two best varieties suited for Somali conditions, on-farm trials will be conducted by CARS, AFMET, and resident U.S. research staff under the supervision of the agronomist and a short-term advisor provided by CIMMYT. From these on-farm trials, a tech pak of recommended practices will be developed which will include items such as variety(ies) recommended, planting dates, plant population, number and timing of weedings, specifications for pesticide and fertilizer application, etc.

b) Oil Crop Tech Paks. A tech pak for each of 2-3 oil crops will be developed and extended to farmers. Through buy-ins to AID's centrally funded Collaborative Research Support Projects (CRSP's) and/or ICRISAT, the resident U.S. agronomist will direct research to identify and test improved varieties of oil crops, with emphasis on sesame, the major Somali oil crop. Researchers will also examine the viability of other oil crops such as soybeans, safflower, and sunflower as options for import substitution oil production and crop rotations. The researchers will determine what varieties of sesame and other oil crops should be tested by following the same format outlined for maize, first trials at CARS, then moving quickly to on-farm trials in the Shalambood target area to develop complete tech paks. AFMET and the Agricultural Economist will work with the agronomist and soil scientist to ensure the economic viability of such recommendations.

c) Crop Rotation Tech Pak. A crop rotation tech pak will be developed which may include maize, oil crops, vegetables, and forages suitable for livestock feed. As stated previously, domestic crop market prices, especially for maize, are to be monitored throughout SWMP 1. As production of maize increases and prices decline, it may become economically feasible and desirable to feed maize grain to cattle. The Agricultural Economist will direct a short term consultant study team to produce a market baseline analysis which can be easily updated as conditions change over time. This analysis will include the crop production data collected by the base line survey and up-dated by AFMET, the alternative crop rotations developed by research and others available to farmers, livestock nutrition variables, and prices. This analysis will help guide research, extension, and farmers in determining the most economical crop rotations which will maximize farmer income given smallholders' crop and livestock alternatives.

d) Soils Management Tech Pak. A set of recommended soils management practices will be developed through research and extended to farmers. A long term resident U.S. soils expert will direct research to address the

soils problems identified in the Shebelli basin. These problems include salinity, drainage, soil structure, fertility, etc. The On-farm Water Management advisor will work closely with the resident soils specialist to examine tillage practices and to assess their impact on soil problems. Crop rotations will be examined to determine their relative impacts on soils issues. U.S. forages which draw salts out of the soil profile will be tested for their applicability in Somalia, and added, if appropriate, to the crop rotation tech paks.

This activity will use the existing soils lab at CARS as its soils laboratory. The project has budgeted funds to add to this lab's store of equipment, tools, and supplies to support SWMP 1 soils analysis.

e) Domestic Vegetables and Fruit Tech Paks. After the first two years of focus on maize and oil crops, short term technical assistance, including a marketing specialist, a vegetable and fruit horticulturalist, and other experts as necessary, will conduct a study to (a) determine the extent of the domestic fruit and vegetable market and (b) the fruit and vegetable crops that can be physically grown in the Shebelli basin. From this study, the team will recommend a schedule to select two vegetable crops/year for Phase 1 development of tech paks to then be recommended by AFMET to farmers.

It is recognized, however, that improved varieties and practices may require larger volumes of irrigation water in some cases, and water supply on the Ethiopian run of the river may be diverted to irrigate some 28,000 hectares as is now planned, thus estimates of potential at this point would be pure conjecture. After reviewing the outputs of SWMP Phase 1 assistance to the DILU, in terms of water supply and demand models, basinwide water allocation and management plans, the team should recommend whether or not expanded or intensified fruit production for domestic markets should receive research attention during SWMP Phase 2. If fruit research is appropriate and for vegetables (for which annual water budgets are a lesser constraint), the team should make recommendations designed not just to increase the quantities and varieties of fruits and vegetables to be produced, but also to increase the quality of this production, as appropriate to address domestic consumers' preferences.

3) Vegetable and Fruit Processing Feasibility Study.

In Year 3 or 4, a short term study will assess the processing facilities that could be used to process fruit and vegetable production from the Shebelli basin and how

such facilities could be improved and expanded. If feasible, a strategy of possible interventions will be recommended for inclusion in design of SWMP Phase 2 to address domestic market potential.

4) Turn-Key MS Agronomy Training for a Core Group of GSDR Counterpart Researchers.

There are three main GSDR entities from which the SWMP adaptive research component will draw counterparts for research activities:

CARS (now under the new MOA Directorate of Research supported by IBRD), AFMET, and the SNU Faculty of Agriculture. Each of these organizations has a core of capable staff, which will become progressively well trained through the SWMP-supported intensive short courses at SNU. In all, at least 16 MS degrees in Agronomy will be awarded by the FOA at SNU to counterparts trained by a U.S. advisory university over a 3 year period. Counterparts to be trained will be selected from the MOA Directorate of Research (ARI, CARS), AFMET, FOA, the Seed Multiplication Center, etc. As an output of SWMP 1, staff of the three key entities (CARS, AFMET, and FOA) will become a substantial research group actively addressing irrigated agricultural problems in Somalia.

5) Research Coordination

Recognizing that research and extension activities in Somalia are being carried out by numerous donor projects and various GSDR organizations, the World Bank will sponsor an Agricultural Research Council under AFMET 2. This Council will receive IBRD support for an annual research/extension conference and a regularly published journal, both of which will serve as mechanisms whereby researchers and extensionists in Somalia can share useful information generated by their respective activities. SWMP 1 agricultural researchers will actively participate in these conferences and will contribute to the journal on a regular basis. These activities will further disseminate SWMP 1 research results and reduce duplication of effort amongst donor projects.

The IBRD-supported Agricultural Research Council will be comprised of representatives of AFMET, CARS, and the FOA. This council will meet at least twice a year between cropping seasons to plan and coordinate their respective research trials and to ensure that they collectively address the most pressing agricultural problems. The committee will analyze the results of activities in the previous season, and plan the activities for the coming cropping season. By

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coordinating their respective work plans, duplication of effort will be avoided, and current research activities will be assured of building upon past achievements. This effort was undertaken in September 1986, as a training exercise under the Agricultural Delivery Systems Project, and will be continued under IBRD sponsorship, to capitalize on enthusiasm generated by AID's pilot exercise.

4.3 Shalambood Target Area Rehabilitation

Phase 1 outputs of this component are designed to address the most pressing infrastructural needs of irrigation in the Shalambood target area, with an emphasis on smallholders. Selected critical physical structures will be rehabilitated, and the groundwork laid for additional rehabilitation, as improved management practices are defined and practiced by the GSDR and private water users themselves. Support to this component will comprise one direct AID contract for engineering design and, based on successful performance, follow-on supervision; one direct AID civil works fixed price rehabilitation contract(s); and long- and short-term technical assistance in perimeter management to achieve the following outputs:

1) An Increased Number of Small Farm Households with Secure Land Holdings.

As reflected in Table 2, approximately 60 percent of the land in the Shalambood target area is held by smallholders, either as individuals or through smallholder agricultural cooperatives. Although land disputes are to date relatively uncommon, these farmers have expressed fear of a "land grab" as knowledge of the proposed physical rehabilitation leaks out and larger farmers become interested in the area. Given the expressed concern of AID and the GSDR to emphasize smallholder production in the Shebelli basin, it is important that smallholders' tenure be secure prior to initiation of any civil works rehabilitation.

The project will provide Somali shillings to fund a major land registration effort in the Shalambood area. Although a full cadastral survey may be completed by UNDP during AID's Phase 2, it is believed that a cadastral map would take too long and be too complicated to prepare to fulfill the learning process purpose of Phase 1. Instead, the GSDR will put in place simplified, low cost, on-site procedures and deploy special teams for land registration, in a settlement-by-settlement campaign. It is expected that by the end of the campaign, at least 90 percent of small farmholdings in Shalambood--or double the current number--will be securely and officially registered. Special measures will be initiated to ensure

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that female smallholders' parcels are registered, since, as stated the Social Soundness Analysis (Annex M), female-headed households have far fewer registered parcels than male-headed households. Nevertheless, this registration campaign will not be able to protect the rights of plantation laborers who are assigned small plots on large farms as part of their labor contract. DILU land registration staff will, however, establish an inventory of these plots, identifying assignees, size, and type of cultivation by farm, to be used in monitoring plans and as input to the SWMP agricultural research component. Special technical packages devised for small plot farmers will be extended to these contract laborers through SWMP farmer training activities, and formalization of contract laborers' right to an individual plot, as a legally required contract provision, will be discussed during Phase 1 AID/GSDR policy dialogue.

2) Phase 1 and Phase 2 Engineering Design for Shalambood Target Area of 8,000 hectares.

The MMP and TAMS reports are essentially pre-feasibility and feasibility-level studies of the Faraxaane and Shalambood target areas. The GSDR, with IBRD funding, has issued an Invitation for Proposals to an international short-list of engineering firms for detailed design of Faraxaane, with a contract award expected in June or July, 1987. A draft Scope of Work for such an AID-funded contract for the expanded Shalambood perimeter is found in Annex O to this PP. Construction of selected elements of this overall engineering design (see output 3 below) are seen as the highest priority for meeting the Phase 1 objective of increasing a pilot group of smallholders' access to water within the target area. Remaining construction will be funded under Phase 2. The engineering design will produce:

a) Results of Complementary Investigations, including aerial photos taken at 1:10,000 and supported by ground surveys to produce a series of 1:2,000 base maps and 1:10,000 soils maps, which will include soil classes and sub-classes to define soil irrigability and drainage requirements; a topographical ground survey which includes longitudinal and transverse profiles of the main and branch canals and proposed main and secondary drains, as well as definition of tertiary and quarternary canals' and drains' alignments from the base photos; a detailed site investigation of main structures, including the Genale barrage and main regulators and gates; and a geotechnics and materials investigation which will include core drilling of structural samples of the Genale barrage, as well as observation pits, borehole samples, lab analyses, shear tests and penetrometer tests of alignments of the Dhamme Yassin, Second through Sixth Secondarios, proposed maintenance roads, borrow areas, etc.

b) Detailed Design for Civil Works Rehabilitation of the Shalambood Perimeter, which will include final detailed decisions for both Phase 1 and 2 on location/alignment and design of:

- the irrigation network, with any new canal alignments roads or tracks clearly justified and defined;

- typical cross sections of all canals, drains, roads and tracks;

- determination of necessary canal and drain rights of way, and proposed arrangements for same; this investigation will include careful consideration of the need for livestock watering sites and rights of way during the dry season, to minimize damage to canals;

- proposed origin of fill materials (canal and drain excavation and/or borrow areas);

- definition of velocities (maximum and minimum), and volumes of flows, slopes and command heads; this will take into account the need to meet standards to prevent breeding of water borne vectors of malaria and schistosomiasis parasites;

- structural design of regulators, partition and crossing structures, offtakes, turnouts, etc.;

- establishment of typical provisional layouts for recommended on-farm irrigation and drainage;

- establishment of recommended irrigation schedules (irrigation volumes and depths);

- provisional operation and maintenance specifications and schedules;

- groundwater supplemental irrigation suitability map, based on analysis of water quality samples from supplemental groundwater irrigation already present in the Shalambood target area;

- an implementation schedule for rehabilitation/construction work; and

- study of alternative methods of providing energy required for any pumping activities (e.g. drainage reflows).

c) Preparation of Invitation for Bid Documents for the Civil Works Rehabilitation, including preparation of the actual Invitation for Bid documents in accordance with AID requirements, including but not limited to general conditions, technical plans and specifications, special conditions, and bid forms, including a bill of unit rates and total estimates;

preparation of the engineer's estimates, including a bill of quantities for the various works and confidential bills of unit rates and costs; and assistance in evaluation of bids, and preparation of a short list.

The engineering design will take 15 months, estimated from June 1988 through August 1989. The contract will be written so as to allow for amendment to include civil works supervision, should the contractor exhibit satisfactory performance.

3) Civil Works Rehabilitation: Phase 1

a) Genale Barrage Rehabilitated and Functional. One key part of the engineering design contract will be the structural assessment and detailed design of the rehabilitation of the Genale Barrage. Because of the critical contribution of this structure to all downstream water efficiency (see 2.1 above), the design will be completed by March 1989, ahead of the full design for the Shalambood perimeter. Should AID and the GSDR so wish, a separate contract can be initiated at that time for barrage rehabilitation. Although eventual scope depends on the detailed engineering design, it is anticipated that at a minimum all gates and regulators will be recast, installed, and functional by the end of rehabilitation, in December 1991 (three and a half years after long term technical assistance for the DILU is put in place).

b) Dhamme Yassin Canal Feeder Reach, Main Alignment and Turn-out Gates to Second, Third and Fourth Secondarios Rehabilitated. The proposed civil works contract will base this rehabilitation on retaining the current earth canals upgraded if necessary with clay linings, and not the concrete-lined canals proposed by TAMS. Aside from the approximately 17 percent reduction in costs afforded by this approach, retention of earth canals is particularly suited to the montmorillonite (shrinking and swelling) clays predominant in the area. The concept of earth canals lined with lightly reinforced concrete slabs as proposed by TAMS is questionable due to problems with maintenance and longevity because of the upheavals that can be created by these soils. A consistent cut and fill design, including corresponding compaction procedures, and clay linings where needed, will result in canals subject to very limited seepage losses.

The proposed rehabilitation will require increasing the Yassin canal's capacity from 8 to at least 10 m3/s at the headworks to accommodate the needs of the downstream users, and provide for desiltation facilities through specific deepening and widening of a section of the feeder reach. These measures should relieve to some extent the current high maintenance costs due to silt load. Operation and maintenance tracks along the Dhamme Yassin and one secondary canal (preferably the Fourth Secondario) will also be upgraded as required to 3 meter wide all weather coralstone surface during this rehabilitation phase (or other widths necessary to provide adequately for livestock movements without damage to the canals).

c) Up to One Secondario (Secondary Canal) Rehabilitated. Funding is provided for the rehabilitation of one secondary canal during Phase 1, with preference given to the Fourth Secondario which serves the a large population of smallholders. This will provide for an action-based learning process with small farmers to reach down to the azienda-level groups by the end of Phase 1 construction in 1991. It is also possible that if AID funds the rehabilitation of the Genale barrage, the Yassin feeder reach, and its turn-out gates to the Second and Third Secondarios, the large farms along those branch canals may be encouraged to themselves contribute to accelerated rehabilitation so as not to delay potential benefits, and to minimize costs to the project in Phase 2.

4) Preparation of Phase 2 PP.

The Design Engineers who design the rehabilitation needed in the target area will design the rehabilitation for the entire area even though part of the actual rehabilitation will occur in Phase 2. The construction firm doing the rehabilitation will ensure that the works rehabilitated during Phase 1 are consistent with the over all rehabilitation plan and that nothing will have to be redone in Phase 2.

5) Water Users' Groups Exercising Improved Management of Tertiaries, Quarternaries and Other On-farm Structures.

An AID-financed long term technical advisor, resident in Merka near the target area, will work with staff of the DILU and ETC in Genale to identify and establish a typology of local organizations involved in water management on the Shalambood perimeter early in the project. Based on this inventory, the advisor will collaborate with Shebelli River management, adaptive research, engineering design personnel and, most importantly, the water users' groups themselves to specify new or improved grassroots skills needed to more efficiently manage scarce irrigation resources. Based on this skills needs assessment, AID-financed technical assistance and counterparts will design a series of training courses to be offered at ETC Genale. It is anticipated that such courses will give equal weight to both managerial subjects (e.g. to group formation, leadership, organizational dynamics, explanation of systemwide recurrent costs that must be shared among system users, etc.) and technical water management issues. By the end of Phase 1, at least one member of all water users' groups in the area will have attended courses or a series of courses and provided feedback to colleagues on the substance and utility of this training. The advisor will be resident in Somalia for one year, during which he will set up the above program which will be managed by the DILU. After this first year, a series of short term follow-up and monitoring return trips are envisioned.

5. DESCRIPTION OF INPUTS AND THEIR PHASING

5.1 Basinwide Water Management

AID foreign exchange for Phase 1 activities under this component will support the following inputs:

- Short term advisors for start-up activities and to maintain momentum from previous projects early in implementation;

- A team of five long term resident advisors, including four advisors who will assist the DILU to produce the outputs described in 4.1 above, and a Local Organizations Advisor resident in Merka;

- Supportive equipment, vehicles, and other commodities (including radio communications equipment, and a DILU computer system with software for adaptation);

- Short-term intensive MS courses delivered in Somalia by U.S. experts as the basis for SNU MS degrees in Irrigation which will train at least 16 DILU counterparts by the end of Phase 1;

- Other short-term specialists to supplement resident long term TA skills.

Figure 5 shows the phasing of inputs under this project component for illustrative purposes. Actual phasing may need to change during project implementation, as the long term TA team develops detailed work plans and assists the DILU to monitor other donors' inputs into basinwide systemic upgrading.

5.1.1 Short Term Technical Assistance for Start-up Activities. Nine person months of short term technical assistance will be provided for project activities that will need to take place during the initial six months of the project, while advertisement and selection of a long term technical assistance contractor is proceeding. These advisors include:

- A water law specialist who will assist the GSDR to redraft the proposed Water Law to address the problems highlighted in Section 2.1, above;

- An institutional advisor who will help the MOA to develop a staffing, recruitment, and organizational plan which will convert the DLWR into a Directorate of Irrigation and Land Use; and

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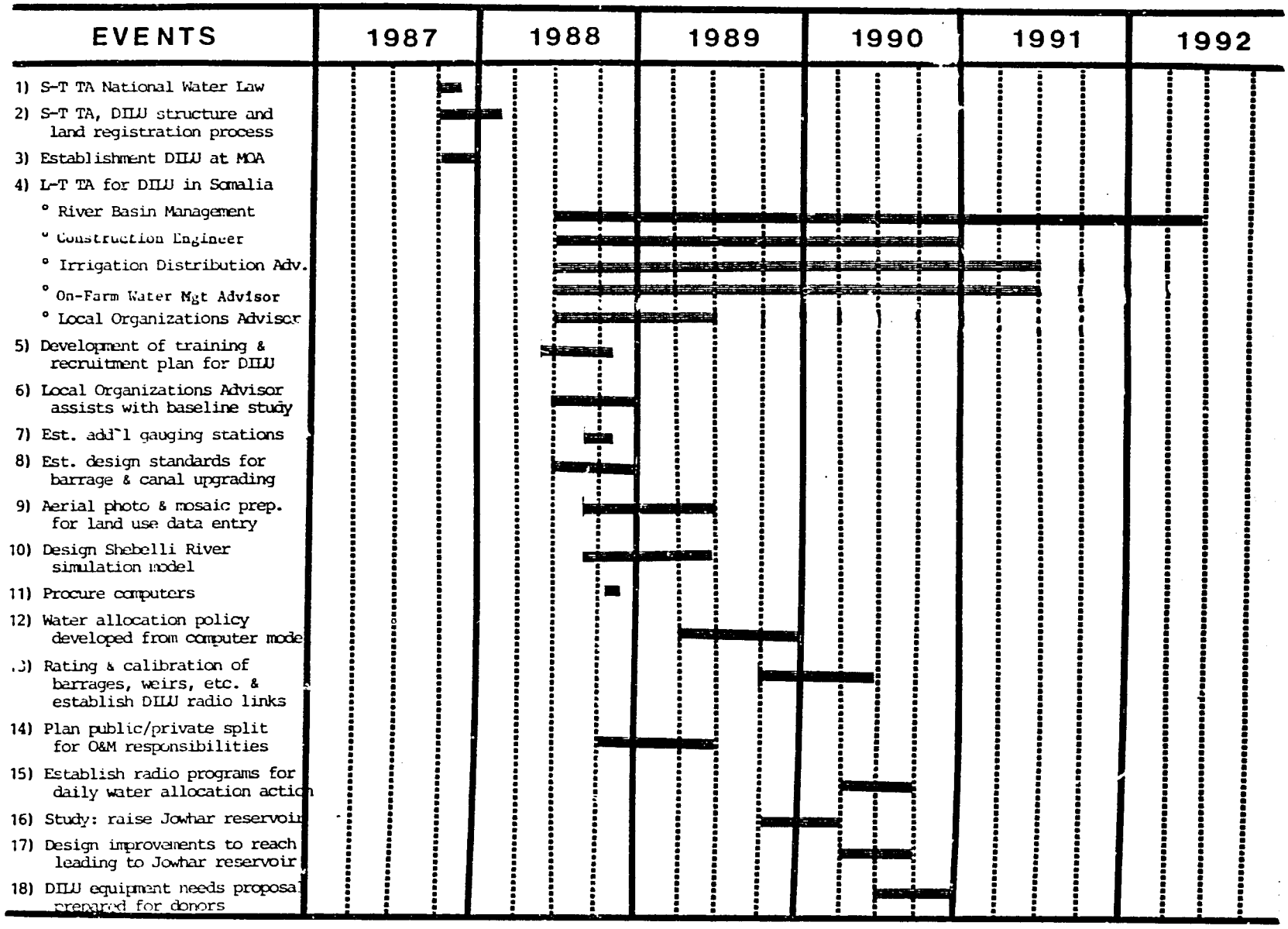
Figure 5: Basin-wide Shebelli Water Management Phasing of Inputs



- A land registration advisor, who will assist DLWR to establish a simplified, low cost, on-site land registration process that will be tested in Shalambood by an intensive mass registration campaign during the first six months of project implementation.

These inputs will be contracted through buy-ins to centrally-funded projects, e.g. Water Management Synthesis II Project administered by AID/S&T/AGR and/or by use of IQC contractors (especially for the land registration activity, which requires anthropological input).

5.1.2 Long Term Resident Advisors to Strengthen DILU Basinwide Water Management Capability. Four of the advisors funded by SWMP 1 will be resident in Mogadishu for 4 person years each, starting as soon as possible during project implementation. These positions will include:

- A River Basin Management Specialist, who will supervise all other TA in this component, and will report directly to the contractor's Chief of Party. This advisor will: (1) take the lead in assisting the DILU to develop basinwide water allocation and water distribution plans and models; (2) coordinate use of short-term TA advisors as needed; (3) upgrade the hydrologic data collection system (flows available seasonally, user demand by canal); and (4) establish operational rules that ensure balanced and equitable distribution of available water supplies throughout the system, working through water users' associations so far as possible. This advisor will work primarily with the Shebelli River Management Department planned under the new DILU.

  An Irrigation Distribution Advisor will assist the Director of RWRA to organize his decentralized regional and district offices in accordance with modern irrigation district management practices, but taking into account cultural practices and logistical realities in Somalia. This advisor will design and conduct training activities for regional and district DILU staff throughout the basin, and will take the lead in establishing the DILU radio-link communication system, and mechanisms for feeding decentralized data provided by users' groups into the central water allocation system. This advisor will also assist RWRA to organize and train personnel responsible for the measuring and distribution of water for irrigation, by: (1) reviewing existing organization and staffing patterns, lines of authority, etc.; (2) developing job descriptions and training plans for DILU; and (3) developing management plans for supervision and reporting.

- An advisory construction engineer, who will advise the DILU in all aspects of rehabilitation and maintenance of structures on the Shebelli River including development of specifications for existing barrages, renovation of head regulators, and planning and design of new control and storage structures (e.g. raising the level of the Jowhar reservoir). He will assist RWRA to develop its capability in primary and secondary canal maintenance, design and maintenance contracting and supervision, and preparation and review of bid tendering documents. This advisor will work with the Canal Desilting Project (now on-going), and will design and organize training for water users' groups in sytem maintenance and repair and other earthworks at the tertiary and quarternary level. This advisor will also assess the systemwide road network, and prepare plans and cost estimates for upgrading as necessary to provide adequate access for maintenance and repair equipment and access to markets.

  The resident On-Farm Water Management specialist (irrigation engineer) will deal both with local irrigation system management and water application on crops. He will work with the DILU and the local organizations advisor to help improve local irrigation system management, especially in the Shalambood target area as a "test site". He will also work with the research team, as crop tech paks are developed, to analyze land preparation and water application methods to increase irrigation efficiency in husbandry of the target crops. Since most of his time will be spent at the Shalambood target area and with the Ag Research team, his residence is planned at Afgoi. Three person years are budgeted for this position.

- The fifth long term advisor, a Local Organizations Advisor, will be housed in rented accommodation in Merka near Shalambood, with a required background of MS or PhD in anthropology and in-depth experience in working with irrigation water users' associations. This advisor will be resident in Somalia for one person years and successive follow-up TDY's to work with the DILU to develop profiles of local organizations' structure, leadership, and capabilities for undertaking expanded functions needed for systemwide development (e.g. operations, maintenance, revenue collection, data supply on users' water needs, etc.). This advisor will work with all types of local organizations (including water users' groups, village councils, self-help groups, etc.) and SWMP-funded extension agents, to help DILU to conduct baseline studies and monitoring of relationships between large and small farmers, subsistence irrigated agricultural activities of plantation laborers, etc. He/she will take the lead in monitoring impacts of the land registration campaign in Shalambood and land use changes resulting from project interventions. He/she will also work closely with the long term agricultural research team and GSDR counterpart researchers to assess farmers' training

needs and production constraints, seasonal labor supply issues, etc., and will recommend training formats most likely to reach small holders effectively (including women farmers and contract laborers with small individual plots on plantations).

5.1.3 Commodities. SWMP 1 will provide funds for imported commodities necessary for the effectiveness of the long and short term technical assistance package including: project vehicles; radio communication equipment to link DILU with its regional and district offices, and the main stem water control structures; a computer, software, accessories, spare parts, and maintenance contract for the river allocation model; stream flow gauges and miscellaneous equipment for the hydrologic monitoring system, etc.

5.1.4 Logistical Support. FSU support has been budgeted for rental and servicing of four housing units in Mogadishu for the four long term advisors who will work with the DILU. Support for the local organizations' advisor's housing in Merka has been budgeted at the same standard cost used by FSU, but will specify that the contractor will need to independently rent, upgrade, and maintain this housing unit for the one year of this advisor's residence in Somalia.

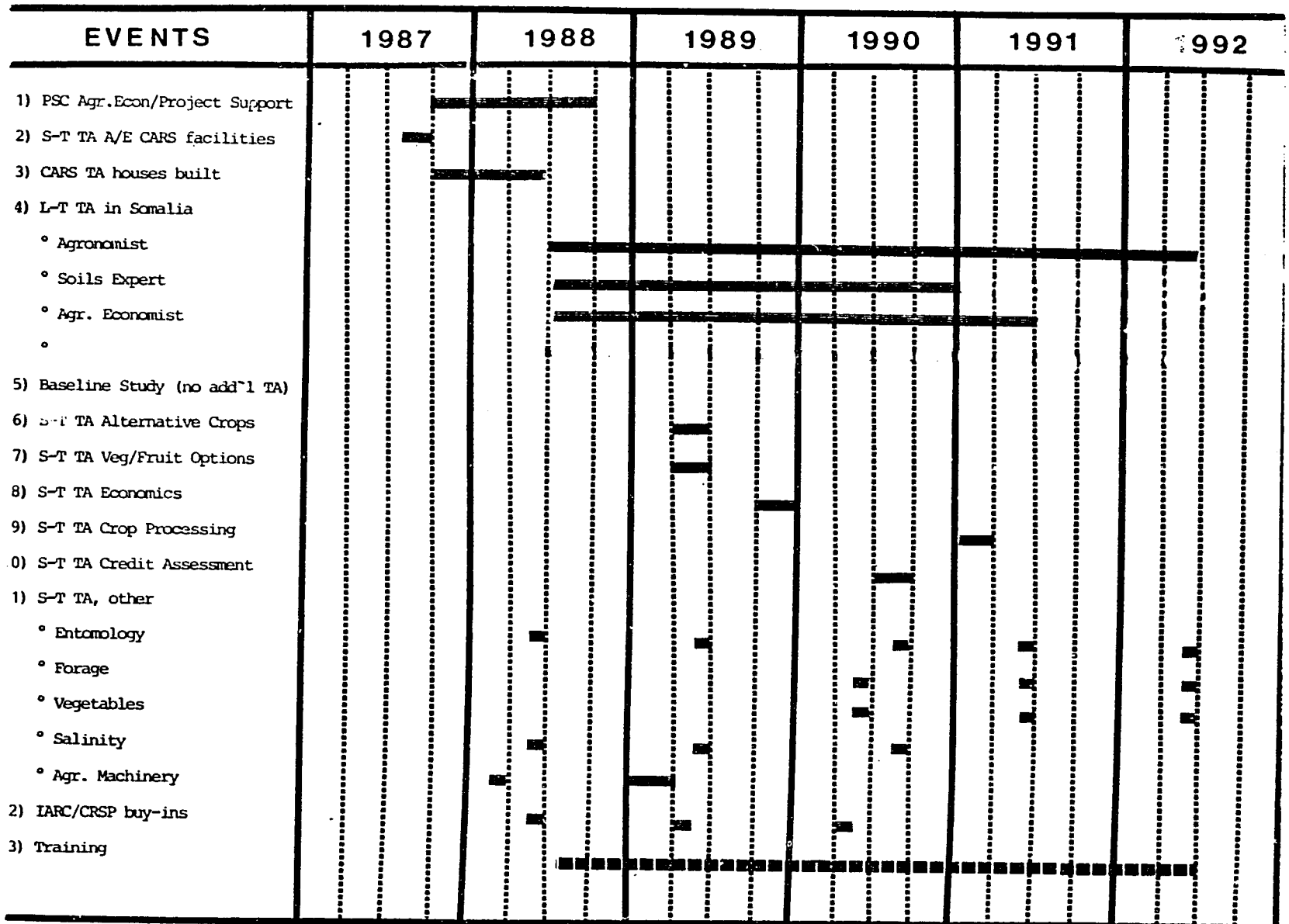
5.2 Adaptive Irrigated Agricultural Research

5.2.1 Summary. The primary inputs to this component will be the following Research Team:

- One long term Agronomist - 4 PY;
- One long term Soils Expert - 2.5 PY;
- One long term Agricultural Economist - 3 PY;
- One PSC Agricultural Economist/Project Support for first 12 months of project;
- 35 person months short-term TA, described below;
- Buy-ins to CIMMYT, ICRISAT, and CRSP's (AID's centrally-funded Collaborative Research Support Projects);
- MOA Counterparts (LT), Extension Workers (LT), and Support Staff (LT);
- FOA Researchers (part time associates);
- Commodities - vehicles, equipment, supplies, etc;
- Inputs for M.S. degrees in Agronomy at SNU to train Counterpart Agricultural Researchers from the MOA and FOA.

5/x

Figure 6: Adaptive Irrigated Agricultural Research Phasing of Inputs



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5.2.2 Resident Technical Advisors' Functions. The long term resident Agronomist will serve as chief of the research team. This expert will direct the crop-specific research to develop the maize, oilseeds and vegetable tech paks discussed below. Four person years are budgeted for this position.

The long term resident Soils Expert with experience in arid irrigated areas will work primarily on development of the soils management tech pak. He will also work with the research team in production of the crop-specific tech paks. Two and one half years are budgeted for this position.

The resident Agricultural Economist will direct the market studies and crop monitoring activities discussed below. He will also take the lead in the short term studies detailed below, except for the baseline study; this will be supervised by the Chief of Party of the long term technical assistance contract. Three person years are budgeted for this position.

The PSC Economist will assist USAID's direct hire Project Manager with the first year of SWMP start-up activities, e.g. preparation of the RFP and review of bidders' proposals for the long term TA contract, final design and review of the baseline study, orientation and backstopping of the new long term technical assistance team.

5.2.3 IARC Buy-Ins. Short-term personnel from CYMMIT and ICRISAT, or an Oil Seeds CRSP, or other ag research institutions, will be brought in to SWMP 1 through buy-in to AID's centrally-funded projects. The IARC's/CRSP's will recommend a limited number of improved seed varieties which are expected to have a good chance of success under Somali conditions, and they will provide seed stock for experimentation. Twice each year they will provide technical assistance to help set up the test trials and analyze the previous trial results. This activity is estimated to have an annual cost of $50,000, since it is assumed that AID's central-funding will support core salary costs of short-term TA. SWMP 1 buy-ins will fund advisors' travel, per diem, and seed purchases.

5.2.4 Short Term Studies

Final A & E Designs For Research Support. Before the resident staff arrive, USAID will contract for final A/E plans for housing, offices, lab structures, and guest houses at Afgoi and Genale. Part of this study will include an analysis of the existing CARS facility with recommendations for rehabilitation/new construction necessary to accomplish the research goals of this project. As input for these final designs, short-term TA will prepare an institutional analysis of the CARS staff - positions, departments, training needs, goals, etc., CARS functions and relationship

with other GSDR entities. Two person months of short-term TA is budgeted for this activity. The USAID engineering office will work with the USAID ADO Project Manager to supervise this A/E effort.

Baseline Survey. During the first 6 months after the research team arrives in country, they will conduct a baseline survey to collect necessary agronomic, economic, and social data. Overall supervision of the baseline study will be the responsibility of the long term technical assistance contractor's Chief of Party. This baseline study will serve as a point from which to measure production gains in the Shalambood target area. It will also give the research team a better understanding of the issues facing small holders in the target area, and will set the stage for monitoring and evaluation of the equity impacts of all SWMP 1 interventions. To ensure that socio-economic concerns are adequately addressed (e.g. needs of women farmers), the long term local organizations advisor (an anthropologist with experience working with water users' groups in irrigated areas, and resident in Merka) will also be part of the baseline survey team. This survey should allow the tech paks developed by SWMP 1 to better solve real constraints and increase profitability and production for smallholders. No short-term TA is anticipated for this activity.

An Alternative Crop Study will be accomplished during the second year after the resident long-term research staff arrive. The resident staff will have worked for two years on maize and oil crops, and the markets for those crops will have been monitored closely. Keeping in mind the close relationship between crops and livestock in the area, the resident staff will work with a forage specialist, a livestock nutrition expert, and a marketing specialist to study what alternative crop options are available and financially viable for testing in Shalambood. This team will determine the strategy for research into crop rotations which may include forage crops which will reduce risk and increase income for small farmers. Special attention will be given to identifying forages that draw up salts from the root zone for testing in Somalia. Three person months of short-term TA is budgeted for this activity.

Also during the second year after the resident staff arrive, a Vegetable and Fruit Option Study will be conducted. The research team will work with a ST horticulturalist specializing in vegetable and fruit production and a ST marketing specialist to determine: (a) the types and varieties of vegetables and fruit that can be physically grown in the area, (b) the domestic demand for vegetables and fruit, and (c) a research strategy to examine two vegetable options per year during Phase 1. Three person months of short-term TA is budgeted for this activity.

Economic Studies Prior to the Midterm Evaluation. A detailed midterm Phase 1 evaluation will be undertaken in year three after the team arrives in country. It is expected that 3 months of short term economic analysis will be needed prior to this evaluation, to serve as the basis for a more complete economic analysis of SWMP 1. This analysis will provide input to assessment of the feasibility of Phase 2, determine if progress is being made in the areas of research, extension, and increased farmer productivity, and serve to redirect focus of activity as necessary. The economic analysis will also feed into the design of Phase 2. It is estimated that 6 person months of short-term TA will be needed for this activity.

Crop Processing Study. As fresh market demands for crops are met by production increases, agro-processing alternatives will need to be analyzed as input to design of Phase 2. The research staff will work together with a short-term private sector specialist, a short-term food processing specialist, and a short-term marketing specialist to study agro-processing options. This study will lay out alternative interventions which may be included in Phase 2. Three person months of ST TA is budgeted for this activity.

Credit Assessment. Availability of credit has been identified as a constraint to use of improved inputs in the target area. The CSBS is entering the second phase of a small farmer credit program in 1987. By 1990, results from this effort should be available. The long-term research staff will be assisted by 3 person months of short-term TA to evaluate the status of agricultural credit in the target area and to provide recommendations for Phase 2 design.

5.2.5 M.S. Degree in Agronomy Inputs: Turnkey Training by a U.S. University. These inputs are described in Annex N: Training Plan, and they will be managed under the Project Management and Support component of the project (PP Section 7.1), since the M.S. degree training serves both the basinwide water management and the adaptive research components of SWMP 1. The Financial Plan (PP Section 6) allocates the MS training costs to the Project Management and Support budget heading.

5.2.6 GSDR Inputs (Somali Shilling Costs)

AFMET

AFMET staff will participate in SWMP 1 research and will undertake SWMP 1 extension activities. AFMET staff will also participate in the training activities funded by the project. AFMET activities will primarily include farmer training and demonstration fields at AFMET's Extension Training Center (ETC) in Genale and the provision of Field Extension Agents (FEA) who will be funded by SWMP to work in the Shalambood target area.

The ETC Genale staff supported by the local currency budget of this project component include the Regional Extension Officer (REO) for Lower Shebelli Region who is based in Genale at the ETC; the Deputy REO; four Subject Matter Specialists (SMS); one District Extension Officer (DEO); and four Field Extension Agents (FEA). The four SMS specialists in Agronomy, Farming Systems Research, Plant Protection and On-farm Water Management will work with long term U.S. advisors and the CARS staff to conduct the Afgoi on-station and Shalambood on-farm trials needed to develop tech paks. The DEO will monitor the activities of the four FEA's who will work in the Shalambood target area to conduct on-farm trials, collect valuable data on the effectiveness of the proposed tech paks, and provide that data as feed back to researchers. AFMET will further extend proven tech paks through the IBRD-supported AFMET 2 Project.

Total project budget for AFMET is $676,000 in Somali Shilling equivalent.

CARS

The adaptive irrigated research effort will originate at the Central Agricultural Research Station (CARS). After extensive discussions with other donors, USAID was designated as the primary sponsor of irrigated agricultural research in Somalia. The project will finance the portion of the operation of CARS needed to produce the outputs discussed above. As discussed in other sections of the PP, the research sponsored by the project will be practical production-oriented research focused on producing profitable technological packages for farmers.

The resident expatriate research staff will collaborate with their CARS counterparts to produce initial tech paks. It is expected that the Agronomist will have up to six counterparts, the Soils Specialist three, the Agricultural Economist three, and the On-farm Water Management Advisor will have four each in irrigation application. Other CARS support staff who are an integral part of the research agenda of the PP are listed in the detailed budget. All researchers will be expected to contribute regularly to the IBRD-sponsored National Research Meetings and Journal.

The SWMP long term researchers and CARS counterparts will work with participating AFMET and FOA researchers in a functional research coordination committee comprised of technical staff from each organization. This working committee will meet together at least once every two months to analyze results of previous trials, monitor on-going trials, and plan future activities. This concept of a technical working committee was tested under AID's Agricultural Delivery Systems Project when 10 technical staff from each of the three organizations met on a pilot basis to discuss their respective roles in addressing agricultural problems. The success of this first two week seminar held in September 1986 was very encouraging, and technicians and their respective institutions requested a continuation of this research coordination mechanism under SWMP1.

The National Range Agency has a tree nursery near the Genale barrage which supplies fuelwood, windbreak, and fruit tree seedlings to farmers in the area at nominal costs. In order to support this activity but not duplicate on-going research under the NRA, the GSDR will provide $500,000 in Somali Shilling equivalents to support the NRA's Genale nursery. This amount has been included in the CARS operating expense budget as agro-forestry activities which the NRA administers.

Total project budget for CARS is $1,657,700 and $3,266,000 in Somali Shilling equivalent.

FACULTY OF AGRICULTURE

The SNU Faculty of Agriculture is recognized in Somalia as the lead training institution for all agricultural technicians. In an effort to focus the strengths of all agricultural specialists on addressing Somali agricultural problems, the project will provide research stipends to Somali faculty and students who participate in agricultural research activities sponsored by SWMP 1. The FOA participated in the September 1986 research coordination seminar sponsored by the Agricultural Delivery Systems Project, and will continue to participate in the technical research working committee purposed under SWMP 1. All MS students will complete a MS report. FOA faculty members and students who participate in SWMP 1 research activities, as directed by the SWMP research coordination committee, will receive a modest honorarium. It is estimated that 22 faculty members and 40 students will participate in this effort for a total annual budget of $228,400 in Somali Shilling equivalent. All researchers will be expected to contribute regularly to the IBRD-sponsored National Research Meetings and Journal.

Total project budget for FOA is $228,400 in Somali Shilling equivalent.

5.3 Shalambood Target Area Rehabilitation

Section 5.1 above discusses the inputs to be provided under the basin-wide Shebelle water management component towards the proposed accelerated land registration campaign (output 1 of this component) in the Shalambood target area, and the technical assistance and local costs for improved local management skills (output 4 of this component). These inputs are summarized in Figure 6, but are not discussed at length herein. Additionally, funding and inputs for on-farm water management are covered under the adaptive research component discussion in 5.2 above, although they too will be an integral part of the inputs to improve local level management in the target area.

The key inputs under this component are two-to-four direct AID contracts for the Shalambood perimeter's physical rehabilitation, as follows:

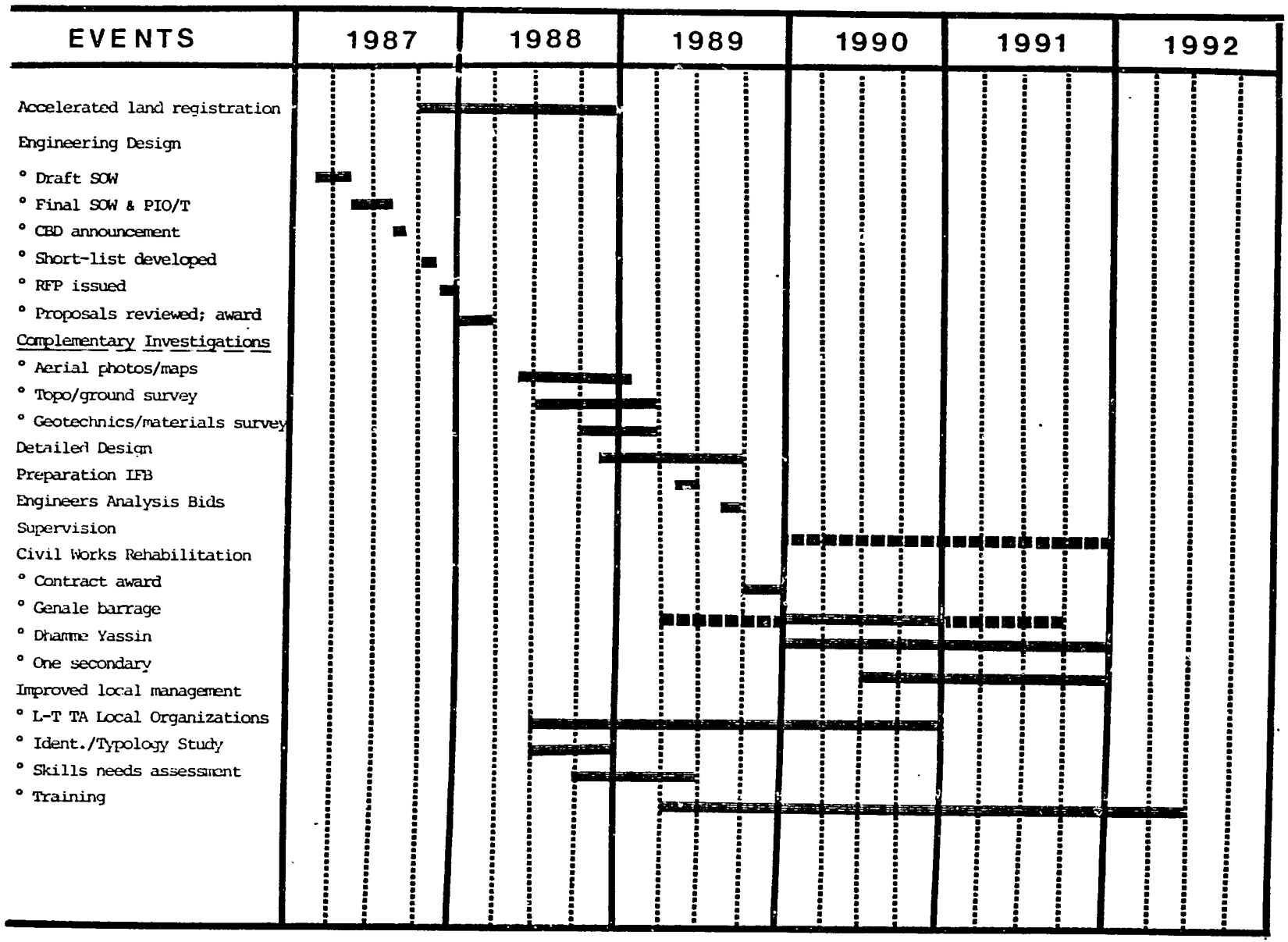
1) Engineering Design: Based on the draft scope of work for engineering design at Annex O, USAID/Somalia will develop a final scope of work for the complementary investigations and detailed design of the 8,000 hectares (net) Shalambood irrigation system rehabilitation, with particular attention to requirements for recommended phasing overall and the proposed Phase 1 civil works. The scope of work will call for a level of effort contract, based on cost-plus-fixed-fee. Due to the short duration of the design effort (15 months) the contract will not provide for Field Support Unit (FSU) services and will instead require the Contractor to provide housing, household furnishings, etc. and all support itself, assuming most of it will be on a rental basis. The contract will provide for duty free entry of any imported goods.

The requirement for A & E services will be synopsized in the Commerce Business Daily. Architect and Engineering selection procedures will be followed in order to award a contract. The design contract will be for a 15 month period with provision for amendment to include construction supervision for Phase 1 and possibly Phase 2 based on continued satisfactory performance. The contract will provide for Code 941 and Somalia eligibility for any sub-contractors, which may be necessary for aerial photography and possibly for map production. Language similar to that used to promote small and minority businesses under U.S. Government contracting will be modified to encourage sub-contracting with Somali firms where appropriate.

The contract will include requirements for the complementary investigations, detailed design, preparation of bid documents for the civil works contract(s), and analysis of bids necessary for the physical rehabilitation contractor's selection. The detailed design for the Genale barrage will be required as a high priority. Should AID so wish, an earlier contract may be amended for the barrage repair as separate from the envisioned civil works rehabilitation contract discussed below.

The engineering design is estimated to require approximately 52 person months of expatriate and 260 person months of Somali personnel to complete the work, in addition to direct and indirect costs, for a total cost of U.S.$ 1.904 million of which U.S.$ 1.457 million will be provided by AID and U.S. $ .447 million by the GSDR, through lump sum deposit to the AID trust fund account, in Somali shilling equivalents.

Figure 7: Shalambood Target Area Rehabilitation Phasing of Inputs



2) Construction Supervision: The engineering design contract in (1) above will include provision for an amendment to include construction supervision at the discretion of AID, assuming satisfactory performance by the contractor. This is, however, mentioned as a potential second direct AID contract should the design firm prove inadequate. The decision would need to be made by USAID/Somalia early enough that a new scope of work could be developed and the supervision contract opened for competition. The supervision contract would also include a provision that it could be extended, subject to availability of funds and continued satisfactory performance, for Phase 2 of SWMP.

Construction supervision is estimated for Phase 1 at U.S.$ .494 from AID and U.S.$ .098 in Somali shilling equivalents from the GSDR.

3) Civil Works Rehabilitation: The Invitation for Proposals (IFP) for the Phase 1 civil works rehabilitation contract will be a key output of the engineering design contract. It is anticipated that the IFB will include rehabilitation of the Genale barrage as an early priority (if not contracted through an earlier separate IFB) as well as repair, deepening and widening of the Yassin feeder reach and channel to the Fourth Secondario, and rehabilitation of the Fourth Secondario itself. This contract will also be for Code 941 eligibility and use of Somali sub-contractors, as appropriate, will be encouraged. It will be awarded in late 1989, with the construction funded under Phase 1 lasting two years. This contract will also include provision for an amendment so as to move smoothly into Phase 2 construction activities if contract performance so merits. A total of U.S.$ 5,923.6 is budgeted for Phase 1 construction including U.S.$ 4,939.2 from AID, and U.S.$ 984.4 in Somali shilling equivalents from the GSDR.

5.4 Other Donor Inputs

Table 3 which follows illustrates the number and types of known donor efforts related to SWMP components. Section 7.1 of this PP discusses plans for the creation of a Shebelli Donor Coordination Committee to enhance the effectiveness of AID's and these other donors' inputs.

TABLE 3

OTHER DONOR INPUTS

Donor	Project Name and Summary Description	Funding
SHEBELLI RIVER MANAGEMENT:		
IBRD	Power Sector Organization and Management Studies: Relevant to status of MJVD and management of the Juba River and Bardhere Dam.	NA
FAO	Support to Water Law: Short-term TA to GSDR to define and draft new law (completed).	NA
FAO	Support to National Water Center: TA, equipment and training to Water Resource Division, MMWR, to establish self-reliant center to undertake water resource data collection, processing and analysis. (3/86-2/89)	$ 1.1 M
KFW	Duduble Off Stream Storage: Currently under design, estimated storage capacity 196 MCM	$ 17. M
IBRD	Faraxaane Irrigation: Rehabilitation and construction of 7,000 ha near Genale. and rehabilitation of Qorioley and Falkeerow barrages.	@ $ 30 M
ADB/ADF	Qorioley Irrigation Phase 1 & 2: Design, supervision and construction of vastly rehabilitated 2500 target area in Qorioley District; Neither parameters nor funding established for Phase 2 to date.	NA
EEC	Daara Salaam-Jusley Irrigation: Design, supervision and rehabilitation up to 6,000 ha above Genale; project appraisal 3-4/87.	$ 7 M
UNSO/ DANIDA	Kilometer 60 Irrigated Fuelwood Plantation: 5000 ha. coverage to serve Mogadishu market;	NA
Agro-Action	Smallholders Jowhar Rice Project: 400 ha. cultivated by small farmers over 5 villages; outside funding now complete; all objectives achieved;	

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SUPPORTIVE ADAPTIVE AGRICULTURAL RESEARCH:

IBRD	AFMET 2: Establishment and support of MOA Research Directorate; O&M for AFMET and Genale ETC staff; construction of housing for Genale ETC staff, including FEAs.	$ 20 M proposed start 9/87
ADB/ADF	Farm Production: Support to AFMET 2, including construction of housing and offices at CARS in Afgoi. Report to be submitted to ADB Board 5/87.	NA
Italian Cooperation	SNU/FOA: Construction of new buildings and equipment for 3 departments; dormitories, staff housing. Continuing provision of professors.	NA
SAREC (Sweden)	SNU/FOA: Annual grants for staff research.	NA
FAO	Fertilizer Project: (1) GCP/SOM/035/Norway (12/83-12/88) (2) GCP/SOM/039/Arab Gulf Fund.(1986) TA and commodities for AFMET to increase fertilizer use by small farmers.	 $ 1.6 M $ .5 M
UNDP UNCDF	Seasonal Credit to Small Farmers: (1) UNDP-financed (9/83-10/86) (2) UNCDF-financed (9/83-12/86) Second Phase still on-going with new project to start 4/87, small scale individual and group in-kind loans through CSBS in Lower Shebelli Region.	 $ .5 M $ 1.0 M
	Seed Multiplication Center: (1) CGP/SOM/029/Denmark (1/81-12/86) (2) TCP/SOM/6655 by FAO (1/87-3/87) New project to start 4/87 for TA, training, equipment at Afgoi SMC.	 $ 1.1 M $30,000
UNDP/FAO	Land Use Planning in Lower Shebelli Region, then either Middle Shebelli or Bay Region. Ground survey, soil classification & mapping; 1987 start.	$ 1.8 M
EEC	Genale Grapefruit Nursery & Project.	NA
GTZ	Support to Smallholder Irrigated and Rainfed Agriculture (SSIRA, 3/87 - 3/90): Work with smallholders on canal rehabilitation (quarternaries); improved agricultural technology, and credit in Gorgal-Afgoi Yarei (Qorioley District, and Awdegle-Mubarak (Afgoi District).	DM 5 M

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OTHER ACTIVITIES-SHALAMBOOD:

WHO	Drinking Water in Lower Shebelli: Provision of handpumps to communities.	$ .5 M
CARITAS	Provision of monopumps to communities in Lower Shebelli region for safe drinking water.	NA
SOMAL-FRUIT	Upgrading & resurfacing of 87 km Afgoi- Golweyn Road, currently under discussion.	NA
EEC	Road Maintenance/Construction: Afgoi-Gelib Road.	$ 2 M ECU

6. COST ESTIMATE AND FINANCIAL PLAN

The total cost of Phase 1 of SWMP is estimated to be U.S.$ 36 million, of which U.S.$ 22.6 million will be contributed by AID and U.S. $ 13.6 million in Somali shilling equivalents by the GSDR. Total cost of the ten year effort is estimated at U.S.$ 80 million equivalent, with the AID contribution estimated at U.S.$ 50 million.

Table 4 provides a summary cost estimate by Source of Funds (AID or GSDR) and Use (inputs). Note that in this and all subsequent tables the GSDR contribution is presented in U.S. dollar equivalents, using the current official exchange rate of So.Sh. 90 = U.S. $ 1.00. Table 5 provides Projected Expenditures By Input by Year, and Table 6, Projected Expenditures by Component. Tables 5-7 are organized by fiscal year to allow AID and GSDR contributions to be shown on each table. Table 7 provides a Schedule of Obligations by AID Fiscal Year. Detailed component budgets are found in Annex O.

The projected expenditures are based on a series of standard costs established by USAID/Somalia based on experience with similar projects to date, and on detailed estimates by the Design Team for non-standard line items. The standard costs used for personnel, training, and selected commodities, are found in Annex O. Detail on costs of non-standard items, including the estimates for the physical rehabilitation of the Shalambood target area, are also found in Annex O.

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Funding is provided as follows:

6.1.1 AID CONTRIBUTION

A. Technical Assistance ($6,891,200)

AID funding will cover expatriate technical assistance personnel. The budget will provide for 32 person years of long-term and 107 person months of short-term expatriate technical assistance. The funding is considered all inclusive, to include salaries, allowances, benefits, shipping and travel, leave and contractor's overhead, except housing and maintenance/repair of housing. Provision and support for housing is separated out in the component budgets as an Field Support Unit (FSU) cost for all contractors except for the advisor housed in Merka. His/her housing and its support is budgeted separately as the contractor will be responsible for renting and servicing this unit.

Of this total technical assistance budget, the following is budgeted:

	LT TA (PY)	ST TA (PM)	TOTAL
Project Coord. & Support	8	10	$1,132.0
River Basin Management	13.5	62	1,132.0
Agricultural Research	10.5	35	2,619.4
TOTAL	32	107	$6,891.2

Project Coordination and Support budget includes a Chief of Party and local hire expatriate off-campus Coordinator for U.S. university which will provide turn-key MS training to SNU, as well as short-term TA for procurement project commodities, and start-up logistics. Short-term TA are provided for evaluations, Phase 2 design, and procurement.

River Basin Management includes a River Basin Management Engineer, Construction Engineer, Irrigation District Advisor, On-Farm Water Management Advisor, and a Local Organization Advisor. Short term assistance is provided as needed.

Irrigated Adaptive Agricultural Research includes an Agronomist, a Soils Specialist, an Ag Economist, and a PSC Project Coordinator for long term positions. Short term technical assistance includes specialists in entomology, soil salinity, crop specialists, IARC/CRSP buy-ins, etc.

B. Field Support Unit ($1,127,000)

The Field Support Unit budget includes housing for technical assistance personnel and vehicle maintenance.

C. Training ($1,119,500)

AID funding will provide for professors from a U.S. university to undertake up to 23 trips of approximately 5 weeks each to teach turn-key courses in Somalia leading towards SNU MS degrees in Irrigation and Agronomy. Funding is also provided for the U.S.-based Campus Coordinator for the program, and for materials and documents for MS report preparation. This in-country turn key concept will cost less than one-half the cost of sending a student to the U.S. for an M.S. degree. The current budget also provides for 20 months of short-term third country training, with sites to be determined. Annex N provides further information on recommended sites.

D. Commodities ($3,276,200)

AID funding for commodities to CARS totals $1,657,700 which includes farm and lab equipment, supplies, a generator, irrigation pump, office equipment, computers, a bus, and 6 vehicles.

AID funding for commodities to the DILU totals $1,437,500 which includes heavy equipment for desilting activities, radio equipment, computer equipment, office equipment, supplies, and 8 vehicles.

AID funding for commodities to the Project Coordination and Support includes office and training equipment, and four vehicles.

E. Construction ($ 7,092,000)

AID funding will cover approximately 82 percent of the Engineering Design and Supervision and Civil Works Rehabilitation Construction contracts for Shalambood target area rehabilitation, with the GSDR funding the remaining 18 percent. AID and GSDR funds are allocated on a 50-50 basis for fixed price construction of 4 technical assistance residences in Afgoi and 2 guest houses (Afgoi and Genale). Both dollar and shilling construction budgets include ten percent contingency and five percent annual inflation.

F. Other ($1,439,000)

This includes $1,360,000 for computer modelling services, aerial mosaics, other subcontracted services, and operating expenses under River Basin Management activities. It also includes $79,000 for dollar operating expenses for Project Coordination and Support activities.

G. Contingency and Inflation ($1,655,000)

Inflation is figured at 5 percent per year over the life of the project. Contingency is also included in this portion of the budget.

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AID funds will be disbursed through standard AID procedures, including direct AID procurement of selected items (IQC A/E and Afgoi-Genale residential construction contracts, the Shalambood target area's engineering design and supervision Contract(s), Shalambood civil works rehabilitation contract(s), household furnishings, etc.), and procurents through the long term technical assistance contract.

6.1.2 GSDR CONTRIBUTION $13,013,300

Although all GSDR contribution amounts are expressed in US dollars, they will be provided in Somali Shilling equivalents based on the exchange rate at the time of disbursement.

A. Personnel ($1,345,600)

Staff salaries and allowances for the participating organizations will be provided by the GSDR as follows: DILU - $847,000; CARS - $341,300; AFMET - $73,500; and Project Coordination & Support - $83,800.

B. Field Support Unit ($1,259,000)

The Field Support Unit shilling budget is estimated to total $1,259,000. This will provide for local costs for housing, and operation and maintenance.

C. Training ($315,400)

GSDR funding covers local costs for project sponsored MS training, 315 person weeks of in-service training and workshops for CARS personnel, 275 person weeks for DILU personnel, 600 weeks of farmer training at ETC Genale, and 5400 days of training for the 50 FEAs of the region in irrigated agricultural technologies.

D. Commodities ($1,653,600)

DILU commodities ($1,060,000) include desilting equipment such as draglines, backhoes, scrapers, etc., and 20 vehicles. CARS commodities ($243,600) include farm equipment, motorcycles, and 6 vehicles. AFMET commodities ($350,000) include farm equipment, motorcycles, and 6 vehicles.

E. Construction (3,746,600)

The construction budget for target area rehabilitation includes the GSDR contribution of $1,528,800 to the Design and Supervision contract and the Rehabilitation contract. DILU will use $1,175,000 for the construction of a new headquarters and staff housing. CARS will use $1,042,800 to refurbish its facility at Afgoi (including buildings, land leveling, and irrigation works), and for the construction of four staff houses and 2 guest houses. GSDR funds will be deposited in the AID trust fund as a lump sum prior to each contract's signature. All contracts will allow Code 941 eligibility. This construction budget includes ten percent contingency and five percent annual inflation.

F. Operating Expenses ($3,454,800)

Operating expenses include fuel, maintenance on buildings and vehicles, per diems, office supplies, etc. This budget is allocated as follows: Project Coordination and Support - $50,000; DILU - $2,024,000; CARS - $1,418,800 (which includes $500,000 for NRA); AFMET - $233,600; FAO - $228,400.

G. Contingency and Inflation ($1,238,400)

Contingency and inflation are included at 5 percent per year over the life of the project.

GSDR funds will be disbursed on an annual basis through its Ordinary and Domestic Development Division budgets. Subsequent sections of this PP emphasize the importance of enhanced annual planning so that these budgets will be approved on a timely basis consonant with the schedule of project implementation.

6.2 Method of Implementation and Finance

Exhibit 6.2.a presents the methods of finance and implementation for Project 649-0129. More detailed information about the inputs and contracting modes is given in Sections 5 and 7 of this project paper. This Mission general assessment of Funding Policies and Procedures dated 12/31/85 (updated as of 12/31/86) should be referred to for an overall perspective regarding the Payment Verification Policies as they impact on USAID/Somalia. Since AID direct contracting and direct reimbursement are being employed, these policies have significant impact on this project in only one area. Internal financial controls over the use of local currency by Host Government at the Domestic Development Division (DDD) level is acceptable. However, at the project level, these controls are inadequate. Controls exercised at local non-government agencies are inadequate to be minimally acceptable. In order to encourage the adoption of minimal fiscal standards and practices, the amount of $200,000 has been budgeted for independent audits, financial review, systems design to establish adequate control. Also, when possible, USAID will make every effort to place control of local currency with the expatriate contractor teams whose stewardship over the currency is considered adequate.

6.2.3 Recurrent Costs

The long term technical advisors to the DILU will work with the DILU to address recurrent costs issues. Under the authority of the new Water Law, project advisers will work with the DILU, the Ministry of Revenue, and water users' groups (especially those in the Shalambood target area, as "test site") to define

the responsibilities of each entity in secondary canal operation and maintenance, recurrent cost financing, and operational aspects of fee collection and reinvestment in maintenance. Water users' groups will continue to be responsible for tertiary canal and farm ditch maintenance, as they are now, but project advisors will assist the DILU to train user groups in improved maintenance practices, especially ones that discourage the breeding of water borne disease vectors.

Project advisors will work with the DILU to develop a plan for pricing water delivery services which will take into consideration the following factors:

- Seasonal water shortage which may require differential seasonal pricing to encourage water use efficiency;

- Policy decisions on allocation to perennial versus annual crops in times of water shortage, which may need to be reflected in differential water pricing, and MOA licensing to control any proposed expansion of the area under perennial tree crops;

- The higher profitability of perennial crops, which can thus bear the cost of supplemental groundwater irrigation; differential pricing could be used to favor annual crop farmers, and thus, motivate perennial farmers to finance their own groundwater irrigation wells and pumps (where salinity permits);

- Smallholder farm budgets (provided by SWMP research outputs).

Users' fee collection will come on line during Phase 1 apace with improved reliability of DILU water supply deliveries, to maintain the credibility of the user fee system.

EXHIBIT 6.2.A

TABLE 4

SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(U.S. $ 1,000; SoSh 90 = $1.00)

LINE ITEM	FX	LC	TOTAL
TECHNICAL ASSISTANCE	6891.2	0.0	6891.2
PROJ COORD & SUPPORT	1132.0	0.0	1132.0
RIVER BASIN MGT	3139.8	0.0	3139.8
IRRIG AG RESEARCH	2619.4	0.0	2619.4
FSU	1127.0	1259.0	2386.0
PROJ COORD & SUPPORT	150.0	202.3	352.3
RIVER BASIN MGT	617.0	622.2	1239.2
IRRIG AG RESEARCH	360.0	434.6	794.6
PERSONNEL	0.0	1345.6	1345.6
PROJ COORD & SUPPORT	0.0	83.8	83.8
RIVER BASIN MGT	0.0	847.0	847.0
IRRIG AG RESEARCH			
CARS	0.0	341.3	341.3
AFMET	0.0	73.5	73.5
TRAINING	1119.5	315.4	1434.9
PROJ COORD & SUPPORT	1119.5	228.1	1347.6
RIVER BASIN MGT	0.0	50.0	50.0
IRRIG AG RESEARCH			
CARS	0.0	17.9	17.9
AFMET	0.0	19.4	19.4
COMMODITIES	3276.2	1653.6	4929.8
PROJ COORD & SUPPORT	181.0	0.0	181.0
RIVER BASIN MGT	1437.5	1060.0	2497.5
IRRIG AG RESEARCH			
CARS	1591.9	243.6	1835.5
AFMET	0.0	350.0	350.0
FOA	65.8	0.0	65.8
CONSTRUCTION	7092.0	3746.6	10838.6
RIVER BASIN MGT	0.0	1175.0	1175.0
IRRIG AG RESEARCH			
CARS	201.4	1042.8	1244.2
SYSTEM REHAB	6890.6	1528.8	8419.4
OPERATING EXPENSES	1439.0	3954.8	5393.8
PROJ COORD & SUPPORT	79.0	50.0	129.0
DILU	1360.0	2024.0	3384.0
CARS	0.0	1418.8	1418.8
AFMET	0.0	233.6	233.6
FOA	0.0	228.4	228.4
CONT & INFLATION	1655.0	1304.8	2959.9
PROJ COORD & SUPPORT	419.2	90.9	510.0
RIVER BASIN MGT	709.6	701.6	1411.2
IRRIG AG RESEARCH	526.3	512.4	1038.7
TOTAL	22600.0	13579.7	36179.7

TABLE 5

PROJECTION OF EXPENDITURES BY FISCAL YEAR
(U.S. $1,000; SoSh 90 = $1.00)

	FY 87		FY 88		FY 89		FY 90		FY 91		FY 92		TOTALS		
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	TOTALS
TECHNICAL ASSISTANCE	292.4	0.0	1067.6	0.0	1815.4	0.0	1849.2	0.0	1148.6	0.0	718.0	0.0	6891.2	0.0	6891.2
FSU	590.0	80.0	102.0	215.3	165.0	356.9	144.0	323.6	81.0	182.1	45.0	101.1	1127.0	1259.0	2386.0
PERSONNEL	0.0	86.8	0.0	173.4	0.0	222.6	0.0	247.6	0.0	277.6	0.0	337.6	0.0	1345.6	1345.6
TRAINING	13.0	1.8	156.5	67.2	254.0	61.6	296.0	61.6	233.0	61.6	167.0	61.6	1119.5	315.4	1434.9
COMMODITIES	500.0	500.0	2018.1	633.0	144.9	14.4	337.4	470.7	137.9	17.0	137.9	18.5	3276.2	1653.6	4929.8
CONSTRUCTION	201.4	291.4	827.1	1320.6	1771.4	1208.3	3044.8	577.2	1247.4	349.1	0.0	0.0	7092.0	3746.6	10838.6
OTHER	0.0	65.8	340.0	876.0	362.0	751.0	512.0	754.0	115.0	754.0	110.0	754.0	1439.0	3954.8	5393.8
CONT & INFLATION	0.0	0.0	184.2	153.5	281.0	228.4	494.7	292.8	369.7	278.5	325.4	351.7	1655.0	1304.8	2959.9

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TABLE 6: PROJECTED EXPENDITURES BY COMPONENET BY FISCAL YEAR
(U.S. $1,000; SOSH 90 = $1.00)

LINE ITEM	1987		1988		1989		1990		1991		1992		SUB-TOTALS		TOTALS
	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	
Basin-wide Shebelli Water Mgt	916.0	617.0	1679.8	1540.5	1659.9	1469.7	1795.8	1166.7	808.1	822.8	404.3	863.1	7263.9	6479.7	13743.6
Adaptive Irrig Agr. Research	607.8	408.7	1701.3	1566.6	807.8	862.2	1124.4	852.2	667.7	609.9	455.8	616.5	5364.8	4916.1	10280.9
Shalambood Rehab	0.0	0.0	827.1	216.4	1771.4	386.1	3044.8	577.2	1247.4	349.1	0.0	0.0	6890.6	1528.8	8419.4
Proj. Coord. & Support	73.0	0.0	487.3	115.5	554.6	125.2	713.1	131.5	609.5	138.0	643.2	144.9	3080.7	655.1	3735.7
TOTALS	1596.8	1025.7	4695.5	3439.0	4793.7	2843.2	6678.1	2727.5	3332.6	1919.8	1503.3	1624.5	22600.0	13579.7	36179.7

TABLE 7: AID PLANNED OBLIGATIONS
(U.S.$ 1,000)

	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	TOTAL
US Obligations	2500.0	10000.0	5100.0	5000.0	0.0	0.0	22600.0
US Expeditures	1596.8	4695.5	4793.7	6678.1	3332.6	1503.3	22600.0
GSDR Expenditures	1025.7	3439.0	2843.2	2727.5	1919.8	1624.5	13579.7
Total Expenditure	2622.5	8134.5	7636.9	9405.6	5252.4	3127.8	36179.7

7. IMPLEMENTATION PLAN

7.1 Management Structure.

7.1.1 USAID/Somalia. Overall policy and implementation guidance for SWMP1 will be provided by the SWMP Project Committee. The committee will meet on at least a quarterly basis to review progress, any problems to date, and to identify means of resolving issues and responsible action office for same. The Project Committee will include representatives from all relevant line and staff offices (expected to include Agriculture, Engineering, Project Office, Program Office, Controller, Training Officer, Management and Contracts Offices) and will be chaired by the Project Manager.

USAID's Office of Agricultural Development (O/AD) will assign one U.S. direct hire officer full-time as AID project manager for SWMP. This O/AD project manager will work closely with the GSDR implementing agencies discussed in Section 7.1.2 below, and will provide technical and managerial supervision to U.S. technical assistance contractors. Given the scope and complexity of the project, this project manager will be supported during Year 1 by a Personal Services Contractor hired to assist with start-up activities discussed in Section 5.2 above.

The USAID Engineering Office will be responsible for technical review, approval and supervision of all A & E and construction contractors. The USAID Engineering office will keep the O/AD project manager informed of progress and any problems in implementation. The USAID Environmental Officer in the Engineering Office will additionally monitor: (1) environmental assessment activities, (2) compliance with AID Regulation 16, and (3) coordination of the Juba Development Analytical Studies Project with the SWMP1 basinwide management component. AID's Regional Economic Services Office for East and Southern Africa (REDSO/ESA) will provide a Project Development Officer to lead both external evaluations (in Year 3 and late in Year 4) and other technical support (especially REDSO Engineer and Contract Officer) as needed for Phase 1 implementation and Phase 2 design, upon Mission request. As requested, these inputs will be requested at the REDSO/ESA Scheduling Conference each September.

The USAID Mission Director or his/her representative will serve as an ex-officio member of the GSDR Shebelli Steering Committee (SSC); in addition, s/he will be an active participant in the Shebelli Donor Coordination Committee. These committees are discussed in Sections 7.1.3 and 7.1.4 below.

7.1.2 AID/W. The AID/W Project Development Officer in AFR/PD/EAP will establish and chair an AID/W Project Committee including AFR/TR/ENG, AFR/TR/ARD, AFR/EA, GC/AFR, and AFR/DP, and the Bureau Environmental Advisor (AFR/TR/PRO) to provide guidance based on review of SWMP's semi-annual Project Implementation Reports, and to assist, as needed, with: (1) recruitment of ST TA for start-up activities (through AID/W IQC contracts and/or buy-ins to AID's centrally-funded projects like WMS II), (2) if requested by mission, recruitment and selection of A & E and long-term technical assistance contractors, and (3) if requested by mission, review of scopes of work and RFP's for A & E, long term technical assistance, and construction contracts. The AFR/PD/EAP Project Development Officer will work closely with the AID/W Contracts Office (SER/OP/OS/AFR) to provide this backstopping assistance, and will consult with S & T/AGR and S & T/H to identify centrally-funded resources to support the SWMP activities (e.g. CRSP's to supply improved seeds, and water borne disease experts for evaluation teams).

7.1.3 GSDR. The Institutional Analysis (Annex I), and its summary in Section 8.2 of this PP, describe and analyze the key Somali organizations that will be involved in implementing SWMPl. The Ministry of Agriculture will take the lead in implementing all components of SWMP through its two new Directorates - the Directorate of Irrigation and Land Use for the basinwide Shebelli water management and Shalambood rehabilitation components, and the Directorate of Research for the supportive adaptive research component. SWMP will also collaborate with Somali National University's Faculty of Agriculture to provide long-term in-country training for DILU staff and MOA researchers; FOA researchers will also participate in SWMP research. The MOA Directors General of DILU and the Directorate of Research will liaise closely with the Ministry of Revenue (which controls both the Ordinary and Domestic Development Budget, and which will be involved in implementation of water users' fee collections and reinvestment), and the Ministry of National Planning. The MOA will also work closely with the Ministry of Justice and Religious Affairs to redraft the proposed new National Water Law with ST TA funded by SWMP.

Project policy and overall guidance will be generated by a GSDR Shebelli Steering Committee, chaired by the MOA Vice Minister for Planning and composed of senior representatives from AID, the MOA Directorate of Irrigation and Land Use, the MOA Directorate of Research, the SNU Faculty of Agriculture, the Ministry of Revenue, the Ministry of National Planning, and the Ministry of Mineral and Water Resources (represented by the head of its National Water Data Center, and a representative of the National Water Committee).

The Steering Committee will meet quarterly to review progress under the SWMP components and to discuss issues of general concern. Written minutes will be kept so that a record of decisions is available. Given the proposed 10 year life of the overall project, and the likelihood of periodic personnel changes within both AID and the GSDR, it is important that such a written

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record be maintained. MOA creation of the Shebelli Steering Committee will be specified in the Grant Agreement as a condition precedent to disbursement of funds for the long-term technical assistance contract.

7.1.4 Donor Coordination. The GSDR will establish a Shebelli Donors' Coordination Committee (SDCC) to be chaired by the Permanent Secretary of the Ministry of National Planning (MONP). This committee will include representatives of all donors listed in Section 5.4 who have resident staff in Somalia, including AID. Donors without resident staff (e.g. the ADB) will be kept informed through circulation of written minutes and will be briefed by the Permanent Secretary of MNP when their representatives are in Somalia. Given the array of activities listed in Section 5.4, it is important that donors coordinate their demands on the basinwide water supply and regularize their collaboration to avoid redundancy and/or ineffectiveness in investment planning. It is proposed that the Shebelli Donors' Coordinating Committee also meet no less than twice each year. MOA establishment of this Committee will also be included in the Grant Agreement as a condition precedent to AID's disbursement of long-term technical assistance funds. As stated in PP Section 4.1, supplying the heavy equipment and fuel needs of the DILU is seen as an issue for multi-donor collaboration. The SDCC will serve as the forum for approving plans and financial commitments from all donors. To this end, once AID's LT advisors have assisted the DILU to prepare an equipment needs assessment and proposals for SDCC review.

A discussion of the proliferation of autonomous agencies and "projects" outside of regular government lines for planning, budgeting and audit is presented in the Institutional Analysis (Annex I). Although the GSDR's planning and budgeting cycles to date have not been overly influential in determining resource flows, there are indications that this may be changing. Certainly all AID projects, including SWMP1, will be subject to an increasingly rigorous budget review and planning process as the Domestic Development Division (DDD) continues to build up its staff capability.

The DDD is moving towards a cycle wherein plans and budgets will be developed in June-July of each year for a September review and approval process for the next fiscal year (which begins on January 1 in Somalia). It is therefore recommended that the Shebelli Donors' Coordinating Committee meet in April of each year to coordinate donors' financial plans. It is further recommended that the AID/GSDR Shebelli Steering Committee meet in March before the SDCC's April meeting each year, to prepare a refined SWMP financial plan for the next year's activities for review at the SDCC, and then again in June to review SDCC decisions and adjust SWMP inputs and schedules as necessary.

7.2 Contracting Strategy

7.2.1 Start Up Activities. Section 9 of this PP recommends a condition precedent to AID's signature of the project's construction contract and several covenants related to policy issues. To initiate project implementation and to maintain momentum from previous activities, USAID/Somalia will undertake the following short-term contracting actions during the first 9 months of the project while the longer-term technical assistance contractor is being selected and processed.

- One contract for 3 person months of a Water Law Specialist, with 1 trip of 1 month in FY 1987 and 1 trip of 2 months in FY 1988. The services will be obtained either through a buy-in to WMS II or an IQC;

- One contract for 6 person months of an Anthropologist to assist the MOA with the accelerated land registration campaign in Shalambood. Due to the proposed duration of services, an IQC cannot be used. USAID/Somalia will work with AID/W to explore other possibilities, e.g. a buy-in to one of AID's centrally-funded projects such as LTC or an IQC;

- One contract, either through WMSII buy-in or an IQC, for 2 person months of an Institutional Advisor to assist the MOA to plan the organization, staffing and recruitment for the new DILU;

- One IQC work order for 2 person months of A & E services to finalize the IFB for LT TA housing in Afgoi, guest houses in Afgoi and Genale and refurbishment of CARS office/lab facilities in Afgoi;

- One direct AID contract with a U.S. firm for the construction discussed above. Annex S contains justification for the use of the direct AID contracting mode (since MOA institutional flux and experience cannot support use of the host country contracting mode);

- Mission CMO will procure up-front commodities with PIO/C's such as household furnishings, equipment, and vehicles for the support by FSU of the long-term TA;

The Mission will also initiate its major LT technical assistance procurements during this period. Shalambood engineering design and supervision will be contracted separately from SWMP's LT technical assistance to the MOA, so that SWMP advisors to the DILU can assist the GSDR to oversee all of the large construction contracts funded by donors in the Shebelli. Combining the two contracts would likely create difficulties with other donors and other U.S. engineering design contractors, since the winning firm would be, in essence, supervising itself on AID's Shalambood

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rehabilitation work. Conflict of interests can best be avoided by separating the joint venture contract from the A & E contract. The two long-term procurements will thus include:

- One cost-plus-fixed fee contract for engineering design of Shalambood target area irrigation rehabilitation. The RFTP will state that this contract may later be amended to include follow-up construction supervision services, subject to continued satisfactory performance; and

- One cost-plus-fixed fee contract for all of the long and short-term technical assistance requirements for basinwide water management and irrigated agricultural research, with the exception of JARC/CRSP buy-ins, evaluations, and special skills required for Phase 2 PP design.

Figure 8 depicts the GSDR institutional affiliations of these contracts and the advisors therein. As reflected in Figure 9, these procurements will be initiated while the condition precedent to signature of the LT TA contract is being met. They will both be direct AID contracts, with USAID/Somalia's Engineering Office taking the lead on the former and the O/AD Project Manager coordinating the latter (with assistance from the REDSO Engineering and Contracts Offices, and AID/W Contract Office and Project Committee as needed). Each is discussed below.

7.2.2 Engineering Design, Construction and Supervision for Shalambood Rehabilitation. The scope of work for the engineering design contract is described in PP Section 5.3. As stated above, that section also recommends that the design contract provide for amendment to include construction supervision at the discretion of AID. Assuming satisfactory contractor performance, this provision will eliminate the need to undertake a second A & E procurement, and should facilitate more timely mobilization of the civil works rehabilitation contractor. Only U.S. (Code 000) prime contractors may bid on the engineering design contract, though provisions in the RFTP will allow both developing country (Code 941) and Somalia sub-contractors at the discretion of the prime.

The schedule for procurement of the civil works rehabilitation contractor(s) is also discussed in PP Section 5.3. This contract (or contracts, if the Mission chooses to separately advertise for rehabilitation of the Genale Barrage while A & E design of the feeder reach and canals is still on-going) will be open to firms from the U.S. (Code 000) and will be direct AID fixed price contract(s). Any commodity source/origin waivers for construction materials will be identified in the engineering design, and will need to be approved prior to signature of any construction contract(s). Annex S provides the Mission's justification for use of the direct AID contracting mode for these construction services. USAID/Somalia has determined that a fixed price contract mechanism is appropriate in order to provide performance incentives for timely (or early) completion of construction.

FIGURE 8 : SWMPI TECHNICAL ASSISTANCE
CONTRACTING MODES

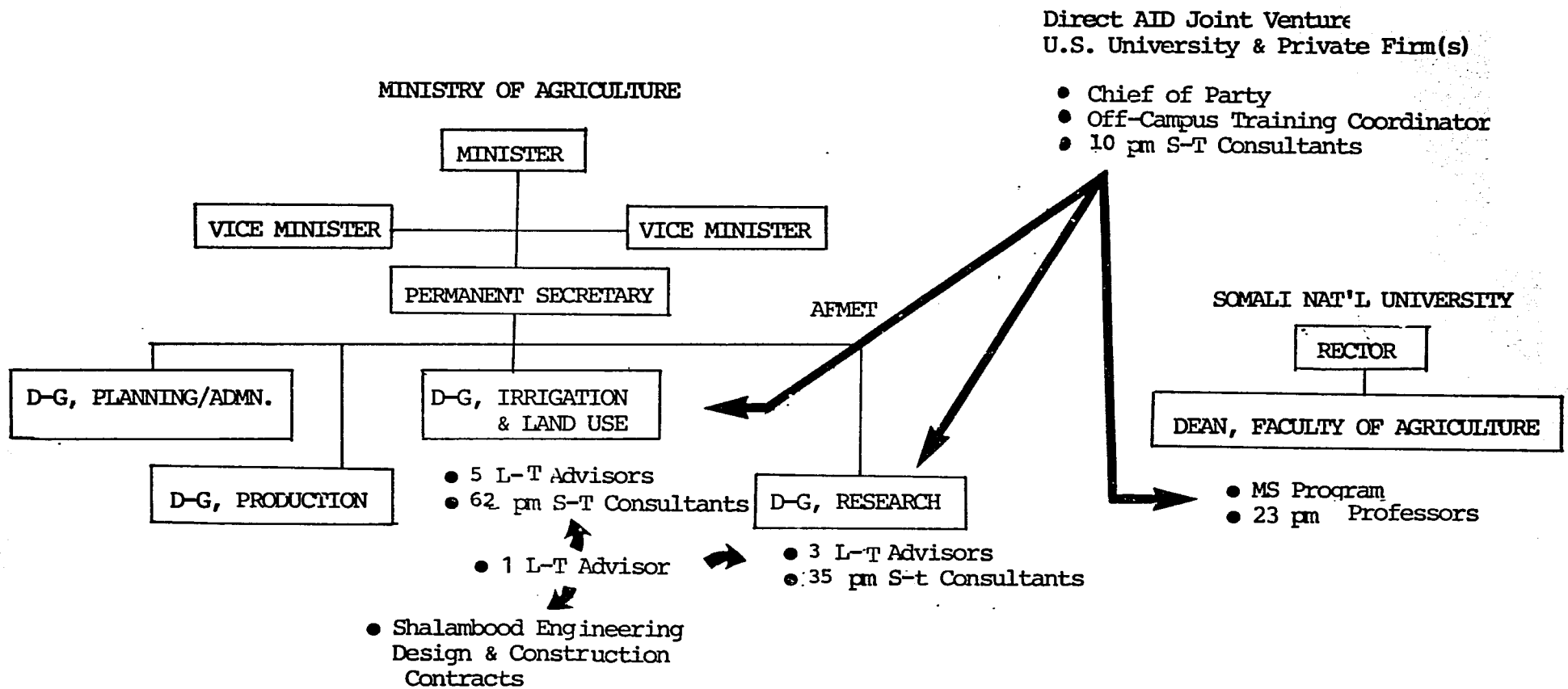
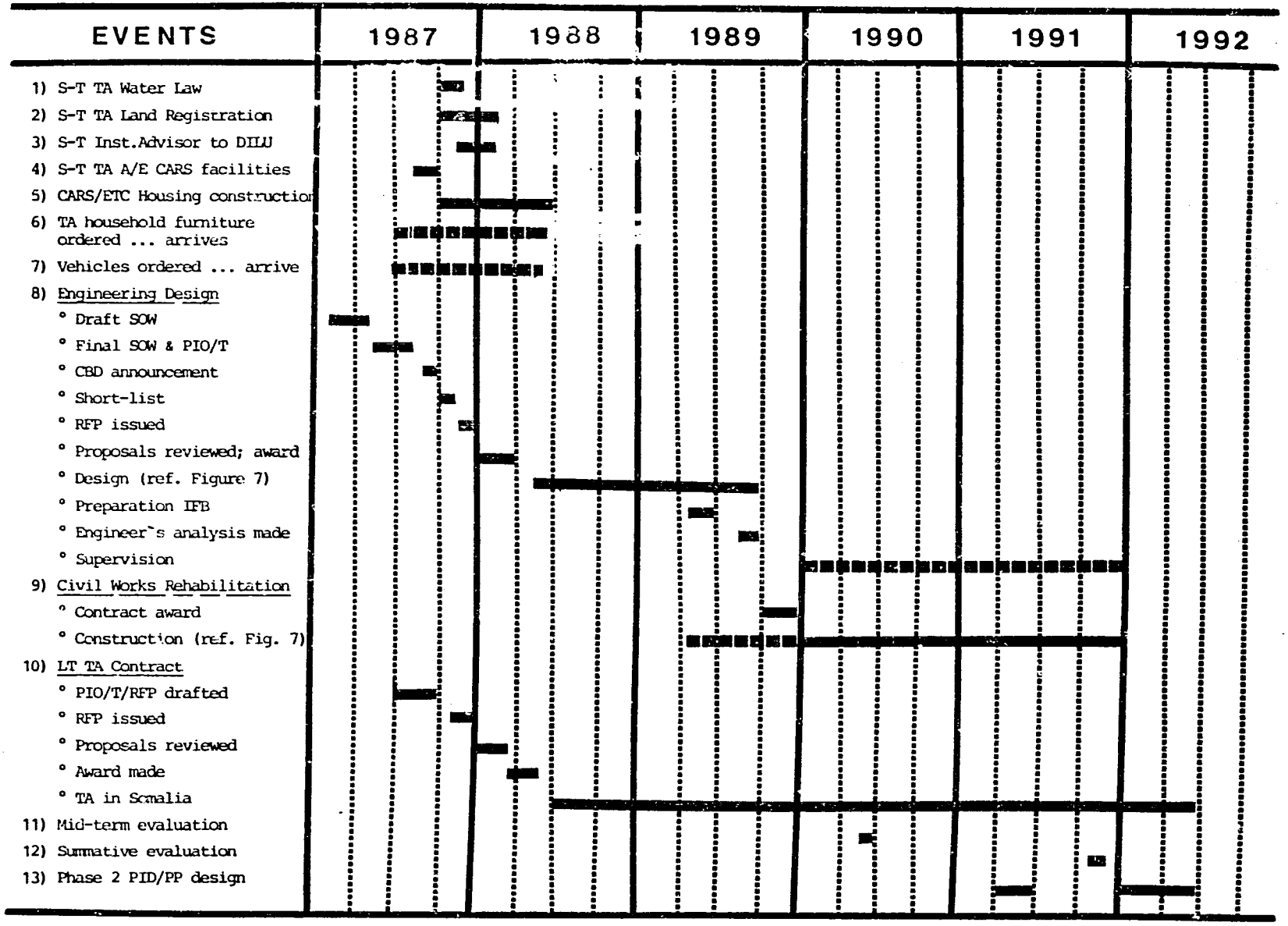


Figure 9: Contracting Actions



All of these contracts will be advertised for open competition within the geographic codes given. The Mission has carefully considered the provisions of the Grey Amendment, and believes that the complexity of design/construction issues and logistical difficulties in Somalia support the need for as wide a competition as possible. No set-asides for 8A, small, or minority-owned businesses are contemplated.

7.2.3 Long-term Technical Assistance for Basinwide Water Management and Irrigated Agricultural Research. USAID/Somalia will develop an RFP suitable for a joint venture by a private firm or firms and a U.S. university that will require the following:

- approximately 24 person years of long-term and 97 person months of short-term TA as described under inputs for basinwide water management (section 5.1) and agricultural research (Section 5.2);

- approximately 30 person months of short-term services to provide instruction in English language skills and agronomy/irrigation for the turn-key in-country MS program described in Annex N;

- approximately 8 person years of long-term and 10 person months of short-term TA to coordinate, support and manage all items above and below; this will include 4 person years each of a full-time Chief of Party (resident in Somalia and supplied by the prime contractor) and a local hire expatriate off-campus coordinator to backstop U.S. university inputs into the MS program at SNU;

- provision of commodities and services (if necessary, through approved sub-contracts) to obtain the aerial photography, rectified mosaics and computer simulation model for basinwide water allocation and management (ref. Section 5.1);

- provision of necessary placement and support services for approximately 20 person months of short-term third country participant training; and

- procurement of necessary technical and administrative equipment, including radio equipment, hydraulic gauges, and computers, and other supplies as described in the component inputs (PP Section 5).

As indicated in the component budget in PP Section 6, the joint venture personnel stationed in Mogadishu and Afgoi will be supported by the USAID/Somalia Field Support Unit (FSU). The contractor will be independently responsible for house rental, furniture and support for the local organizations advisor in Merka.

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The AID Mission has considered numerous possibilities for the procurement and management of SWMP1 LT TA, and believes the proposed joint venture contract arrangement to be the best option for the following reasons:

(i) Dividing the LT TA package into three contracts: agricultural and research, basinwide water management, and MS training could make it extremely difficult to integrate lessons learned from one component into the strategic planning and running of other components.

(ii) A number of inputs are designed to serve all components, notably:

- The MS training program which trains both DILU and agricultural research staff;
- The Local Organizations Advisor, who supplies grassroots input to all three components (basinwide water management, agricultural research, and Shalambood target area rehabilitation); and

- The on-farm Water Management Advisor, who also provides input to all of the project components above.

(iii) Given AID's desire to maintain a synergistic balance and interaction between investments in basinwide management strengthening, on-farm adaptive research, and grassroots participation by water users' groups, the complexity of the project will require a Chief of Party supplied by the prime contractor, accountable to the USAID Project Manager and MOA for management and integration of all the activities above.

The COP will need to be a senior manager with an inter-disciplinary background that includes irrigated agriculture, water management capacity, building on a basinwide scale, communications, negotiation skills, and familiarity with Africa. The COP will provide support, direction and quality control for all efforts under the joint venture contract. He/she will have an office in Mogadishu, supported by Somali staff, which will function as a Project Coordination and Support office (PCS). This office will provide a base for coordination of the MS program inputs that equally benefit the DILU and Directorate of Research and the ST external training. The contractor will locally recruit and hire an expatriate Off-Campus Coordinator for the MS program. The Off-Campus Coordinator will assure that visiting U.S. university instructors' and part-time students' schedules are coordinated, liaise with the FOA on proposed course content, and generally assure smooth operation of the MS program.

The Chief of Party will be the key point of contact for AID on technical and administrative matters. The LT Agronomy Advisor at CARS and the LT River Basin Management Advisor at DILU will report to the COP, and will supervise their respective teams. The COP's contact with the GSDR will be the Chairman of the Shebelli Steering Committee, in other words the Vice-Minister for Planning of the MOA. It is also expected that s/he will have regular informal contact with the Directors General of DILU and the Directorate of Research, CARS, ETC Genale, AFMET management, and the FOA/FOE deans.

The joint venture contract's RFP will be advertised for open competition by U.S. firms and universities, with Code 941 eligibility for any sub-contracts interested firms wish to propose. The RFP selection criteria will encourage bidders to include participation of small, minority and women-owned businesses in their proposals.

7.2.4 Other Procurement Actions. USAID's O/AD will collaborate with CARS and the expatriate researchers to identify short-term TA needs that can most appropriately be handled through IARC and CRSP buy-ins and will use standard AID procedures for accessing those services, principally through the AID/W Project Committee.

The PCS budget provides for 9 person months of non-contract technical assistance. This includes 3 person months for a formative mid-term evaluation, 2 person months for a summative Phase 1 evaluation prior to design of Phase 2, and 4 person months of external assistance for design of the PP or PP Amendment for Phase 2. These evaluations and Phase 2 design services will be procured by the Mission through IQC's and will be supplemented by participation of REDSO/ESA and AID/W personnel as appropriate. It is also expected that SWMP1 LT advisors will provide most of the technical inputs for design of Phase 2. The evaluations are discussed in PP Section 10.

8. SUMMARY OF ANALYSES

8.1 Policy Analysis

8.1.1 Macroeconomic Issues. Under the State-managed socialist economy prior to 1983, small farmers in Somalia were caught in a technical and economic equilibrium trap. Control of agricultural marketing outlets and production factors was vested in government monopolies, monopsonies, and inefficient parastatal input supply systems.

To stimulate economic growth, the GSDR initiated a series of economic readjustment measures, shifting to greater reliance on private sector mechanisms for allocating and distributing agricultural inputs and products. Liberalization of the foreign exchange regime, and of marketing of grain, bananas and livestock have had significant positive impacts on the economy.

In the context of SWMP, land tenure and private sector input supply are key policy issues which need to be addressed during Phase 1 policy dialogue. Land under agricultural production in the Shalambood area is presently divided between five categories of land tenure: (1) small farmer holdings (46.4 percent); (2) small farmer cooperative holdings (13.7 percent); (3) large special interest cooperative farms (14 percent); (4) state farms (10.2 percent); and (5) large-scale private farms (15.7 percent).

Forty-five percent of the small farmer holdings are registered; fifty-five percent are not. This appears to be a disincentive to investment and productivity, since agricultural yields from unregistered lands are significantly lower than yields from registered parcels. Land tenure is also an equity issue, since small farmers on unregistered holdings will be at risk in terms of a potential "land grab" as proposed SWMP rehabilitation nears. For both production and equity reasons, the establishment of GSDR measures to simplify and accelerate land registration in the Shalambood target area are proposed as a covenant for inclusion in the Grant Agreement.

The 24.2 percent of land held by state farms and special interest cooperatives is also an issue, since these farms' productivity is well below that of smallholdings in Shalambood. The establishment of achievable targets for privatizing/divesting selected farms in the Shalambood area in favor of smallholders is thus a second item recommended for the SWMP policy agenda.

Policy goals designed to increase the allocative efficiency and supply of agricultural inputs are: (1) elimination of subsidies for ONAT tractor hire and fertilizer, to stimulate

private sector market entry; and (2) allowing the private sector to import fuel and rationing of hydrocarbon fuels by import parity pricing, to reduce speculative demand and improve distribution.

A credit study during year 3 of project implementation will explore numerous other targets of opportunity for possible inclusion in SWMP 2 to further encourage private sector activity, such as: (1) expansion and simplified provision of small farmer credit; (2) credit for private entrepreneurs to undertake franchised input procurement and provide supplier credit to farmers; (3) establishment of easier credit terms for loans aimed at privatization, especially of parastatals such as the National Foundry and ONAT; (4) feasibility of a harvest credit policy to permit farmers to store grains longer and receive higher market prices; (5) standardization of agricultural equipment, especially tractors, to reduce the cost of spare parts' inventories; and (6) long-term credit mechanisms to promote supply of low turnover spare parts.

8.1.2 Legal Issues. Islamic legal philosophy welcomes inputs from "foreign sources" consistent with its Quranic value system, thus western sciences and technology have much to offer contemporary Islamic water law in Somalia. Law No. 77 of 1972, and Law No. 13 of 1966 (which the former repealed for the most part), are the two major Somali water laws. Many other laws have since created water-related projects and autonomous agencies without consolidating the functions of administrative entities, or even properly coordinating them through a national water policy and institutional framework.

With some minor changes, the FAO 1984 new draft "National Water Law" has been approved by a Committee headed by the Ministry of Justice and Religious Affairs, and is ready to be sent to the Council of Ministers. The draft law still needs to be approved in turn by the Council, which first circulates the draft among all the ministries, then the People's Assembly (or its Standing Committee), and the President to become enacted.

The major flaws of omission and commission of the draft law are:

(a) Sectoral Water Allocation. The draft law by and large rewards water-intensive, inefficient, and less beneficial users and uses of water. This is, or could become, a potential source of problems, fostering over-irrigation of some fertile lands and under-irrigation of others, and contributing to salinization. AID's agricultural strategy promotes food self-sufficiency and thus import-substitution crops as a higher priority than horticultural exports. Inter-sectoral and intra-sectoral water allocation should be based on objective criteria that use as parameters the land, water use efficiencies of crops, and domestic and international economic factors. The draft law gives a rigid prioritization of sectors which are themselves not easy to define or are mutually exclusive. It is silent about intra-sectoral water allocation.

(b) Water Pricing Policy. The draft law includes some ambiguous and problematic provisions relating to pricing policy. Islamic law and the Somali constitution (Art. 42) consider water to be the property of the State. A distinction must be made, therefore, between the "pricing of water" and "charging for the services needed to supply water." The "beneficiaries of the water resource development works are expected to contribute to the cost thereof" according to the new draft law. This legal provision is too limiting, particularly since Article 37 of the Somali constitution rightly makes it the duty of every "person" to contribute to state expenditures, and participate in the economic growth of the economy. Also, the draft law does not define "costs" or "beneficiaries"; definitions of these terms should be added to Article 1. The rights of the state should not, and need not, be limited only to a contribution towards the capital cost of the development works, but rather, for example, should include charges for the recurrent costs of water delivery systems. The draft law also allows "different categories of consumers" to be charged different "prices" without providing any criteria or rationale for that type of differential pricing policy decision. This could play havoc with national welfare and the spirit of the proposed law by allowing arbitrary rather than economically rational decisions. The draft law should strengthen, on the other hand, the case for inter- and intra-sectoral comparison of costs and benefits, to maximize economic efficiencies in the allocation and use of water resources. There are, of course, instances when the market price of some water supplies should be kept comparatively low for equity reasons. Such decisions, too, should be brought within the purview of the national interest through prescription of generalized and appropriate principles, criteria, and procedures of welfare economics.

(c) Water Management Administration. The draft law only increases administrative chaos, duplication, and costs. The draft law should be modified to set up a process for the reorganization of water-sector administration. Enactment of the water law should be conditioned upon the completion of administrative reorganization, without which the system may only be able to muddle through, with opportunities for real progress foregone.

(d) Omissions in the Draft Law. The draft law has ignored several key issues. These include the status of current water rights and the rights of customary water users; the transfer of water rights among users and uses; and the legal status of water users' associations and other water management entities. The draft law must also define the body of law applicable to the settling of water rights disputes.

Funding is provided under SWMP1 for up to 3 months of short-term assistance by a senior water law specialist early in project implementation to assist the GSDR to redraft the law to address these concerns.

8.2 Institutional Analysis

8.2.1 Present Institutional Framework for Water Resource and Agricultural Development. GSDR ministries are headed by a Minister and Vice Minister(s), Presidentially appointed; under them, the Permanent Secretary coordinates the work of the Directors General--usually the key managers within each ministry, heading Directorates which are, in turn, subdivided into departments. Autonomous "projects" or "agencies" are administrative units attached to a ministry which report directly to a Vice Minister. They work outside the bureaucratic structure, usually with donor support, which provides their staff substantially higher salary and benefits than are received by line employees of ministries.

Responsibility for agricultural development in the Shebelli basin rests primarily with the Ministry of Agriculture, assisted by parastatal and public agencies. The Ministry of Livestock, Forestry and Range, and the Ministry of Mineral and Water Resources are also involved in the agricultural sector, as are credit institutions. The MOA's Department of Land and Water Resources (DLWR) is responsible for data collection, operation, maintenance and management of surface water resources, including irrigation systems and implementation of GSDR policy regarding land reform and registration. DLWR manages a countrywide staff of 218, 122 of whom are based along the Shebelli River in regional and district branch offices; they are collectively responsible for the operation and maintenance of five of the seven main stem water control structures, and they operate and maintain the primary and secondary canals through their desilting project and water administrators.

Several other institutions share major responsibility for water resource development within the GSDR-the National Water Committee (NWC), and the Ministry of Mineral and Water Resources (MMWR). The NWC, chaired by the Minister of MMWR, is the highest policy and decision-making body in the water sector, coordinating all water resource projects. The primary responsibility of the MMWR--providing water for human and livestock consumption--has de facto limited the activities of the NWC to rural groundwater supply. The MMWR's National Water Data Center, established in 1986 with AID and UNDP funding, is responsible for centralizing the collection and interpretation of water data on both groundwater and surface water towards the development of a national master plan for water resources.

8.2.2 Structural Problems: Need for New Framework

8.2.2.1 Fragmentation of Irrigation Development. Developments along the Shebelli are proceeding without any significant degree of donor coordination. There is no single GSDR

institution responsible for coordinating both surface water and groundwater extraction, although both are used for irrigation purposes. Operation of the main control structures along the Shebelli is also fragmented, being housed within three separate GSDR entities (two different MOA departments and the Ministry of Industry).

8.2.2.2 Ministerial Organization, Autonomous Agencies and Projects. Within the public sector, "autonomous agencies" and "projects" have proliferated. This structure renders parallel line departmental authorities within ministries practically powerless. Autonomous agencies and projects recruit the best graduates and attract all but the most devoted government employees to leave the regular civil service structure for the better remuneration packages that they can offer.

As a result, the GSDR operates without an adequate ordinary operating budget, while its development program consists almost entirely of non-sustainable projects that work outside normal ministerial structures.

8.2.2.3 Fragmentation of Agricultural Research and Extension. Agricultural research is currently being undertaken by three agencies within the GSDR: ARI (CARS), AFMET, and the SNU Faculty of Agriculture. No direct institutional links now exist to coordinate the research work of these agencies, or to link their research to agricultural extension.

8.2.3 New Institutional Framework--Shebelli Water Management Project. The GSDR Ministry of Agriculture shares AID's concern over the ineffectiveness of its program due to institutional fragmentation and the inequities and inefficiencies of the line ministry/"donor-funded project" dichotomy. Through collaboration in the design of SWMP1, the MOA and USAID/Somalia have identified a new framework that will not only greatly increase the likelihood of success of SWMP1 interventions, but assure that they are sustained over time.

The proposed reorganization will establish two new Directorates, as follows:

- The DLWR will be elevated to the status of a Directorate of Irrigation and Land Use. It will retain all of its current functions and will, in addition, take over a number of others. It will be headed by a Director General, who will report directly to the MOA Permanent Secretary.

- The Department of Research was recently elevated to the status of a Directorate of Research, retaining all of its current functions and slowly gaining back some that have

been moved out to projects. Its Director General will also report to the Permanent Secretary. The creation of this Directorate will be funded by IBRD under the umbrella of AFMET 2; its creation will greatly enhance AID-supported efforts under SWMP's adaptive irrigated agricultural research component.

In order to alleviate inequities, line ministry personnel assigned to these directorates will receive project level remuneration, to be mutually agreed upon by AID and the GSDR. This step should enhance the new directorates' abilities to attract and maintain qualified staff, and it represents a modest start on civil service reform within the MOA.

This proposed new organizational structure is presented in Figure I-4 of Annex I. A discussion of the new structure and functions and their specific relationship to implementation of SWMP1 follows.

8.2.3.1 Directorate of Irrigation and Land Use (DILU).

As reflected in Figure I-4, the DILU will initially be composed of four departments: Department of Shebelli River Management (SRM), Department of Regional Water Resources Allocation (RWRA), Department of Land Evaluation and Use (LEU), and the Department of Finance and Administration (F&A). A detailed description of the proposed functions of these departments is included in Annex I. SWMP long-term advisors will work with all four departments, but most closely with the SRM and RWRA. LEU will participate in the preparation of land use data for the basinwide water allocation model, but primary long-term TA to LEU will be funded by UNDP and FAO. SWMP short-term advisors will work with the F&A Department during the second half of Phase 1, as water users' fee systems are developed, and policy regarding MOA/Ministry of Revenue responsibilities for fee collection and reinvestments are defined.

Existing personnel of the DLWR (ref. Figure I-3) will be folded into the Directorate, and new graduates recruited. Due to the economic upturn of the Somali economy, a number of well-educated professionals have recently begun to return and approach the Ministry for work, so although new recruitment of personnel will be needed to staff the new Directorate, the MOA is convinced that the effort will be successful.

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8.2.3.2 Directorate of Research.

Agricultural research activities proposed for SWMP1 will require the upgrading of the Central Agricultural Research Station at Afgoi. A key assumption in project design is that AFMET2, supported by the World Bank, will continue to improve the quality of research and extension services through:

- consolidating and selectively expanding the agricultural extension system;

- strengthening research support to extension; and

- introducing a mechanism for improving research coordination and extension linkages.

The World Bank will take the first step toward institution building in agricultural research by supporting the MOA's newly established Directorate of Research.

The research/extension linkage will need to be forged at national, research station and regional levels. Though the IBRD is the major donor supporting extension basinwide, SWMP1 pilot activities in the Shalambood area will be AID-funded to avoid bottlenecks in project implementation. Accordingly, SWMP1 will support and encourage collaboration between research and extension efforts within the Shalambood target area, including training for extension agents and Shalambood smallholders at ETC Genale, trials on Shalambood farmers' fields, and demonstrations on the ETC Genale fields. This will allow for grassroots participation by the local farming community in regional adaptive research and extension activities, so that agricultural research will be based on a realistic assessment of farmers' risks, access to resources, and appropriate costs.

It is important that SWMP1 deliver pragmatic adaptive research, targeted to the Shalambood target area and towards solving on-farm water and crop management problems extendable eventually to the whole Lower Shebelli. On-farm water management and water users' groups will be initially linked by collaboration between CARS and AFMET in SWMP research and training activities. With IBRD funds, AFMET will implement complementary extension and training to disseminate, in other irrigated areas, lessons learned by the adaptive research and extension funded by the SWMP1 project.

8.3 Irrigated Agricultural Production in Shalambood and Research/Extension Proposals

8.3.1 Crops and Horticulture. Annex J describes existing agricultural activities and constraints in the Shalambood target area. Present land use in the Shalambood target area is characterized by the predominance of irrigated annual crops. Of

the 3,804 hectare portion which comprised the TAMS study area, only 7 percent was under perennials (mostly bananas) and the rest annuals. Purely rainfed agriculture is virtually absent; irrigated maize and sesame are the dominant cropping patterns, accounting for over 86 percent of the total area under cultivation. Other crops include fruits, vegetables and some legumes (relatively recent), with the majority of horticultural hectarage planted in vegetables (391 hectares) and only 270 hectares of perennial fruits (95 percent bananas).

Irrigation of these crops uses a form of wild flooding characterized by application of 25 to 30 centimeters of water in a basin approximately 1/16 hectare in size, regardless of slope and levelness of the fields. This practice normally results in inundation of crops; as a result, both yields and cropping intensity are rather low.

8.3.2 Soils. The target area soils developed mainly in the heavy clay older alluvial deposits of the Shebelli River. Two similar soils, Saruda and Golweyn series, cover 83 percent of the area. These are heavy clay Vertisols, whose distinctive properties are due to the fact that the dominant clay mineral, montmorillonite, expands on wetting and shrinks on drying, resulting in the formation of deep wide cracks and in a "self-mulching" mixing of the upper soil layers. The advantages of these soils include the fact that they are relatively uniform, and have nearly flat relief. Their disadvantages are mainly due to their difficult physical properties and generally low fertility.

When dry, the soils are very hard, but when wet they are very sticky and may cling to tillage implements, thus the timing of tillage operations must be coordinated with soil moisture content. Once the soil is wetted and the cracks close, both surface infiltration rates and subsoil permeabilities are very slow, posing problems for both water entry and drainage. Because of the compact subsurface layers, observed depth of most crop roots is less than 50 centimeters. These soils have only moderate capacity for storing water available to plants, particularly in relation to the generally modest rooting depth, thus, irrigation has to be scheduled at fairly frequent intervals.

Chemically the soils are slightly alkaline (pH 8.0-8.5) and high in calcium, with high cation exchange capacities, but organic matter levels are low, generally less than 1 percent. Nitrogen appears to be the major limiting nutrient, but phosphorus is also generally low. It is recommended that Phase 1 adaptive research pay attention to possible crop responses to modest phosphate applications. Potassium and sulphur levels appear adequate at current yield levels, but their levels as well as trace element availability will also require greater attention during Phase 1 research.

Soils and water salinity levels are discussed further in the engineering analysis summary below. It appears that current levels of salinity in the upper soil horizons are still low, even after 60 years of irrigation; they can be expected to remain at an acceptable level, if river water is used in amounts sufficient to provide a small surplus for leaching. The lower quality groundwater, however, must be used with caution, (subject to future verification) at no more than 20 percent of total irrigation volume applied on a field.

8.3.3 Extension. AFMET organizes extension on a national basis, using a modified T&V system. There are three FEA's in the Shalambood target area- two also have responsibilities outside the area, and a large part of AID's target area is as yet uncovered by the FEA's.

The following constraints in the target area must be addressed: an insufficient number of Field Extension Agents; lack of transport, housing, offices and equipment for FEA's; inadequate time set aside for training; no enumerators for field surveys; lack of Subject Matter Specialists trained in on-farm water management; inadequate facilities at Genale ETC; paucity of recommendations from research to extend; and poor research-extension coordination.

Any AID-funded support must be closely coordinated with that provided by IBRD and ADB under AFMET 2, due to begin in September 1988. Preliminary summary recommendations are:

(1) The number of FEAs covering the target area should be increased from 2 to 4, to attain a coverage of 1 FEA per 800 farm families. This ratio should be improved to 1:500 during SWMP2;

(2) The FEA's should receive in-service training focussed on irrigation water management, vegetable crops and animal traction;

(3) Four SMS's, including one specialized in on-farm water management, should be appointed to the regional headquarters (based at ETC Genale);

(4) motorbikes should be provided for all FEA's to enhance their outreach to farmers. More detailed proposals to upgrade SWMP-funded extension in Shalambood are found in Annex J.

8.3.4 Supportive Adaptive Research. In addition to the lack of linkage between research and extension, the key constraints in Somalia are lack of trained researchers and poor research facilities. Despite these handicaps, CARS and SNU/FOA have produced some promising results with improved seeds, however, very little research has been undertaken to date on mixed

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cropping, farming systems, and water management. SWMP-funded research will develop yield-increasing "tech paks", including improved varieties and husbandry practices, initially focussed on maize and sesame. Results found promising in the station-based trials at CARS will be subject to on-farm verification trials in Shalambood, organized in collaboration with extension personnel at ETC Genale. FEA's will provide feedback from farmers to the SWMP research team, and researchers will become more familiar with farmers' needs through supervision of on-farm trials. When proven "tech paks" become available, they will be demonstrated on the ETC Genale farm, where farmer training will be located.

The project research activities will be guided by three long-term expatriate advisors: a Research Agronomist, a Soil Specialist, and an Agricultural Economist. The On-farm Water Management advisor will assist with crop specific water applications at the farm level. SWMP's Local Organizations' Advisor, resident in Merka, will provide input on water users' groups, etc. The long-term researchers will be supported by 35 person months of short-term TA during Phase 1 research activities, plus buy-ins to AID's centrally-funded Collaborative Research Support Programs and IARC's.

8.3.5 Private Sector Initiatives for Supporting Agriculture. The research and extension methodology proposed above will increase farmer awareness and use of a variety of new inputs. A Phase 1 credit study will assess whether Phase 2 should provide a modest credit fund through CSBS to support farmers' short-term production needs and "push" the Somali private sector towards more support of smallholder agriculture through increased supply of such inputs as improved seeds, pesticides, fertilizers, tools, equipment and tractors for land preparation, cultivation and harvesting. As yields increase through improved input supply, farmers would be encouraged to increase quantity and quality of production over a wider variety of crops. This would in turn improve availability of raw materials for the fresh and processed markets. Although numerous constraints exist, given the dynamic Somali economy, it is likely that much of this scenario will evolve without external credit assistance. Selected short-term TA and modest credit funds during Phase 2, however, might be provided to accelerate this process.

8.4 Engineering/Infrastructure Analyses

8.4.1 Shebelli River Basin Management. Most of the water of the Shebelli River's flow originates in Ethiopia; by the time it reaches Afgoi, the average annual flow is about 1500 MCM/year, occurring mostly from April to mid-December. Though revised estimates are not currently available, flows will be reduced considerably if planned irrigation diversions in Ethiopia come on line after construction of a hydro-electric dam on the Ethiopian run of the river.

About 132,000 hectares are now irrigated to some degree by gravity or pumping diversions from the Shebelli, with an estimated 12,000 hectares in perennials and 120,000 hectares in annuals. The irrigation water supply is undependable because of the variability of the river flow; even if the river was regulated, there would not be enough water to double-crop, under optimum conditions, more than 60-70,000 hectares from Afgoi downstream. Older barrages can no longer serve the purpose for which they were intended, because most of their control gates are not operable. Most irrigation canals have their delivery capacity impaired by sediment deposits, and most head regulators and turnout gates are out of service. Drainage systems are generally non-existent. Under these circumstances, it is understandable that most on-farm water management is very inadequate and inefficient; overall irrigation efficiency has been estimated to be as low as 15-20 percent.

Over the last few years, a number of additional main stem control works were completed on the Shebelli River: (1) a Flood Relief Channel Project at Duduble to limit downstream flows at that location to a maximum of 100 m3/s; (2) an Off-Stream Reservoir Project at Jowhar with a live storage capacity of 200 MCM, which now augments the low flow of the river by 30 MCM/month over the December - February dry season; (3) a barrage at Balad to serve a 2,000 hectare irrigated area; (4) a new barrage at Gayweerow serving some 2,500 hectares now being redeveloped under ADB sponsorship; and (5) a new barrage near the downstream village of Kurtenwaare.

A number of donors are contemplating the renovation of the older barrages and of various parts of the irrigation distribution system, including the head regulators and other structures. As these projects come on line, the irrigated areas they command will demand even greater shares of an already insufficient water resource.

8.4.2 Shalambood Target Area Rehabilitation

8.4.2.1 The Shalambood Perimeter. Shalambood was selected as the target area of the Shebelli Water Management Project by AID on the basis of previous studies and recommendations. This project will restore the Genale-Dhamme Yassin canal system as originally constructed. Over the 10-year life of SWMP, AID funding will support rehabilitation of:

- the Genale barrage diversion structure on the river;
- the Yassin main canal and branch canals, i.e. the Second to Sixth Secondarios (channels and control structures).

In addition, provisions are made for:

- implementation of a drainage system, including branch and main drains and pumping station;

- improvement and extension of the road and track network (hard surfaced);
- rehabilitation of the tertiary canal system and construction of a symmetrical tertiary drain system.

While the TAMS 1986 study covered a gross area of only 5,280 hectares (or 4,148 net hectares), after consideration of the area commanded by the key main stem control structures, USAID/Somalia has determined that SWMP should cover 10,210 (gross) or 8,020 net hectares.

8.4.2.2 Irrigation Requirements and Availability. Data available in previous reports, including proposed cropping patterns, have been used to estimate irrigation requirements (see Table K-2 in Annex K, section 2). Effective rainfall and water available at Awdheegle on a monthly basis, three years out of four, are compared with headworks requirements at the Genale off-take to the Yassin canal. Based on the assumed continued division of 90 percent annuals and 10 percent perennials in the Shalambood target area, these requirements represent, from April to November, only 12.5 percent or less of the flows available at Awdheegle, while they would jump up to 40-50 percent from December to March, and even higher to more than 90 percent in December and January. Even after making allowance for perennial plantations watered from well extractions, the Der season annual requirements are still 40 to 70 percent of Shebelli volume available at Awdheegle. Solutions to this imbalance could come partly through releases from upstream storage at Jowhar (and later in Phase 1 from Duduble). Revised crop rotation patterns for annuals will be prepared during SWMP1, to better match Shalambood's seasonal requirements and resources. Groundwater in the Lower Shebelli regime is rather abundant and only partly used; though annual recharge is estimated to be 50 to 70 MCM, however, groundwater quality is poor, and its use must be limited, if soil salinization is to be kept under control.

8.4.2.3 Surface Drainage. Both surface infiltration rates and subsoil permeabilities of the Shalambood target area's soils are very slow once initial soil wetting has caused the soil cracks to close. Field infiltration tests showed that, in non-cracking situations, the heavy soils of the Saruda and Golweyn series (which cover 83 percent of the target area) accept about 50 mm of water in the first two hours, but only a further 20-25 cm in the next 5 hours, after which further infiltration is extremely slow. These slow infiltration rates appear to be related to the soils' heavy clay textures; soil structure observed in the dry soil is ephemeral, disappearing as the soil wets and expands, until all the cracks close completely, to produce a soil with very little macroporosity.

The current lack of any surface drainage structures, farmers' use of bunds to form basins of various dimensions, and the presence of slight depressions and low spots due to poor land

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levelling, all result in water-logged patches in which crop growth is poor. Better land levelling and the installation of a system of primary, secondary, tertiary and quarternary drains would eliminate this problem.

8.4.2.4 Sub-surface Drainage. Sub-surface drainage works are not recommended for the Shalambood target area because they would be expensive, in view of low soil hydraulic conductivities which would require a very closely spaced system of drains of doubtful efficiency.

8.4.2.5 Sediment Problems. The large quantities of sediment carried by the Shebelli River are deposited in irrigation channels of all sizes, resulting in the need for frequent maintenance. Analysis of the sediment shows it to be mainly clay-sized particles, whose deposition is caused by calcium flocculation, which causes them to fall even in moving water. Larger canals are excavated by machine, with farmers' groups paying the fuel and driver incentive costs; the smaller ones are dug out by hand.

8.4.2.6 Salinity Problems. Shebelli River water has a very low sodium hazard, but a generally moderate (and occasionally high) salinity hazard. The water salinity peak reported at the beginning of the Gu season, however, was found on analysis to occur only one year in three, when river water is very low for two or more months prior to the rains. This hazard may be eliminated when the Jowhar water storage reservoir is managed more effectively to eliminate low pre-Gu river levels during Phase 1.

Groundwater is of poorer quality than river water, with EC values of 2.0-2.5 microohms/cm near the river, rising to 3.0 microohms/cm in areas away from the recharge zone of the river and main canals. These salinity levels require that groundwater, at present applied mainly to perennials in the dry season, be used with caution.

Salinity values of surface soils (0-50 cm in depth) are generally low to negligible, and exchangeable sodium levels are very low at all soil depths. Moderate leaching in future can be expected to keep the upper soil layers low in salt content. Based on current salinity levels in the upper 100 cm of the soil profile, 91 percent of the 611 sites examined by MMP had salinity levels which were low to negligible.

Soil salinity levels, however, must be interpreted in relation to the different levels of salt tolerance of different crops. In these terms, the mean salinity levels referred to above suggest that even the relatively salt-sensitive crops of maize and grapefruit, as well as sodium-sensitive bananas, can all be grown on most Shalambood sites with less than a 10 percent yield

reduction. Salt-tolerant varieties of many crops are becoming increasingly available, so with good management and careful crop selection, salinity problems in the Shalambood target area are not considered to be a serious limiting factor.

8.4.2.7 Physical Rehabilitation of the Shalambood Perimeter. The feasibility design prepared by TAMS in 1986 is generally acceptable, with the following reservations and recommendations:

(a) Rehabilitation of the Genale Barrage: Detailed tests on samples of materials taken from the concrete structure and its foundation will be an important preliminary step (see Annex K). The PP Design team accepts TAMS' recommendations for: replacing most metal parts in the barrage including gates and pipes; replastering and refurbishing the masonry works; and ripraping and gabioning the river bed and banks in the vicinity of the barrage. Before proceeding with final design, however, the structural condition of the concrete barrage, and its expected remaining life must be evaluated. The PP analyses and estimates, in the absence of necessary laboratory test data, have assumed that the barrage's structural integrity has been preserved through its 60-year life; if this assumption is correct, TAMS' specifications will be adequate for the barrage's rehabilitation.

(b) Main and branch canals will be rehabilitated down to the turnouts to the tertiary canals. No significant variations to current alignments are expected, but the concrete lining of the canals recommended by TAMS has been eliminated, and canal rights-of-way may need to be widened to allow for maintenance and livestock tracks. Purely in terms of engineering, wherever the water's velocity in the canals falls below 0.2m/s, a desilting reach can be provided, long enough for deposition of the coarser sediments (fine sand and coarse silt) in a restricted area. This could be designed for the Yassin canal feeder reach, immediately downstream from its head regulator near the Shebelli River, and/or along the first reach of each branch canal, thus making use of the flat slopes that prevail in these areas. Control of water borne diseases vectors' breeding in other irrigated parts of Africa, however, has required maintenance of higher velocities (e.g. 0.5 m/sec to eliminate schistosomiasis snails). Design of canal systems and slopes will need to take both goals into account-control of vector breeding and desiltation. Desilting will, in any event, need to be carried out as part of normal canal maintenance, using excavating equipment. Automatic desilting facilities are not recommended, as they are not well adapted to prevailing local conditions.

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- Main and branch drains, and a pumping station to lift collected drainage water to the elevation of other waterways, will be a new but necessary feature of the rehabilitated Shalambood irrigated area.

- Tertiary canals will complement the principal system, bringing water either to the farm gates (in the case of large holdings) or to the turnout common to a group of smallholders' farms. Corresponding collector drains will pick up the irrigation return flows from those farms.

- Final decisions will be needed regarding the design of the quarternary system (farm ditches) and land leveling, when additional consideration is given to such aspects as final layout of roads and waterways, cropping patterns, and corresponding irrigation scheduling, etc. These issues can be dealt with during Phase 1 implementation, without affecting adversely the proposed overall schedule of SWMP activities.

8.4.3 Supporting Infrastructure. The project will support the construction of roads and tracks for operation and maintenance of canals and drainage systems, for improved access to markets, and for livestock passage. Roads thus far selected fit within the construction/upgrading plans of the Ministry of Works and other donors. Locally-available coral limestone surfacing is proposed for all maintenance roads and tracks.

Only roads/tracks for maintenance of Dhamme Yassin and its feeder reach) and the Fourth Secondario will be upgraded during Phase 1. All other road/track upgrading needed will be considered for Phase 2 funding or by other donors.

Project funds will also be used to construct several residential and office buildings at Afgoi and Genale. Final design will be completed by an AID/W A&E IQC firm and construction will be undertaken by AID direct contract mode.

Annex K includes the types of local inputs to this construction that can be provided by the Somali private sector. AID's construction contractor will be encouraged to take advantage of these skills whenever possible.

8.5. Financial and Economic Analysis.

8.5.1 Production: The investment period of the project is 10 year with most of the water delivery system completed during the first five years and drainage work during the latter five years. Under these conditions large output increases are not projected during Phase 1. It will be the third year after canal work begins before any increase in output is forthcoming and the sixth year before production really starts to build up to a maximum in the eleventh year when it levels out. Given the need for adaptive research followed by extension work this relatively slow build up in production is reasonable. All crops are assumed to have substantial yield increases. These increases start from a very low present base and, even at full production, are modest when compared to yields under similar conditions elsewhere.

The yield increases come about as the result of the project addressing the two major factors affecting crop production in the area. The first of these is the non-availability of water at critical stages of plant growth and the second is the cultural practices now in use by farmers.

8.5.2 Financial Analysis If this project is to be viable it needs to operate without a subsidy. This means that the farmers will pay the market price for all inputs. The financial viability of the project from the farmer's view point is assessed in Annex L using market-determined prices in four farm budget models. Particular attention is given to the small one hectare farm. The budgets show that although the benefits are less than those of the larger farmers they are still substantial. The small farmer is able to increase his farm income from SoSh 26,000 to SoSh 85,000. Even after allowing for the increased costs of inputs incremental benefits are SoSh 48,000 or almost double the without project income.

8.5.3 Cost Recovery Water charges set at a level sufficient to cover the costs associated with the continued provision of irrigation water within the project area are essential if the improvements are to continue functioning effectively after external funding ceases. If the recurrent costs are not payed by the beneficiaries, it is inevitable that future reliance on GSDR budget allocations will impose a heavy burden on the budget and jeopardize the continued maintenance and operation of the irrigation system. The farm budgets show that all the farmers within the project area will be well able to pay a water charge that covers operation and maintenance costs from their incremental income.

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8.5.4 Benefit-Cost Analysis The project cash flow is given in Table 1-9. As can be seen the project breaks even during year 14 and subsequently produces SoSh 9.7 billion by year thirty. The internal rate of return (IRR) at 13.4 percent, which while probably close to the opportunity cost of capital, puts this project into the acceptable category.

The project's sensitivity to various costs and benefit assumptions are presented in Table L-10. The project is not very sensitive to a 20 percent increase in rehabilitation costs. It is more sensitive to incremental production delayed by one year or to an assumed 20 percent increase in on-farm costs but still yields an IRR of about 10 percent. However, the project is very sensitive to a decline in benefits. If benefits are assumed to be 20 percent less than expected the IRR declines to six percent.

8.5.5 Foreign Exchange Implications The high dollar cost of the civil works will not draw on the GSDR budget since it will be met with donor funds. Somalia will have a continuing foreign exchange need to sustain the project benefits, specifically to meet the costs of imported farm inputs. These include fertilizer, pesticides and fuel for tractor plowing. These costs will amount to some SoSh 83 million per year or approximately U.S. $925,000 at the current exchange rate to balance these input costs are both foreign exchange earnings and savings. Earnings will be from the continued exports of bananas and an increase in the export of watermelon and vegetables. A conservative figure for the value of the increased exports is SoSh 260 million (U.S. $2.9 million) at full production. This more than covers the costs of increased imported inputs. The import substitution savings comes from a reduction in grain and edible oil imports and is worth around SoSh 498 million (U.S. $5.5 million). The project thus will result in a net foreign exchange benefit of U.S. $7.4 million annually when the project achieves full production around year 10.

8.6 Social Soundness Analysis

The proposed project will focus on three major components: 1) strengthening the GSDR capability for centralized Shebelli River management; 2) strengthening supportive adaptive irrigated agricultural research; and 3) improving the intensity and efficiency of irrigated agriculture in the Shalambood target area. The first two components are broader in scope than the last and are meant to have benefits at the national level as well as for local farmers. The target area of the first two components covers the 2,085,000 people living in the Shebelli River basin, or 32 percent of the population of Somalia. The third component focuses on the Shalambood area, as a "test site" where all project components intersect, and the grassroots-oriented learning process can be implemented through intensive dialogue with water users' groups and other local organizations.

Because the project will use the Shalambood area to test all project activities, the target area is the focus of the social analysis presented in Annex M.

The people of Shalambood are part of a larger agro-pastoral system in the riverine area of southern Somalia. The area was settled with large numbers of slaves of diverse origins by the Somalis who, from the mid-19th century, attempted to encourage the production of agricultural surpluses by establishing private plantations. From 1908, the Italians began expropriating land for banana and sugar plantations to help defray the cost of colonial administration. From 1926, the Italians began to build an irrigation system in the Shalambood area. They divided the Shalambood irrigated area into 63 aziendas or plantations.

It is estimated that the target area contains 27,440 people, 25 percent of whom are landless. Currently, land tenure in Somalia is governed by the Land Law of 1975 which establishes State control over all the nation's lands, allowing only for lease holdings of 50 years. Land ceilings are specified and land tax permitted; land transfer (except by the State) and rental (sub-leasing) are not allowed. In spite of this law, tenure security is a major problem in the target area. The number of land disputes has been low and in past they have been settled either by village councils, farmers' committees or through an administrative process established by the Ministry of Agriculture. The frequency of disputes is higher on unregistered land. When land values change as a result of the proposed project, the number of land disputes is expected to rise in the Shalambood area.

That people recognize their azienda as a strong basis for social organization is emphasized by local water management institutions. The method of organizing water management through committees seems to have its origins in pre-colonial Somali society. Cooperation in cleaning canals and allocation of water was strengthened by Somalis' need to keep up the canal system once the Italians had left.

Although the DLWR is theoretically responsible for cleaning all Shalambood secondary canals of heavy silt accumulations, tertiary canals are the responsibility of locally organized azienda-level water users' groups which are managed by farmers' committees. These committees are also called upon to solve local disputes, including land disputes, and to collect the land tax for the municipality. Members are assigned to clean canals at the proper time as defined by the committee. The amount of work they do depends on how much of their land borders the canals; those with little land have to contribute no labor at all. The committee also allocates the water within the azienda.

Even though the DLWR is assigned responsibility to clean secondary canals, in reality it has little in the way of budget to carry out this work. Instead, a special purpose committee made up of representatives of aziendas along a secondary canal collects money and petitions the Ministry of Agriculture to obtain help in cleaning those canals. The MOA provides machinery and skilled labor, and the committee provides money for fuel and a "motivation payment" for the equipment operators.

Farmers seem motivated to participate in the proposed project. LTC reports that 54 percent would support higher land taxes and 18 percent higher water taxes to help support maintenance of the irrigation system, even though water should be free under Islamic law. Farmers, however, will watch to see if maintenance improves before offering full support.

8.7 Environmental Analysis.

The largest major environmental concerns in the project area are 1) salinity problems associated with water and soil management; 2) environmental health problems associated with irrigation practices; and 3) pollution of local and downstream waters associated with increased fertilizer and pesticide use. Those concerns will be addressed during Phase 1 as explained below.

Detailed discussions of salinity problems are found in Annex J and Annex K. The long-term soils specialist on the agricultural research team will work closely with the long-term on-farm water management advisor to develop a soil management "tech pak" and to generally help mitigate against potential adverse effects of proposed activities.

Short-term TA provided by a water borne disease specialist and specifications in the engineering design for the irrigation system and the IFB for the construction contract will require that water velocities in canals meet environmental health standards.

Long and short-term TA based at CARS will carefully monitor any trials involving fertilizer and pesticide use, and ensure that USAID Pest Management Guidelines for Somalia are followed. The enhanced ability of the GSDR to undertake water quality testing with SWMP-funded lab equipment will ensure that adequate monitoring procedures are followed.

Environmental Assessment by long-term research staff will be an on-going activity during Phase 1, timed so as to contribute any information needed during the rehabilitation of the control structures early in the project, as well as during the management and operation of the rehabilitation area. It will also be an

integral part of the monitoring and research components of the project, and will be organized so as to contribute an Environmental Assessment for the design of Phase 2.

The following environmental concerns are omitted from the analysis:

- Land clearing (present scheme already laid out; land already cleared; only minor earth moving needed to refine existing plot levels).

- Flooding (control features already in place are adequate according to 1986 GSDR/TAMS study).

- Endangered species (area has been under intensive cultivation since 1930; only natural areas left are wayside sumps.)

- Aquatic weeds (weed flora already in existence for 50 years; mechanical control is the only method presently used.)

8.8 Energy Analysis

Energy resources--beyond human energy--that will be used by the project are primarily hydrocarbon fuels, as follows:

- Major quantities of diesel fuel will be required to operate the heavy equipment for initial construction and rehabilitation activities described in Annex K, and for continuing operation of some equipment by the DILU for maintenance of main stem, primary and secondary canals.

- Private farmers, generally large landholders, will use diesel-operated pumps to lift groundwater for supplemental irrigation. Some pumps are also used to pump river water; the proposed registration of such pumps should significantly contribute to at least stabilizing, if not decreasing, this action.

- Small farmers acting collectively and larger farmers individually will continue to use farm machinery, primarily tractors, for a number of activities.

- Government and private sector entities involved in provision of services in the target area will continue to use fuel for transport of people and goods.

The design team has assessed various alternatives to this increased hydrocarbon fuel use and believes that recommendations contained in this PP are appropriate to the situation in Somalia. The waters of the Shebelli will traverse the canal system through gravity. The engineering design will require an assessment of

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cost ratios of more labor-intensive or machinery-intensive construction and rehabilitation methods. Maintenance to be undertaken by the DILU is also planned to maximize use of human labor where possible and to use the most cost effective means. The massive amounts of siltation that require removal each year, however, preclude labor-intensive methods in most cases.

Various water-lifting devices are in use in Somalia and will continue to be tested under this project. Some larger farmers still use windmills, although Somalia's wind patterns are so erratic that few are found to be effective. WHO and CARITAS are providing hand-pumps to community wells in Shalambood on a self-help basis. Solar pumps tested in northern Somalia have not proved effective due to maintenance problems, and are not included for testing in this project. Water lifting for irrigation will essentially remain the purview of private farmers who wish to pay for and maintain their own devices.

The supportive adaptive irrigated research component, through ETC Genale, will experiment with different types of equipment that are now or can be manufactured in Somalia. Previous work in this area suggests that the soils of Shalambood may be too heavy for effective use of animal traction for land preparation. Short-term consultants are also planned to investigate solar power for commodity processing and storage.

These alternative uses will be investigated, but the design team concludes that continued reliance on hydrocarbon fuels is a fact of life in Somalia. Annex H, Policy Analysis, recommends that AID continue its dialogue with the GSDR to privatize fuel distribution and allow the market to determine prices. Prices to consumers--GSDR, donors, and farmers--will undoubtedly rise as a result. Annex L, Financial/Economic Analysis demonstrates that small farmers will be able to afford somewhat higher input costs as a result of non-energy consuming aspects of the project, e.g. improved seeds. The fact that most of the river irrigation system is gravity-fed figures prominently in these calculations.

Annex H, Policy Analysis, and Annex K, Engineering/Infrastructure also recommend that AID assist the GSDR to redraft the proposed new National Water Law and develop a basinwide water allocation and pricing system. Preliminary calculations suggest that monies collected for use of irrigation water (gravity-fed and non-energy consuming) will more than offset the fuel costs associated with maintenance at all levels, both government and private.

9. CONDITIONALITY

In line with ECPR guidance on the PID (State 180126, Annex A), Phase 1 conditionality will be confined to covenants so far as possible, particularly focussed on obtaining a general commitment from the GSDR to undertake needed reforms in national water law, and supportive fiscal, cadastral, and land tenure policies, in the Shebelli Basin. The policy actions, however, are critical pre-conditions to the effectiveness of Phase 1 technical assistance to strengthen GSDR water management capacity.

First, prior to the signing of the Shalambood target area irrigation civil works rehabilitation contract, the GSDR must elevate the DLWR to Directorate status (i.e. to become the Directorate of Irrigation and Land Use). Without this action, allowances for GSDR basinwide river management staff could not be increased; it would thus be impossible to recruit and retain qualified Somalis to staff these functions, and long term training investments would be ineffective. To avoid delays in project start-up, pending GSDR fulfillment of this condition precedent, project funds can be disbursed for short term technical assistance to assist with land registration, and definition of the staffing needs and structure for the new directorate.

The second major action needed for Phase 1 effectiveness which will be condition precedent to funds disbursement for Shalambood target area irrigation civil works rehabilitation contract requires that the GSDR transfer the two barrages (Balad and Kurtenwaare) not currently under DLWR control to the new Directorate of Irrigation and Land Use's administration. Transfer of control of the Kurtenwaare barrage is intra-ministerial, involving transfer of authority from the MOA's Settlement Development Agency to the new DILU. Transfer of the Balad barrage will involve inter-ministerial agreement, since this barrage is current under the Ministry of Industry. Since the Balad barrage is located upstream of most irrigation development in the Shebelli basin, investment in project-funded improvements to downstream water control structures serving the Shalambood target area (including the Genale barrage) will be unproductive without this action. Transfer of control over both Balad and Kurtenwaare barrages to the DILU is thus included as a condition precedent to disbursement of Phase 1 funds for the irrigation civil works rehabilitation component.

Covenant 9.2.6 below is essential to avoid the "land grabbing" which could otherwise result from the project's irrigation infrastructure investments. AID/W may wish to change this covenant to a condition precedent to disbursement for construction.

USAID has discussed both recommended conditions precedent and the covenant for land registration with the Minister of Agriculture and the MOA Vice-Minister of Planning; both officials agree with these provisions and see no obstacles to timely GSDR action on all fronts.

Policy reforms needed for Phase 2 will be defined during the Phase 1 policy dialogue. Needed reforms will become conditions precedent to the authorization and obligation of Phase 2 funds. The Phase 1 project-funded policy dialogue will need to be supported by complementary policy dialogue within the Mission's broader portfolio development, particularly with regard to food aid strategy, civil service reform, agricultural inputs policies, and fuel import and allocation policies. Provisions suggested for inclusion in the Phase 1 Grant Agreement are listed below, followed by issues for discussion during Phase 1 policy dialogue, which will define conditions precedent to Phase 2.

9.1 Conditions Precedent to Phase 1, recommended for inclusion in the Grant Agreement.

9.1.1 Conditions Precedent to First Disbursement. Prior to the disbursement of any funds authorized by this Grant Agreement, the Grantee agrees to provide all of the following:

- A statement of the name of the person holding or acting in the office of the Grantee specified in Section 8.3 of the Grant Agreement, and of any additional representatives, together with a specific signature of each person specified in such statement.

- A statement indicating that the Generated Shillings Proceeds Committee has reviewed the annual local currency requirements for the Project and that such requirements will be included in the Annual Budget Programming Document.

- Evidence that the Shebelli Steering Committee and the Shebelli Donor Coordination Committee have been established along with names, titles, and functions of the persons who will serve on each of these committees.

- A letter from the Ministry of Finance confirming that personnel, construction and commodities financed by AID under the Grant shall be exempt from all GSDR taxes and duties.

9.1.2 Conditions Precedent to Subsequent Disbursements.

(i) As a condition precedent to AID's signature of the Project's Shalambood Irrigation Rehabilitation construction contract, the Grantee agrees to elevate the Ministry of Agriculture's Department of Land and Water Resources (DLWR) to the level of a Directorate of Irrigation and Land Use. This Directorate will be headed by a Director General who will report directly to the Permanent Secretary of the Ministry of Agriculture. The Directorate will be vested with all functions, authorities and responsibilities currently under the jurisdiction of the DLWR, notably land registration, allocation of Shebelli River irrigation water, and operations and maintenance of all irrigation canals and water control structures along the Shebelli River, as well as direct pumping from the river (except for the Balad and Kurtenwaare Barrages, if these have not yet been transferred to DLWR control). In addition the Grantee confirms that, consonant with its status, the MOA Directorate of Irrigation and Land Use will be empowered to provide renumeration levels acceptable to AID for DILU staff."

(ii) As a condition precedent to AID's signature of (or concurrence with) a construction contract for rehabilitation of irrigation infrastructure under this project, the Grantee agrees to transfer responsibilities for all control, operations and maintenance of the Balad and Kurtenwaare Barrages to the MOA Directorate of Irrigation and Land Use, and to transfer any GSDR financial support for the operation, staffing, and maintenance of these barrages to this Directorate's budget allocation."

iii) As a condition precedent to AID's signature of a construction contract for rehabilitation of irrigation infrastructure under this project, the Grantee agrees that all environmental review of the IFB must be completed, and satisfactory provision for any necessary environmental mitigation must be included in the final bid documents and ancillary engineering designs.

iv) As a condition precent to AID's disbursement of funds for in-country training activities, the Grantee agrees that the Somali National University will award Master's degrees in Irrigation or Agronomy to trainees who successfully complete the long term in-country training program outlined in Annex N of the Project Paper.

9.2 Covenants recommended for inclusion in the Phase 1 Grant Agreement.

9.2.1 "The Grantee agrees to make appropriate staff available for training programs and to serve as counterparts to the long and short term technical assistance personnel funded by AID."

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9.2.2 "The Grantee agrees to retain project-funded participant trainees in its employ for at least four years after completion of their training, and at a pay schedule in keeping with such training."

9.2.3 "The Grantee agrees to provide adequate office and classroom space and appropriate office and classroom furniture for project-funded training and technical assistance".

9.2.4 "The Grantee agrees to work closely with AID to reconsider and refine the draft National Water Law, especially provisions related to inter-sectoral priorities for water allocation, water pricing policies, administrative procedures for water control, and clarification of the legal status of water users' groups. The Grantee shall make every effort to pass a new National Water Law acceptable to AID before the end of Phase 1 of this project, but after AID funded technical assistance personnel have reviewed the draft and recommended it to the GSDR as appropriate.

9.2.5 "The Grantee agrees to engage in dialogue with AID throughout Phase on macro-economic and other institutional policy reforms which may be essential for achieving the project goal of increasing irrigated production in the Shebelli River Basin, notably the policies which are discussed in Annex J of the Project Paper, especially covering the operational costs of public sector agricultural machinery services (ONAT) by increasing fees; preparation of action plans for the most efficient use of state farms and lands held by special interest cooperatives in the Shebelli Basin, which will include study of returns from privatization or divestiture; the procedures which constrain private sector supply of and producer access to agricultural inputs; and maintenance of producer price incentives in domestic agricultural markets.

9.2.6 "The Grantee agrees to establish a simplified, low cost, on-site land registration process, and to provide staff to undertake a mass land registration campaign which will be completed for the whole Shalambood target area early in Phase 1 implementation to protect the rights of smallholders. The Grantee also agrees the enforce the provisions of Land Law No. 73 of 1975, which state that the Government may nationalize registered and unregistered lands which are not cultivated over a two-year period, and agrees that any lands thus nationalized will be expeditiously transferred to another smallholder."

To C.P. Construction Contract

9.2.7 "The Grantee agrees, under the auspices of the Inter-Governmental Authority Against Drought (IGAAD), to initiate discussions with Ethiopia concerning riparian rights on the Shebelli."

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9.2.8 "The Grantee agrees that area currently planted to bananas in the Shalambood target area will not significantly increase during SWMP 1."

9.2.9 "The Grantee agrees to make available fuel sufficient for the project's needs, to be puchased by the project."

9.3 Phase 1 Policy Dialogue

Issues to be addressed by Phase 1 policy dialogue are summarized in section 8.1 of this Project Paper, and are discussed more fully in Annex H "Policy Analysis." Annex H also discusses related policy issues which can best be addressed in the development of AID's Economic Support Fund (ESF) and PL 480 programs' conditionality.

9.4 Conditions Precedent to Phase 2

Short and long term technical assistance is provided in Phase 1 to address the broad range of policy dialogue activities referenced above, as input into the design of Phase 2, including its conditionality. At a minimum, it is recommended that funds not be authorized or obligated for Phase 2 until the GSDR has satisfied the two conditions precedent below:

9.4.1 "The Grantee shall provide evidence that it has enacted a National Water Law acceptable to AID."

9.4.2 "The Grantee shall provide evidence that it has established a system of assessing, collecting, and reinvesting water users' fees adequate to pay for operation and maintenance of the Shalambood target area's irrigation system, and that controls are in place to ensure that fees thus collected will be used only for this purpose."

10. MONITORING AND EVALUATION

10.1 The Baseline Survey

Each of the three major components of the proposed project require further data collection before implementation can be successfully initiated. Basic research on the socio-economic conditions in the Shalambood rehabilitation area needs to be started early in Phase 1 to help implementors better anticipate obstacles and to plan programs geared to local needs.

Local organizations, e.g. water users' groups, need to be studied to enable implementors to better understand how these groups fit into the larger network of local institutions in the interriverine area. This study process will identify both individuals and organizations who can facilitate project activities.

Similarly, the baseline research will provide a standard against which socio-economic change can be measured. The baseline survey will be limited in scope, and designed so as to be easily carried out and analyzed with the resources readily available in Somalia. Additional surveys and studies (e.g. on local institutions) can be proposed and funded later in Phase 1 as data needs become clearer. All data should retain gender distinctions, to enable the project to obtain a clearer profile of the often differential access of female farmers to resources.

The LT expatriate research team at CARS and the local organizations advisor will design and test the baseline survey instrument, and train enumerators in necessary research techniques. The actual survey will be carried out by a Somali counterpart survey team under the supervision of the expatriate advisors. The entire process of design, enumeration, analysis and report preparation should be completed from June 1988 to January 1989, as only critical pieces of data should be collected during the baseline survey, to avoid unnecessary delays in the start-up of.

The socio-economic survey will establish the current status of the rehabilitation area in terms of: demography, labor supply, health and educational status, access to services, yields and cropping practices, and husbandry practices.

A minimum of a five percent stratified sample (n=200 households) should be surveyed. The contractor procurement schedule in PP section 7-2 should allow repeat sampling to be carried out during both the Gu and Der seasons of 1988.

The baseline survey should provide at least the following data:

1) Adequacy of water supplied to agricultural land during both Gu and Der seasons;

2) Portion of wages retained by family for consumption;

3) Number of days worked, by season, full-time or part-time etc.;

4) All sources of income, by type with amounts earned (i.e. from collection of firewood, fodder, water sales etc.);

5) Livestock census;

6) Husbandry practices and patterns of land cultivation (i.e. use of tractor plowing, furrows etc.);

7) Household/farm budgets: a detailed examination of income sources, expenditures and consumption;

8) Availability, delivery systems and pricing of farm inputs (seed, fertilizer, pesticides, etc.);

9) Record of crops grown and hectarages in a sample area, set up for monitoring activities;

10) Land holding patterns in the sample, data on land disputes;

11) Type and number of self-help projects being carried out by specified local institutions in the project area;

12) Annual yields of crops based on cutting and weighing;

13) Farmgate prices of crops;

14) Family, demographic patterns, labor data (especially the size of the workforce within each family), age when child is considered to be an adult wage-earner, sources of wages (i.e. banana plantations etc.), male versus female division of labor;

15) Membership in local institutions, patterns of attendance, etc;

16) Access to services and locations of same: schools, health facilities, drinking water, etc;

17) Educational attendance and literacy levels (data separated by gender and age);

18) Access to AFMET services and frequency of contacts; and

19) A simple methodology to assess rural health and child nutrition should be used to rapidly assess health conditions in villages of the target area, especially those made up primarily of small farmers, the landless unemployed and plantation laborers. The Somali Academy of Science and Technology in cooperation with SAREC is running a Community Health Improvement Program which has the capacity to operationalize such measures. Information on incidence of disease attributable to water borne vector breeding (e.g. schistosomiasis and malaria) is especially important for environmental assessment activities, and as a baseline for design of environmental mitigation measures.

One component of the SWMP1 baseline study will be funded by AID's Policy Initiatives and Privatization Project (649-0132). This will be a study of rural-urban linkages in the Lower Shebelli, focussed on the market towns serving the Shalambood target area - principally Genale, Shalambood and Merka. The study will be undertaken by a team from Clark University/SARSA through buy-in to a centrally-funded cooperative agreement managed by S&T/RD/RRD in AID/W. The study will use the methodology now being employed by the same team in the Juba Valley rural-urban linkage study of Kismayo, which allows for ST, U.S. TA to collaborate with Somali researchers and enumerators. The study will provide baseline data useful for designing the adaptive research trials by inventorying private and public sector services based in rural market towns that foster Shalambood agricultural production, processing, and marketing (e.g agricultural input supply, informal sector credit, informal sector equipment maintenance and repair services, off-farm income generation activities that may at times compete with or complete on-farm labor needs, etc.). The LT local organizations' advisor will work closely with Clark/SARSA to design and implement this study.

The baseline study will provide the SSC and AID with useful indicators for project monitoring and for the design of "tech paks" to be tested by adaptive irrigated research. The baseline team's report should highlight potential obstacles and identify individual facilitators and participating local organizations for each component of the project.

10.2 Monitoring

Each of the three components of the project can be separately monitored by trained counterparts from CARS and AFMET for Adaptive Irrigated Research and the DILU for basinwide river management and Shalambood target area rehabilitation.

Monitoring reports will be prepared quarterly for means of interagency meetings several times a year, to permit periodic assessments of the interaction of SWMP's major components. Monitoring data will be exchanged at these meetings, so that the results discussed.

Satisfactory indicators will be established and tracked throughout the life of the project: these indicators should be derived from the data points established in the baseline survey. Figure 11 shows the matching data points in the baseline survey and the on-going monitoring plan. The necessary indicators for each of the three components will be established by consultation among LT advisors and their GSDR counterparts.

Indicators of the effects of all three SWMP components should be measurable in the Shalambood rehabilitation area.

Once satisfactory indicators have been selected and the monitoring system has been established, GSDR counterparts can assure responsibility for maintenance of the system with periodic review and advice from project LT advisors.

It is also recommended that the local organizations advisor work with AFMET and CARS to develop a methodology to involve local farmers in generating monitoring data for the project. Some members of the local community can be selected for training in a simple monitoring methodology and keep the project informed of its performance from the village level point of view. Too often project administrators and target populations have different project objectives in mind. By arranging for several part-time village-level project monitors to be trained, the project can better assure success in meeting local goals and aspirations.

This approach will be particularly useful to assess whether tech paks promoted by the adaptive irrigation research component of the project are seen to be effective in farmers' eyes. Farming recommendations cannot only come from the top down. Mechanisms need to be regularized to allow farmer input into project planning. One good way to ensure that this is taking place is to institutionalize farmers' feedback within the monitoring system. Further discussion at the village level

with LT research advisors can then establish appropriate strategies for research and identify recommendations which would be technically possible, economically feasible, and socially acceptable.

The following indicators are recommended as a basis for monitoring based on the data points established in the baseline survey:

Water Management Component: Changes in on-farm water delivery, including on-going monitoring of flows reaching sample fields by DLWR staff;

Irrigation Research Component:

Inputs:

a. Changes in availability, delivery and pricing of farm inputs (seed, fertilizer, pesticides, other).

b. Changes in patterns of land cultivation (i.e. increased use of the tractor plowing, furrows etc.)

c. Record of crops grown and hectarages in sample.

d. Access to AFMET services.

Outputs:

a. Annual yields of crops based on cutting and weighing.

b. Farmgate prices of crops.

Irrigation System Rehabilitation:

Institutions:

a. Monitoring of land registration changes.

b. Frequency and nature of land disputes.

c. Type and number of local self-help projects being carried out by specified local institutions in the target area.

Water Delivery:

a. Amount and frequency of water on fields throughout the Shalambood system.

Beneficiaries' Standard of Living:

a. Income retained by farmers, separated by gender.

b. Number of days worked, separated by gender.

c. Livestock census.

d. Baseline measures of local health and nutrition should continue to be monitored using a simple methodology to measure overall improvement in local health status (especially incidence of disease spread by water borne vector breeding).

All training in monitoring methodology will be provided in country in the form of on-the-job training to counterparts by LT TA. The ST advisor for water borne disease will design this part of the monitoring program.

10.3 Evaluations

While continuous formative evaluation is an intrinisic part of the M&E process described above, Phase 1 will also have two external summative evaluations. The first of these will take place in June, 1990, approximately 3 years after the first obligation of funds and 2 years after the arrival of the long-term advisors. A team of consultants, AID/W and REDSO/ESA personnel will assess progress and problems to date, and provide recommendations for design of a project amendment, if needed.

The second evaluation will occur in December, 1991. The implementation plan assumes that a PID for Phase 2 will be prepared in September, 1991. The December evaluation will specifically focus on issues raised in the PID that have not yet been resolved in Phase 1, and will feed any recommendations into the Phase 2 PP or amendment design planned for 1992.

SHEBELLI WATER MANAGEMENT PROJECT

VOLUME II - ANNEXES

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ANNEX A

PID APPROVAL CABLE

ANNEX A: PID APPROVAL CABLE

UNCLASSIFIED STATE 180126/01
ACTION: ALL INFO: CBA ECON
VZCZOK00577 10C:695
PP RUEFHC 07 JUN 86
DE RUEEC 60126/01 1580459 CN: 55167
ZNR UUUUU ZZH CHRG: AID
P 070455Z JUN 86 DIST: AID
FM SECSTATE WASEDO
TO AM EMBASSY MOGADISHU PRIORITY 5119
BT
UNCLAS SECTION 01 OF 02 STATE 180126

AIDAC

E.O. 12356: N/A
TAGS:
SUBJECT: SOMALIA-SHEBELLI WATER MANAGEMENT PID (649-0129) - ECPR DECISION AND GUIDANCE

1. THE ECPR HELD 5/28 DURING PROGRAM WEEK WAS CHAIRED BY DAA LARRY SAIERS, AND WAS PARTICULARLY WELL ATTENDED WITH PARTICIPATION BY AFR/EA, DP, PD, AFR/PRE, TP/ARD, PPC, BIFAD, AND USAID DIRECTOR LOU COHEN, PROGRAM OFFICER AKIM MARTINEZ, MISSION ECONOMIST MEREDITH SCOVILL, AND FUTURE DEPUTY DIRECTOR DALE PFEIFFER.

2. ECPR DECISION: THE PID WAS APPROVED WITH THE FOLLOWING PP DESIGN GUIDANCE:

THE PP INTRODUCTION WILL ESTABLISH THE CONTEXT FOR A LONG TERM AID COMMITMENT TO SHEBELLI WATER MANAGEMENT (APPROXIMATELY DOLS 50 MILLION OVER APPROXIMATELY 10 YEARS) AND AN ORDER OF MAGNITUDE FOR THE TOTAL COST OF BASIN DEVELOPMENT, BUT DETAILED PP DESIGN WILL FOCUS ON PHASE I ACTIVITIES (APPROXIMATELY DOLS 12-15 MILLION FOR FIVE YEARS, ESTIMATE TO BE FURTHER DEVELOPED DURING PP DESIGN. THE PURPOSE OF PHASE I IS TO LEARN HOW TO GO ABOUT IMPROVING WATER MANAGEMENT IN THE SHEBELLI BASIN. INPUTS FUNDED UNDER PHASE I WILL INCLUDE INTERVENTIONS WHICH ARE NECESSARY FOR THIS LEARNING PROCESS ACROSS ALL LEVELS IN THE SHEBELLI IRRIGATION SYSTEM (BOTH SOFTWARE AND HARDWARE), AND SUPPORTIVE IRRIGATED AGRICULTURAL RESEARCH. PHASE II WILL BE AUTHORIZED WHEN THE NECESSARY HANDS-ON EXPERIENCE IN SYSTEM MANAGEMENT HAS BEEN OBTAINED, THE FRAMEWORK FOR LARGER SCALE REHAB HAS BEEN ESTABLISHED, AND DESIGN STUDIES HAVE BEEN COMPLETED. THUS, PHASE II MAY OVERLAP WITH PHASE I DURING IMPLEMENTATION. AUTHORIZATION OF PHASE I IS EXPECTED DURING FY 87, AND WILL TAKE PLACE IN AID/W. ADDITIONAL ECPR GUIDANCE FOLLOWS.

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3. PHASING AND TIMING: THE ECPR REAFFIRMED THE BUREAU'S 1/86 DECISION THAT THE SHEBELLI WATER MANAGEMENT PROJECT WILL BE AID'S MAJOR INITIATIVE IN THE AGRICULTURAL SECTOR DURING THE COMING DECADE. AS DESCRIBED IN THE PID, THE PROJECT HAS THREE COMPONENTS: (1) IMPROVEMENT OF PUBLIC/PRIVATE MANAGEMENT OF SHEBELLI BASIN IRRIGATION, (2) SUPPORTIVE ADAPTIVE IRRIGATED AGRICULTURAL RESEARCH, AND (3) SHEBELLI IRRIGATION SYSTEM REHAB. BASED ON AID EVALUATION OF RIVER BASIN PROGRAMS ELSEWHERE, THE ECPR DECIDED THAT PHASE I SHOULD INITATE ALL THREE COMPONENTS ON A MODEST SCALE AS A LEARNING PROCESS THAT WILL ALLOW US TO FINALIZE DESIGN OF LARGER SCALE INTERVENTIONS WHICH WILL BEGIN TO BE IMPLEMENTED DURING PHASE II. THE LENGTH OF TIME NEEDED FOR PHASE I AND ITS FUNDING REQUIREMENTS WILL BE DEFINED DURING PP DESIGN, BUT THE ECPR ESTIMATED THAT APPROXIMATELY DOLS 12-15 MILLION FOR FIVE YEARS WOULD BE REQUIRED FOR AID TO GAIN THE HANDS-ON EXPERIENCE IN WORKING AT ALL LEVELS IN THE SYSTEM WHICH WILL BE REQUIRED. TO IDENTIFY CONSTRAINTS AND PROMISING SOLUTIONS THAT COULD BE EXPANDED IN A PHASE II. PHASE I SHOULD INCLUDE FUNDING FOR INITIAL REHAB ACTIVITIES THAT WILL ADDRESS THE MOST PRESSING WATER CONTROL NEEDS, WHILE WE CONCURRENTLY LEARN ABOUT MANAGEMENT CAPACITY AND USER REQUIREMENTS.

4. MULTI-LEVEL FOCUS FOR PROJECT ACTIVITIES: THE ECPR AGREED WITH THE PID THAT WE SHOULD WORK SIMULTANEOUSLY ON ALL CRITICAL LEVELS IN THE SHEBELLI SYSTEM (FROM CENTRALIZED SYSTEM-WIDE MANAGEMENT FUNCTIONS DOWN TO ON-FARM WATER CONTROL RESEARCH AND ESTABLISHMENT OF WATER USER GROUPS. SINCE THIS WILL NEED TO BE STRUCTURED IN A MANAGEABLE WAY, THE PP SHOULD DEVELOP GUIDELINES FOR THE LEVEL OF EFFORT TO BE SUPPORTED AT EACH TIER OF THE SYSTEM, IN COORDINATION WITH OTHER DONORS' CONTRIBUTIONS.

5. ALLOCATION OF RESOURCES AMONG THE THREE PROJECT COMPONENTS: RESOURCE ALLOCATION AMONG THE THREE COMPONENTS SHOULD BE PROPORTIONAL TO THE PROJECT PURPOSE: TO LEARN HOW TO GO ABOUT IMPROVING WATER MANAGEMENT AND INCREASING IRRIGATED AGRICULTURAL PRODUCTION. THE RESEARCH COMPONENT SHOULD BE PRODUCTION-ORIENTED AND PROBLEM-SOLVING. AS INSTITUTION-BUILDING IS NOT THE PURPOSE OF THIS COMPONENT, FUNDING FOR RESEARCH SHOULD BE SCALED APPROPRIATELY. AND PP DESIGN SHOULD SEEK WAYS TO KEEP COSTS FOR AGRICULTURAL RESEARCH AT A MINIMUM LEVEL NECESSARY TO ACHIEVE PHASE I OBJECTIVES, E.G. BY USING EXISTING STAFF AND FACILITIES AS MUCH AS POSSIBLE. AS LOP FUNDING NEEDED FOR INFRASTRUCTURE REHAB WILL BE DEFINED DURING DESIGN OF PHASE II, IN COORDINATION WITH OTHER DONORS, THE PHASE I PP WILL NOT NEED TO SPECIFY HOW MANY HECTARES OF SMALLHOLDER IRRIGATION WILL BE REHABILITATED BY AID, OR THE EXTENT TO WHICH THE PRIMARY IRRIGATION SYSTEM WILL REQUIRE AID FUNDING.

6. PUBLIC/PRIVATE SPLIT IN RESPONSIBILITIES FOR IRRIGATION SYSTEM OPERATION AND MAINTENANCE: THE ECPR DECIDED THAT THE DEFINITION OF PUBLIC VERSUS PRIVATE SECTOR ROLES REQUIRES ADDITIONAL INVESTIGATION DURING PP DESIGN AND PHASE I PROJECT IMPLEMENTATION. ISSUES RELATED TO THIS SHOULD BE FULLY ADDRESSED IN THE DESIGN OF FOLLOW-UP PHASE(S).

7. RECURRENT COSTS AND ECONOMIC ANALYSIS: THE ECPR DECIDED THAT THESE ISSUES SHOULD BE INVESTIGATED AND ADDRESSED DURING PP DESIGN AND PHASE I IMPLEMENTATION, AND FULLY ADDRESSED IN THE DESIGN OF FOLLOW-UP PHASE(S).

(FYI, SPECIFIC CONCERNS ARE: HOW CAN WE ENSURE THAT USER FEES ARE REINVESTED IN THE SYSTEM, AND WILL USER FEES BE SUFFICIENT TO COVER THE PUBLIC SECTOR SHARE OF THE SHEBELLI IRRIGATION SYSTEM'S RECURRENT COSTS? HOW BROAD WILL IMPACTS FROM OUR INVESTMENT IN THIS PROJECT BE, AND WHAT LEVEL OF PRODUCTIVITY IS ALREADY BEING ACHIEVED IN THE SHEBELLI IN CONTRAST TO INCREASES THAT WE CAN EXPECT TO ACHIEVE THROUGH MULTI-DONOR INVESTMENT IN THE SYSTEM?

THE SOW'S FOR THE MISSION'S PLANNED RECURRENT COST STUDIES SHOULD INCLUDE REVIEW OF SHEBELLI SYSTEM COSTS AND DEVELOPMENT OF BUDGETARY RECOMMENDATIONS WHICH WILL ADDRESS THE RECURRENT COST ISSUE. END FYI).

8. CONDITIONALITY: PHASE I CONDITIONALITY SHOULD BE CONFINED TO COVENANTS SO FAR AS POSSIBLE, PARTICULARLY FOCUSSED OF A GENERAL COMMITMENT BY THE GSDR TO UNDERTAKE NEEDED REFORMS IN NATIONAL WATER LAWS, AND FISCAL, CADASTRAL, AND LAND TENURE POLICIES IN THE SHEBELLI BASIN WHICH WOULD BE DEFINED DURING PHASE I IMPLEMENTATION. IF APPROPRIATE, THESE REFORMS CULD BECOME CONDITIONS PRECEDENT FOR THE PROJECT'S PHASE II.

(FYI, AT THIS TIME, IT IS EXPECTED THAT THE PROJECT'S TECHNICAL ASSISTANCE WILL BE TARGETED TOWARDS IMPROVING THE ABILITY TO MANAGE SHEBELLI IRRIGATION OF THE MINISTRY OF AGRICULTURE AND THE PRIVATE SECTOR, THUS THE C.P. PROPOSED IN THE PID RELATED TO ESTABLISHMENT OF A SHEBELLI WATER MANAGEMENT ENTITY WAS NOT FELT TO BE APPROPRIATE. ADDITIONAL POLICY REFORMS MAY NEED TO BE EMPHASIZED IN OUR FY 87 PROGRAM (AND BEYOND) TO SUPPORT INVESTMENT IN THIS PROJECT (E.G. RELATED TO FOOD AID, CIVIL SERVICE REFORM, AGRICULTURAL INPUTS, AND FUEL IMPORT AND ALLOCATION POLICIES), AND THIS SHOULD BE TAKEN INTO ACCOUNT DURING AID/W MISSION DIALOGUE WITH OTHER DONORS ON LONG TERM POLICY REFORM. END FYI.)

9. CONCERNS: A NUMBER OF QUESTIONS WERE RAISED ABOUT THE STRUCTURE OF PROJECT IMPLEMENTATION AND CONTRACTOR PROCUREMENT WHICH WILL NEED TO BE ADDRESSED DURING PHASE I PP DESIGN, PRINCIPALLY:

- (I) WILL TECHNICAL ASSISTANCE TO PRIVATE WATER USER'S ASSOCIATIONS REQUIPE PVO/NGO INVOLVEMENT?
- (II) SHOULD THERE BE TWO PROCUREMENTS DURING PHASE I: ONE FOR SOFTWARE COMPONENTS, AND A LATER ONE FOR INFRASTRUCTURE REHAB? OR SHOULD THE INITIAL PROCUREMENT SELECT A CONTRACTOR (OR CONSORTIUM) WITH EXPERIENCE IN ALL THREE COMPONENTS?
- (III) IS THERE A ROLE FOR TITLE XII INSTITUTIONS IN THE RESEARCH AND WATER MANAGEMENT COMPONENTS? OR SHOULD INTERESTED UNIVERSITIES JOINT VENTURE WITH PRIMES WHO HAVE EXPERIENCE IN WATER MANAGEMENT INSTITUTIONAL STRENGTHENING AND REHABILITATION?

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10. THE ECPR WAS PLEASED WITH MISSION INTENTION TO INVOLVE THE WATER MANAGEMENT SYNTHESIS PROJECT PERSONNEL IN THIS EFFORT AND AID/W WILL HELP THE MISSION FURTHER THIS COLLAPORATION. (FYI, MISSION DIRECTOR PLANS TO REQUEST AN INITIAL TDY BY WATER MANAGEMENT SYNTHESIS STAFF DURING SUMMER '86. END FYI.) THE ECPR AGREED WITH THE PID THAT DONOR COORDINATION WOULD NEED TO BE CAREFULLY ORCHESTRATED DURING PROJECT DESIGN AND IMPLEMENTATION, SO THAT THE TOTAL DONOR PACKAGE WOULD ADDRESS ALL CRITICAL CONSTRAINTS TO SYSTEM PRODUCTIVITY, WHILE ALLOWING AID AUTONOMY IN IMPLEMENTATION. PLEASE KEEP AID/W INFORMED AS TO PROGRESS IN MISSION'S EFFORTS TO ESTABLISH A DONOR COORDINATION COMMITTEE.

11. AUTHORIZATION VENUE: THE ECPR DECIDED THAT THE PP SHOULD BE AUTHORIZED IN AID/W, TO MAXIMIZE DISSEMINATION OF LESSONS LEARNED DURING PP DESIGN AS THIS WILL CONTRIBUTE TO AID'S UNDERSTANDING OF IRRIGATION PROGRAM ISSUES.

12. IEE: THE BUREAU WILL NEED TO EXECUTE AN IEE CATEGORICAL EXCLUSION FOR THE TRAINING AND RESEARCH PORTION OF THE PROJECT. A POSITIVE THRESHOLD DETERMINATION SHOULD BE MADE WHICH WILL REQUIRE AN ENVIRNOMENTAL ASSESSMENT FOR THE REHAB AND CONSTRUCTION PART OF THE PROJECT.

ANNEX B

LOGICAL FRAMEWORK MATRIX

ANNEX B: LOGICAL FRAMEWORK MATRIX

Life of Project : 10 years total
Phase I : 5 years
Total U.S. funding : U.S.D. 50 million
Phase I : U.S.D. 22.1 million

Project Name: Shebelli Water Management Project (No. 649-0129)

GOAL:	Measures of Goal Achievement	Means of Verification	Important Assumptions for Achieving Goal
To increase agricultural production in the Shebelli River basin.	- Use of Shebelli River water resources have attained measurable progress towards the end of Phase 2 goal of 130% crop intensity on about 130,000 ha. with water measured and distributed in accordance with rational, pre-established allocation criteria by the end of Phase 1.	- GSDR and project surveys	- Sustained annual growth rate of the economy prevails. - Availability of agricultural inputs expands. - New 150 megawatt dam and irrigation off-take upstream in Ethiopia does not alter river flows significantly - GSDR promotes peoples' participation in water agmt. at all levels.
	- GSDR research and extension providing assistance suitable for small, independent farmers that provides a measurable and real return to investment, with small farmer adoption of improved packages in Shalambood increased by 20% by the end of Phase 1.	- CARS, AFMET, and project surveys.	- The amount of land irrigated by the Shebelli remains relatively stable at 130,000 ha. - AID and the GSDR remain committed to the project and the Shalambood target area. - GSDR passes National Water Law that includes criteria for water allocation and water pricing that promotes beneficial use, equity and water conservation. - The GSDR implements water allocation and pricing measures that allow recurrent costs' recovery.
	- The cultivators of approximately 8,000 ha. of land in Shalambood target area are utilizing irrigation water more effectively on a cost-sustainable basis, with at least 30% of the area's smallholder farmers utilizing new water mgt techniques by the end of Phase 1.	- DILU and AFMET surveys.	

PURPOSE	Conditions that will indicate purpose has been achieved (End of Project Status)	Means of Verification	Assumptions for Achieving Purpose
Learn how to improve Shebelli river basin water mgt and to establish the framework for larger scale irrigation rehabilitation in Phase 2.	- DILU and water users' groups mgt capacity strengthened; - Production-oriented adaptive irrigated ag research underway. - Most pressing water control infrastructural needs of smallholders in the Shalambood target area addressed.	- GSDR records - CARS and AFMET farm surveys - DILU records, site inspections, monitoring surveys of farmers.	- Objectives of civil services reform do not conflict with regularizing water resource mgt within central govt. - Water fees are acceptable to the farming population. - Adequate staff available to operate DILU effectively. - large and small farmers cooperate to ensure new mgt systems are equitable. - Viable technical packages can be developed for specific irrigated conditions. - Sufficient data can be collected to produce an irrigated design within project constraints -Adequate construction capabilities can be found to rehabilitate system according to design.

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OUTPUTS	Magnitude of Outputs	Means of Verification	Assumptions for Achieving Outputs
1. Establishment of DILU	1. DILU established by 12/87; at least 16 irrigation engineers with MS degrees on staff by 12/91.	1. DILU and MOA records.	- Ministry of Revenues agrees to fund project allowances for line ministry staff. - GSDR/MOA employees apply for MS program.
2. Enactment of a National Water Law	2. National Water Law revised and passed by 9/92.	2. National Archives	- People's Assembly will pass revised law, and President will sign it
3. Production of plans for implementation programs for basin-wide irrigation control and water allocation: a) Hydrologic monitoring system and data base needed for water allocation established	3.a) Gauging stations re-established at Awdheegle and Kurtenwaare by 10/88; computer simulation model developed and in use by 6/89; aerial photographs at 1:10,000 completed by 6/89; rectified mosaic maps produced by 6/89; survey of pumping installations by 6/89.	3.a) DILU and project reports	- AID contractors can mobilize variety of resources required in timely manner.
b) Upgrading and maintenance of main stem control structures	b) Rating and calibrations of main barrages and weirs completed 6/90; study to raise Jowhar reservoir completed 6/90; design improvements to Jowhar reach completed 9/90.	b) DILU and project reports	
c) Communication system for water control established.	c) Radio links for DILU established by 6/90; radio programs for daily water allocations on-the-air by 9/91.	c) DILU reports; Radio Somalia audio verification	- GSDR issues permits and assigns useful frequencies for radio link-ups. - Radio Somalia will include water allocation announcements at useful times on regular basis.

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OUTPUTS (continued)	Magnitude of Outputs	Means of Verification	Assumptions for Achieving Outputs
3.d) Public/private sector split on responsibilities for secondary and tertiary canal O&M, recurrent costs and water allocation planned.	d) Responsibilities defined by 6/89; training plans developed and training underway by 9/89.	3.d) DILU and project reports.	- MOA and Ministry of Finance reach agreement on allocation of responsibilities for users' fee collection, budgeting of receipts, and reinvestment in O&M.
4. Phase 1 policy dialogue on basin-wide land tenure issues and land registration procedures.	4. Shalambood registration campaign completed as pilot by 3/88.	4. DILU and project surveys.	- Water users' associations willing to support improved water delivery by paying official users' fees to DILU.
5. Seasonal economic reports produced.	5. Gu and Der reports issued beginning 1989.	5. Project reports	
6. Irrigated agricultural tech packs developed. a) Maize tech pak b) 2-3 oilseed tech paks c) crop rotation tech pak d) soils mgt tech pak e) veg. tech paks	6.a) Maize tech pak in field by Gu 1990; b) 1 oilseed tech pak in field by Der 1991; c) other tech paks in field by Gu 1992	6. Research reports, AFMET monitoring reports	
7. Vegetable and fruit processing study.	7. Study completed by 6/89.	7. Project reports	
8. Research team strengthened by new MS staff.	8. Minimum 16 new MS Agronomy staff by 12/91.	8. FDA and CARS records.	
9. Research coordination effected.	9. Ag Research Council holding regular meetings by 1989.	9. AID participation in meetings.	- IBRD funding of Ag Research council under AFMET 2.
10. Increased number of small farm households with secure land-holdings.	10. At least 90% of small farm holdings in Shalambood secure by 12/88.	10. MOA records and project and project surveys.	
11. Engineering design for Shalambood target area of 8,000 hectares completed.	11. Design complete 9/89.	11. AID contractor reports.	
12. Critical structures rehabilitated a) Genale barrage b) Yassin feeder reach c) One Secondario (expected to be fourth secondario)	12. a) Genale barrage rehabilitated by 12/90 b) and c) other rehab complete by 12/91	12. Contractor reports, site inspection	
13. Water users' groups exercising improved management.	13. At least one member of 50% of all Shalambood groups trained	13. Project surveys.	

INPUTS and Magnitude of Expenditures

(U.S.$ 1,000 & So.Sh. 90=U.S.$ 1.00)

PROJECTION OF EXPENDITURES BY FISCAL YEAR
(U.S. $1,000; SoSh 90 = $1.00)

	FY 87		FY 88		FY 89		FY 90		FY 91		FY 92		TOTALS		
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	TOTALS
TECHNICAL ASSISTANCE	292.4	0.0	1067.6	0.0	1815.4	0.0	1849.2	0.0	1148.6	0.0	718.0	0.0	6891.2	0.0	6891.2
FSU	590.0	80.0	102.0	215.3	165.0	356.9	144.0	323.6	[illegible]	182.1	45.0	101.1	1127.0	1259.0	2386.0
PERSONNEL	0.0	86.8	0.0	173.4	0.0	222.6	0.0	247.6	0.0	277.6	0.0	337.6	0.0	1345.6	1345.6
TRAINING	13.0	1.8	156.5	67.2	254.0	61.6	296.0	61.6	233.0	61.6	167.0	61.6	1119.5	315.4	1434.9
COMMODITIES	500.0	500.0	2018.1	633.0	144.9	14.4	337.4	470.7	137.9	17.0	137.9	18.5	3276.2	1653.6	4929.8
CONSTRUCTION	201.4	291.4	827.1	1320.6	1771.4	1208.3	3044.8	577.2	1247.4	349.1	0.0	0.0	7092.0	3746.6	10838.6
OTHER	0.0	65.8	340.0	876.0	362.0	751.0	512.0	754.0	115.0	754.0	110.0	754.0	1439.0	3954.8	5393.8
CONT & INFLATION	0.0	0.0	184.2	153.5	281.0	228.4	494.7	292.8	369.7	278.5	325.4	351.7	1655.0	1304.8	2959.9

Means of Verification

- GSDR accounts
- Contractor vouchers
- AID records

Assumptions for providing inputs

- Timely AID PP design, project approval and authorization.
- Timely procurements of contractors by AID and GSDR.
- Timely release of DB and and DDD budgets by GSDR.

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ANNEX C

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECTS

1. FY 1987 Continuing Resolution, Sec. 523; FAA Sec. 634A; Sec. 653(b)	
Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project.	Congressional Notification will be sent to the committees.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	Yes. Yes.
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	The GSDR is actively circulating a revised Water Law. Short-term technical assistance is included in the project to help move the process along and suggest changes in the draft legislation. It is hoped that the new National Water Law will be passed within the first 2 years of the project. While not critical to the success of Phase 1 of

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	the project, passage of this law is critical to the success of Phase 2 of the project, and will be a CP to Phase 2.
4. FAA Sec. 611(b); FY 1987 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See AID Handbook 3 for new guidelines.)	Yes. See Annex F.
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	Yes. See Annex G. AA/AFR will consider Mission Directors Certification during PP approval in AID/W.
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	The proposed project is complementary to African Development Bank, World Bank and United Nations' programs promoting development in the Shebelli region of Somalia. A Donor coordination committee will be established during project implementation.

7. FAA Sec. 601(a). Information and conclusion whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices;(e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	Assistance will: (a) provide beneficiary farmers with higher yields,thus bringing them more revenue, a portion of which will be spent on more imported goods; (b) technical assistance is proposed for private agricultural inputs suppliers and manufacturers which will develop Phase 2 investment,recommendations and coordination to foster private initiatives and competition. (c) cooperative farmers will be assisted by the project's research and infrastructure rehabilitation activities. Extension will be funded by the World Bank; and (e) the project will increase water management and allocation efficiency and thus will improve technical efficiency of agriculture.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	The major technical assistance contract and large item commodity procurement will be undertaken by private U.S. firms. Increased revenue to farmers will result in increased importation of agricultural inputs, including those from American suppliers.
9. FAA Sec. 612(b), 636(h); FY 1987 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the	The Project Grant Agreement will provide detailed commitment by

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maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	the GSDR to provide local currency for all project activities, and to the extent possible contracts which can be paid for in local currency will be funded by the GSDR. The U.S does not own Somali currency.
10. FAA Sec. 601(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes.
12. FY 1987 Continuing Resolution Secs. 521, 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	The project is geared to increase the production of a limited number of commodities for domestic consumption. The project is not intended to assist in the production of any commodity for export.
13. FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16? Does the project or program take into consideration the problem of the destruction of tropical forests?	Yes. See Annex__., which includes IEE categorical exclusion for training and research, positive threshold determination for rehab and construction, and proposed sow for EA.

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?	N/A
15. FY 1987 Continuing Resolution, Sec. 532. Is disbursement of the assistance conditioned solely on the basis of the policies of any multilateral institution?	No.
16. ISDCA of 1985 Sec. 310; FY 1987 Continuing Resolution. For development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?	Given the size and complexity of the project, no set aside is forseen. Requests for Technical Proposals will encourage to the maximum extent practicable participation of economically and socially disadvantaged firms as leads or sub-contractors.
17. FY 87 Continuing Resolution, Sec. 559. Will the proposed project involve the obligation or expenditure of funds to procure directly feasibility studies for, or project profiles of potential investment in the manufacture for export to the U.S. or third country markets in direct	No.

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competition with U.S. exports, of textiles, apparel, footware, handbags, luggage, flat goods, work gloves or leather wearing apparel? Or to assist directly the establishment of facilities for the manufacture and export of such items to the U.S. or third countries in direct competition with U.S. exports?	No.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria a. FAA Sec. 102(a), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of	(a) One major component of the project is focussed in Shalambood District of Somalia, an area with a population of some 27,000 inhabitants living in 13 settlements and one small town. All of the inhabitants of the region will share in the project benefits of more valuable access to water and increased food production. (b) Emphasis during Phase 1 is on stimulating existing Multi Purpose Cooperatives, Farmer Committees, and Water User Groups to manage their own resources more efficiently on a sustainable basis. The project will also stimulate the institutional development of those groups. (c) These groups exist under the auspices of the District Government and are currently undertaking self-help activities, such as maintenance and improvement of irrigation systems which will be

women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?	strengthened. It is also proposed to provide project funds for small selfhelp activities such as development of watering points for livestock. (d) Women's participation in cooperatives will be the subject of special studies under the project and efforts will be made to specially address women's involvement in access to water and land tenure issues.
b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes.
c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	Yes, where indicated
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?	Yes, the GSDR will provide local currency equal to at least 25% of project costs.
e. FAA Sec. 122(b). Does the activity give reasonable promise of contribution to	The project will contribute to the rational management of irrigation

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the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	systems in the Shebelli and fund irrigated agricultural research both of which will contribute to the development of economic resources and self-sustaining economic growth.
f. FAA Sec. 128(b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?	It has been designed and will be monitored to ensure maximum benefits to Somalia's small independent farmers.
g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development, and supports civil education and training in skills required for effective participation in government processes essential to self-government.	Training at all levels, from farmers to Master's level, in Somalia using Somali institutions is planned. Moreover, the project will provide technical assistance to local groups such as water users' and farmers' associations to assist them to work with local government to more effectively address their needs.
h. FY 1987 Continuing Resolution, Sec. 558. Will the proposed assistance be for any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference or training in connection with the growth	No Research will focus on maize, sesame and vegetables for domestic consumption. Only minor research on fruit crops with insignificant U.S. production (mangos and papaya) is foreseen.

or production in the recipient country of an agricultural commodity for export which would compete with a similar commodity grown or produced in the U.S., excluding: (1) activities designed to increase food security which will not have significant impact on the export of U.S. agricultural commodities; or (2) research activities intended primarily to benefit American producers?

2. Development Assistance Project Criteria (Loans only)

a. FAA Sec. 122(b) Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest. — N/A

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan? — N/A

3. Economic Support Fund Project Criteria

a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of part I of the FAA? — N/A

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b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?	N/A
c. ISDCA of 1985, Sec. 207. Will ESF funds be used to finance the construction of the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such country is a party to the Treaty on the Non-Proliferation of Nuclear Weapons in Latin America (the "Treaty of Tlatelolco"), cooperate fully with the IAEA, and pursues nonproliferation policies consistent with those of the United States?	N/A
d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreemei dealing with its implementation, or covered in the agreement b imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes.
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes.
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodites be insured in the United States against marine risk with such a company?	N/A
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)	N/A

5. <u>FAA Sec. 604(g).</u> Will construction or engineering services be procured from firms of countries which receive direct economic assistance under the FAA and which are otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one of these areas? Do these countries permit United States firms to compete for construction or engineering services financed from assistance programs of these countries?	No.
6. <u>FAA Sec. 603</u>. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?	No.
7. <u>FAA Sec. 621.</u> If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable?	Yes.
If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprises, and made available without undue interference with domestic programs?	It is not intended that the facilities of other federal agencies will be utilized.

8. International Air Transport Fair Competitive Practices Act, 1984. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes.
9. FY 1987 Continuing Resolution Sec. 504. If the U.S. Government is a party to a contract for procurement, will the contract contain a provision authorizing termination of such contract for the convenience of the United States?	Yes.

B. Construction

1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services to be used?	It is intended that U.S. Design and Supervision engineering services will be obtained. Construction may be undertaken by a Somali firm.
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Yes.
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million (except for productive enterprises in Egypt that were described in the CP)?	N/A

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	N/A
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller general have audit rights?	N/A
3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the communist-bloc countries?	Yes.
4. Will arrangements preclude use of financing:	
a. FAA Sec. 104(f); FY 1987 Continuing Resolution Secs. 524, 540. (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions	U.S. Dollar funds will not be used for any precluded items listed in 4(a)-(1).

or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?

b. FAA Sec. 483. To reimburse persons, in the form of cash payments, whose illicit drug crops are eradicated?

c. FAA Sec. 602(g). To compensate owners for expropriated nationalized property?

d. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?

e. FAA Sec. 662. For CIA activities?

f. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?

g. FY 1987 Continuing Resolution, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel?

h. FY 1987 Continuing Resolution, Sec. 505. To pay U.N. assessments, arrearages for dues?

i. FY 1987 Continuing Resolution, Sec. 506. To carry out provisions of FAA

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section 209(d) (Transfer of FAA funds to multilateral organizations for lending)?

j. FY 1987 Continuing Resolution, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?

k. FY 1987 Continuing Resolution, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

l. FY 1987 Continuing Resolution, Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

ANNEX D

GSDR REQUEST

بســـم الله الرحمن الرحيـ

Somali Dem. Republic
Ministry of Agriculture
The Office of the Minister

Jamhuuriyadda Demo. Soomaaliya
Wasaaradda Beeraha
Xafiiska Wasiirka

جمهورية الصومال الديمقراطية
وزارة الزراعة
مكتب الوزير

Ref: WB/IWI/C - 7-189

Mogadishu: 30/4/1987

Subject: Shabelle Water Management Project

Mr. Louis A. Cohen
Director USAID
Mogadishu

Dear Mr. Cohen,

Refering to the letter of Mr. R. Garner, the USAID Agriculture Officer, dated April 30,1987, the Government of Somali Democratic Republic requests USAID to fund the first phase of the Shabelli Water Management Project for approximately 22.6 million U.S. dollars. This project will strengthen the Ministry of Agriculture's ability to 1) manage the Shabelli River resource, 2) provide adaptive agricultural research to agricultural production problems, and 3) rehabilitate the irrigation systems in the Shalambood area, with a duration of first phase is about 5 years.

The Somali Government's contribution will be approximately 13.0 million US dollars equivalent in Somali Shillings, depending on their availability from Domestic Development Division funds. We are looking forward to receiving favorable response to our request.

Yours sincerely,

Dr. Mohamoud Abdi Noor
Vice-Minister of Agriculture

cc: Minister of Nat.Planning
Minister of Finance
Minister of Foreign Affairs

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ANNEX E

611 (a) (2) DISCUSSION

ANNEX E: 611 (a) (2) Discussion

The purpose of Phase 1 of the Shebelli Water Management Project (SWMP1) is to learn how to improve Shebelli River basin water management . and to establish the framework for larger scale irrigation system rehabilitation in Phase 2. The life of the Phase 1 project is 5 years. Because of this emphasis on a learning process, as opposed to one focussed on fixed products, the ECPR guidance (FY 86 State 180126 found in Annex A) provided that "... Phase 1 conditionality should be confined to covenants so far as possible, particularly focussed on a general commitment by the GSDR to undertake needed reforms in National Water Laws, and fiscal, cadastral, and land tenure policies in the Shebelli basin which would be defined during Phase 1 implementation."

Current water use in Somalia is guided primarily by the Water Law No. 77 of 18 November 1972, which repealed (for the most part) the Water Law No. 13 of 7 August 1966. Between 1966 and 1972, at least a dozen other laws were enacted that govern or affect water resources. Most of these interim laws created "projects" and autonomous agencies under various ministries. Despite cooperative efforts, and even some legislation, these entities seem to operate with little or no coordination of policies and programs. Some have similar, overlapping, and duplicative functions; consequences of this situation are numerous and costly.

There were four FAO missions to Somalia between 1981 and 1984 to assist the GSDR to frame the first major water legislation since the Law No. 77 of 1972. Intensive discussions with GSDR personnel, and meetings with donor agencies and other countries led to the 1984 FAO Report and Draft Legislation (TCP/SOM/2314). With only minor amendments to the above, a draft of the "National Water Law" (hereinafter called the draft Law) has been prepared by a Committee of the Ministry of Justice and Religious Affairs, headed by the Director of its Legislative Department. The draft Law, unless it is held up for reconsideration, is almost ready to be sent by the Ministry of Mineral and Water Resources (MMWR) to the Council of Ministers to elicit opinions from all ministries. Upon approval by the Cabinet, it will need to be submitted for approval by the Standing Committee of the Peoples' Assembly which is empowered to direct legislative business when the full

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Assembly is not in session. If the President signs the enactment it would become the National Water Law, and would nullify any other law that explicitly contradicts it, including relevant portions of Law No. 77, which is currently in force.

The draft Law is a more unique and comprehensive water law than laws formerly enacted in Somalia. Although the PP highlights some important errors of omission and commission (ref. Annex H), its current movement forward represents a commitment on the part of the GSDR to redefine a more rational, comprehensive and implementable law.

The Land Law No. 73 of 1975 has been reviewed by USAID/Somalia and consultants from the Land Tenure Center of the University of Wisconsin and found to be acceptable legislation for accomplishing the purpose of Phase 1.

The Design Team for Phase 1 included 15 technical specialists: among them were an Islamic Water Law Specialist, two economists, two engineers experienced in irrigation management, and one anthropologist with extensive land tenure experience. The PP design was preceded by a one month study of the Shalambood target area by 3 specialists from the Land Tenure Center of the University of Wisconsin. The conclusions of these consultants have lead to a USAID/Somalia decision to include the following two covenants among these in the Phase 1 Grant Agreement:

> "The Grantee agrees to establish a simplified, low cost, on-site land registration progress, and to provide staff to undertake a mass land registration campaign which will be completed for the whole Shalambood target area early in Phase 1 implementation to protect the rights of smallholders. The Grantee also agrees to enforce the provisions of Land Law No. 73 of 1975, which state that the Government may nationalize registered and unregistered lands which are not cultivated over a two-year period, and agrees that any lands thus nationalized will be expeditiously transferred to another smallholder";

> "The Grantee agrees to work closely with AID to reconsider and refine the draft National Water Law, especially provisions related to inter-sectoral priorities for water allocation, water pricing policies, administrative procedures for water control, and clarification of the legal status of water users'

groups. The Grantee shall make every effort to pass a new National Water Law acceptable to AID before the end of Phase 1 of this Project."

Short term technical assistance in both subject areas will be provided during the first year of project implementation to assist the GSDR in these efforts. Long-term TA will continue the dialogue thereafter. The PP proposes conditions precedent to Phase 2 as follows:

"The Grantee shall provide evidence that it has enacted a National Water Law acceptable to AID".

"The Grantee shall provide evidence that it has established a system of assessing, collecting, and reinvesting water users' fees adequate to pay for operation and maintenance of the Shalambood target area's irrigation system, and that controls are in place to ensure that fees thus collected will be used only for this purpose."

The Mission thus concludes, in its best judgement that necessary legislative action for Phase 2 may reasonably be anticipated to be completed in time to permit accomplishment of Phase 2. The technical assistance during Phase 1 will support these actions.

ANNEX G

611 (e) CERTIFICATION

ANNEX G: 611 (e) CERTIFICATION

The Shebelli Water Management Project will provide a total of U.S.$ 80 million (U.S.$ 50 million from AID and U.S.$ 30 million in Somali Shil ings equivalent from the GSDR) over a ten year period to assist Somalia to increase agricultural production in the Shebelli River Basin. The current design is for Phase 1 of the project, with funding estimated at U.S.$ 36.2 million total, comprising U.S.$ 22.6 million from AID and U.S. $ 13.6 million So.Sh. equivalent from the GSDR. Included in Phase 1 of the project is an estimated $ 8.4 million ($ 6.9 million AID contribution) for the physical rehabilitation of selected sections of the existing irrigation system serving the Shalambood area.

Aside from a few administrative and housing units which will be constructed using project funds, all capital costs of the project will be used to rehabilitate irrigation systems already in existance. Therefore, the maintenance requirements at the end of the project will not be substantially greater than already exist.

The irrigation system, built in the 1930's, has been selectively maintained by individual farmers and user groups, but the larger structures are beyond their capabilities. The project will fund training and technical assistance for the establishment of Directorate of Irrigation and Land Use within the MOA which will be responsible for maintaining the larger irrigation structures. The capabilities of water user groups will also be strengthened through project-funded technical assistance. Vehicles, communications and office equipment will be provided to the MOA for the operations and maintenance (O&M) of the irrigation system. Passage of a new National Water Law, which is anticipated to occur during Phase 1 of the project, will enable the GSDR to establish a rational and equitable, system of water user fees, with the allocation of fees collected proportionate to public/private sector split in responsibilities for O&M. The Project Paper estimates that by the fifth year a system will be in place for the collection of fees. Fee collection will be phased in over LOP apace with the project's delivery of resources and water to participants.

Phase 1 of the project will fund only minor irrigation rehabilitation and construction activities. The bulk of

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infrastructural rehabilitation will be funded under Phase 2 of the project. The capacity of the GSDR to support and maintain the infrastructure funded by Phase 2 will be examined at the time Phase 2 is designed, and a new 611(e) certification will be made at that time.

With the anticipated establishment of water users' fees, the improvement of river administration and the provision of training, equipment and technical assistance for maintenance of physical infrastructure to be provided by the project, and based on past experience of GSDR maintenance of riverine structures and irrigation works, I Certify as to the capacity of the GSDR (both financial and human resources) to effectively maintain and utilize the Project.

Louis A. Cohen
Mission Director

Date 8 May 1987

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ANNEX H

POLICY ANALYSIS

ANNEX H: POLICY ANALYSIS

The policy analysis addresses (1) economic reform; (2) economic issues of land tenure; (3) agricultural input supply/demand and privatization; (4) water law and legal requirements of water management; (5) public organization and management; and (6) key concerns for the on-going macro-policy dialogue.

1. IMPACT OF ECONOMIC LIBERALIZATION ON AGRICULTURAL PRODUCTION AND EXPORTS

Prior to 1983, small farmers in Somalia were caught in a technical and economic equilibrium trap. The economy remained state-managed and socialist. Control of marketing outlets and production factors was vested in government monopolies, monopsonies, and inefficient parastatal input supply systems.

To stimulate economic growth after years of policy-driven production decline, the GSDR initiated a series of economic readjustment measures. These have begun to restore the role of the markets and prices in allocating resources. In general, the pace and magnitude of these reforms, while not all inclusive, have clearly set the stage for a more market-oriented economic structure. Emphasis is shifting away from state control over the factors of production and markets to greater reliance on private sector mechanisms for allocating and distributing inputs and products (National Development Strategy, Ministry of National Planning, 1985). A brief historical impact analysis highlights the response of Somali agricultural producers and markets to these favorable economic policy initiatives.

1.1 Foreign Exchange Liberalization.

After years of pegging the exchange rate to the US dollar, which caused gross overvaluation of the Somali shilling, the GDSR initiated a flexible exchange rate policy, devaluing the currency by 1400 percent. In 1985, a free foreign market mechanism was established by the Central Bank, allowing foreign exchange held by private sector sellers to be legally sold at a market-determined rate negotiated with individual buyers. In 1986, a foreign exchange auction was established as a conduit for the sale of IBRD, AID, GDRM and Italian foreign exchange to importers at a market determined rate. This measure has helped to narrow the free market/official exchange rate gap. The present gap is about 67 percent (So.Sh. 150/$US 1.00 on the free market compared to So.Sh. 90/$US 1.00 for official

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transactions). The movement to a more realistic exchange rate was directly responsible for redressing some of the trade imbalance. The overall agricultural trade deficit fell from $327 million in 1980 to $301 million in 1985 (free market and GSDR trade statistics).

In support of exchange rate readjustment, the GSDR also adopted a number of complementary measures. These include: (1) legalizing external foreign exchange accounts and internal foreign currency export promotion and import accounts for Somali nationals and expatriates; and (2) reducing foreign exchange surrender requirements for exports from 100 percent to 35 percent in 1985. This has since been raised to 50 percent in 1986.

Exchange rate liberalization measures have fostered a more favorable climate for private sector entry into import/export markets for inputs and products by expanding the available foreign exchange pool. Further liberalization in the direction of rate unity at a floating or market-determined rate would accelerate this trend.

1.2 Liberalization of Grain, Banana and Livestock Marketing.

Prior to 1982, farmers were required to sell their main staple products to the Agricultural Development Corporation (ADC) at artificially regulated prices. Parallel market prices for these commodities ranged between 6 to 8 times the government procurement price.

Mandated low returns from farming severely depressed agricultural production in the middle and late seventies. Inflationary pressure eroded ADC procurement prices in real terms to the point where they were lower than the actual costs of production. Between 1977 and 1980, real prices (adjusted for inflation), for maize, sesame, and sorghum fell by some 60 percent. The Design Team estimates crop price supply elasticities at 1.12 for maize, 0.59 for sesame, and 0.18 for sorghum. As expected, production of maize and sesame, the major staples, declined significantly.

By the end of 1981, this trend reversed. ADC producer prices for sorghum and maize were increased by 50 percent. Prices eventually gravitated toward higher international levels following government procurement price removal, elimination of the ADC monopoly and further entry of private sector traders into domestic agricultural commodity markets.

The impact of price liberalization on the agricultural sector was dramatic. Between 1980 and 1985, maize prices increased by over 100 percent in real terms. Significant price increases for sorghum (130 percent) and sesame (150

percent) were also reported. The upward price adjustment called forth production increases of 155 percent for maize (an irrigated crop in Somalia), 18 percent for sorghum, and 88 percent for sesame. Increased production over the past several years is largely attributed to the supply elasticity response. Because of these bold initiatives in price liberalization, trends in self sufficency ratios for major consumption crops have been reversed and are now rising, following half a decade of severe decline.

Consumers and producers have both benefited from price liberalization. The former have seen a real rise in living standards. Food supplies are now more readily available at lower real prices than under the socialist system in which only a limited supply of commodities was available through severely constrained official channels, and the parallel market furnished only small additional quantities at speculative prices. Small farmers have seen a real rise in farm income as returns from crop farming have increased from negative rates to a current 8 percent (Design Team calculation) after farm-gate price liberalization.

Production and export of bananas deteriorated during the middle and late 1970's from inadequate producer prices, an over-valued exchange rate, and lack of access to foreign exchange for scarce inputs. This trend also reversed in the early 1980's as a 130 percent domestic price rise, currency depreciation, and liberalization of banking regulations and export earning retentions called forth greater production. The Design Team estimates that the price elasticity of banana supply has been 0.46, meaning that a one percent price change has induced a 0.46 change in output.

Another powerful stimulus to the domestic banana industry was the dissolution of the parastatal Banana Board marketing monopoly and its replacement by a greatly privatized joint venture corporation, SOMALFRUIT, which is 60 percent foreign private sector and 40 percent GSDR owned. This readjustment resulted in improved marketing and shipping facilities, and provided better banana input supply and distribution to growers.

Banana exports constitute Somalia's second most important export product, after livestock. From a high of 81.8 thousand tons in 1975, banana exports declined to 34.3 thousand tons in 1981.

After price and market liberalization, exports advanced by 75 percent in 1982/83, reaching 62 thousand tons. The foreign exchange value of banana exports was $16 million in 1986, up from $6 million in 1981 (Goldensohn, Harrison, and Smith. The Impact of Policy Reform on Economic Growth in the Agricultural Sector of Somalia. Mogadishu: January, 1987).

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Livestock production contributes approximately 40 percent of Somalia's GDP. It is also the country's principal foreign exchange earner through export of live animals, hides, and skins. Export earnings from this sub-sector amount to some 90 percent of total earnings. The dominant position of livestock exports in foreign trade is explained by the nation's comparative advantage in livestock production. The current domestic retail meat price is 33 percent below the world market price when valued at the free market rate of exchange. By comparison, the domestic retail price in Egypt is two times greater than world price at the Egyptian parallel exchange rate. Egypt recently signed an agreement with the GSDR to procure 20,000 head of Somali cattle.

Though producer earnings from livestock have kept pace with inflation, the export picture has been somewhat erratic during the liberalization period. Between 1981-1982, livestock export earnings rose from $98 to $106 million. Then, following the Saudi Arabian ban on Somali livestock imports in 1983, the value of livestock exports plummeted to $33 million in 1984. Lifting bans on small ruminants and new cattle market development (i.e. Egypt) has since expanded exports to $66 million in 1985 (Goldensohn et al).

Economic liberalization has brought partial privatization of livestock export marketing. The parastatal monopoly of the Livestock Development Agency to purchase and market animals for export has been dissolved. This function has largely been privatized, although there are reported liquidity problems among some 90 percent of the private livestock traders. Regulatory harassment in the form of licenses and permits, export tariffs of 25 percent *ad valorem*, and the 50 percent foreign exchange surrender requirement at official exchange rates reduce the competitiveness of Somali exports in world markets.

There are three remaining macro-economic policy issues associated with this series of reforms. Public Law 480 imports of maize should be discontinued to guard against adverse domestic producer price incentives and thus production effects from oversupply. Other concessionary food imports, particularly edible oils (which have relatively high domestic price elasticities), must be closely monitored, with levels part of annual multi-donor dialogue, to preserve domestic production incentives. There is also a need to lower export tariffs on livestock and eliminate parastatal control of by-product markets to enhance competitiveness, and thus maximize foreign exchange earnings, in international markets. Finally, further moves toward exchange rate unity at a floating rate should be encouraged to boost exports and rationalize imports.

Notwithstanding that more remains to be done in the area of agricultural economic policy reform, changes over the past five years have contributed in a major way to creating a policy environment and macroeconomic climate that is conducive to private sector investment and further agricultural growth.

2. POLICY ISSUES RELATED TO LAND TENURE

Agricultural production in the Shalambood area is presently undertaken within five main farm tenure categories: (1) small farmer holdings (46.4 percent); (2) small farmer cooperative holdings (13.7 percent); (3) large special interest cooperative farms (14 percent); (4) state farms (10.2 percent); and (5) large-scale private farms (15.7 percent).

Land tenure on private farms is governed by statute and tradition which allow tillers of two or more years duration de facto right to the land. Registered land is rented from the State on a 50-year lease basis. The land registration procedure is cumbersome, costly, and time consuming. Consequently, many small farmer plots tend to be unregistered.

Forty-five percent of the small farmer holdings are registered; fifty-five percent are not. It is believed that this tenuous system of land tenure is a disincentive to investment and productivity. Agricultural yields from unregistered land are significantly lower than yields from registered parcels (Roth, Lemel, and Unruh. Land Tenure and Water Allocation in the Shalambood Region. Mogadishu: University of Wisconsin, Land Tenure Center, 1987).

Land tenure rights on multi-purpose agricultural cooperatives (Tacabwadaag) appear identical to those of small private farms. Farmers occupy the land they till and have free access to markets for their produce. Their farms are unregistered individually, but all land is registered in the name of the cooperative, which delivers limited inputs and marketing services to members. Membership is voluntary and average agricultural productivity of these farms is close to the norm for non-cooperative small farms.

Multi-purpose cooperatives are a transition between the collective farms (Ujeedo Badan) of the past and a private enterprise agricultural economy. Because tenure arrangements and productivity of these farms do not differ significantly from small independent farms, there would appear to be little advantage in singling out this category for special privatization in the immediate time-frame. Indeed, the cohesive nature of cooperatives of this type could be an asset for organizing improvements to input supply in the area.

Labor for special interest cooperative and state farms is provided from the indigenous hired labor pool and indentured servitude with few, if any, tenure rights accorded to those who till the land. Productivity of these units is well below (sometimes as much as 30 percent) the norm for small farms in the region because of inefficient resource use. By comparison, large-scale private farms average higher yields than all other categories of holdings through improved inputs and better farming practices.

Privatization of special interest cooperatives and parastatal farms is an immediate priority. State management and general landlessness of the labor force is contrary to the broader need to privatize economic activity to promote greater resource allocation efficiency and equity. Since the GSDR has already established precedents for dismantling other state farms and distributing occupancy rights to tillers, these precedents can be used as models for further privatization during Phase 1 of the Project. An initial target could be the "400 hectare farm" run by the Ministry of Agriculture in Genale; divestiture could be linked to Civil Service Reform.

The economic and equity issues of current land tenure modalities within the Shalambood area create a clear and present need for tenure rationalization. A simplified land registration procedure and development of action plans for privatizing land tenure on parastatal and special interest cooperatives should be considered for covenants for releasing funds under Phase 1 of the project. Implementation of the privatization action plan should be considered for inclusion as a condition precedent to authorization and obligation of funds for Phase 2 of the project.

3. SMALL-FARMER INPUT DEMAND AND SUPPLY AND PRIVATE SECTOR PARTICIPATION IN DELIVERY SYSTEMS

The technological gap between commercial plantation agriculture and subsistence farming in the Shebelli basin is enormous and widening. For the former, improved farming practices and technology have been employed since pre-independence, while for the latter, there has been a long history of very low intensity input-use beyond labor, land, and water. Yields, even in the irrigated sub-sector, are well below those achieved in other parts of Africa with similar environmental conditions.

3.1 Demand Constraints

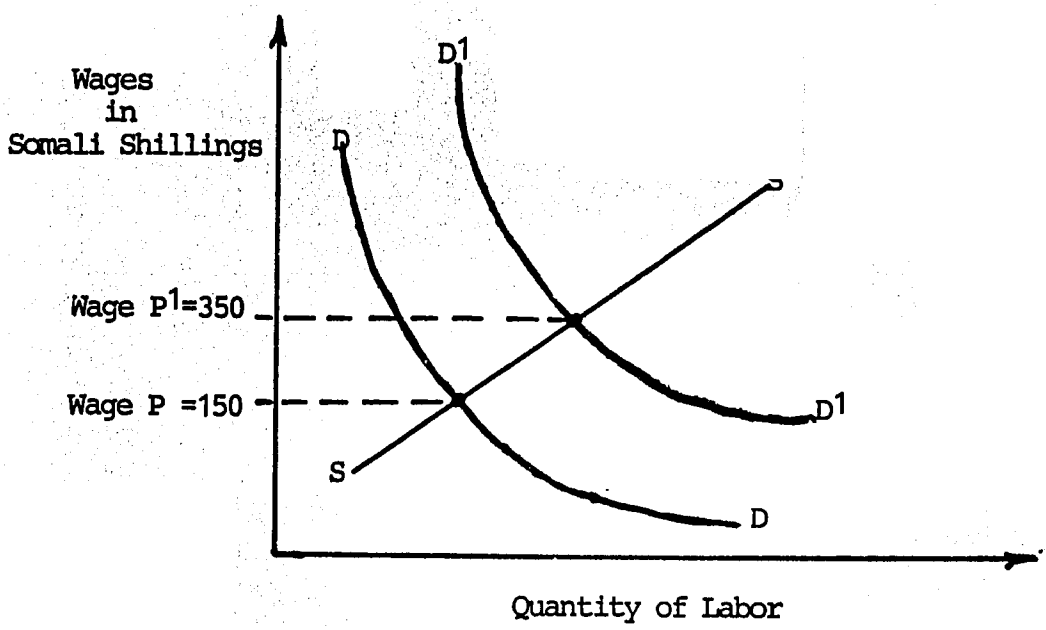
Small-farmer agriculture in the Shebelli area presently operates at a very rudimentary technological level. The only inputs available to the livestock sector are some marginal veterinary services. Aside from some mechanized tillage, dryland sorghum production follows time-honored traditional practices. Irrigated maize uses very few, if any, modern inputs.

On the 7.5 percent of small farms using urea fertilizer, pesticides, better seeds, and improved tillage practices, the internal rate of financial return has increased from 8 percent without the package to 13 percent after adoption (Design Team calculation). This is a strong indicator that demand for improved technology can be induced by greater small farmer exposure and access. This hypothesis is confirmed by farmer response to labor bottlenecks.

There appears to be a seasonal labor bottleneck; this is reflected in farmer estimates of a 133 percent spread between the peak and off-season agricultural wage. The estimated average wage from farmer interviews is So.Sh. 300-400 during the Gu and the Der compared with So.Sh. 150 during the Jilal for a 625 square meter plot of labor input. Design Team observations of extensive shattering losses in sesame harvest provide additional evidence of the seasonal shortage. Without a labor bottleneck, harvesting would be done during periods of optimal moisture content to minimize shattering, if cheap labor were abundantly available. Farmers attribute outward migration of adult males to the seasonality of the labor shortage.

With reference to Figure H-1, assuming a constant supply of labor, the upward sloping supply curve SS is intersected by the demand curve DD at wage P (So.Sh. 150) during the off-peak season. During peak demand at primary tillage, cultivating, and harvest, the demand curve DD'shifts to the right and intersects the constant supply curve SS at wage P' (350 So.Sh.). During peak demand for labor, farmers have three options: (1) to pay the higher wage for a constant input of labor; (2) reduce the labor input and lower crop production efficiency (revenue losses from shattering might be less than the increased labor costs); or (3) opt for a lower cost technology (if available).

Figure H-1



Subject to supply limitations, Shebelli area farmers substitute capital for labor in procuring mechanized services to offset higher labor costs during peak demand periods. The growing demand for tractor services has been induced by the seasonal labor bottleneck and higher cost, enhanced productivity from mechanized tillage of vertisolic soils, and close proximity to commercial plantations. These plantations have been using advanced techological inputs since the end of the Second World War and provide an informal conduit for inputs and information.

In this environment, where technology is little changed from historical practices, significant yield increases may be achievable with small manageable input packages. In the very early stages of the transition from traditional subsistence to dynamic market-oriented agriculture, the relationship between output changes and marginal changes in practices is likely to be quite substantial. This has, in fact, occured among the few farmers in the target area using improved inputs; these farmers reported yield increases of 100 percent from available technological improvements.

Nowhere is the principle of substantial output gain for marginal input changes more evident than in the demand for water. Without water, the opportunity cost of agricultural land in the Shalambood area approaches zero. Where irrigation water is available, land values are 40 to 50 thousand So.Sh. per hectare. Without irrigation water, land is valued at 3 to 4 thousand per hectare. The only factor keeping the value of non-irrigated land from actually

reaching zero is seasonal rainfall. Farmers receiving 2 to 3 irrigations average 94 percent higher yields than those with one or no irrigations (LTC report). In the Shebelli region, seasonal demand for water far exceeds available supply because it is treated as a free good by public policy which imposes no user charge.

The early stages of technological adoption do not necessarily require development of completely new technologies, rather, they require intensified delivery of existing ones over a broader base. Once an effective mechanism for input delivery has been installed, it is easier to develop improved second generation technical inputs for the production take-off phase, if market and price conditions justify the cost of these inputs.

The present low level of demand for inputs, except water, is severely constrained by the absence of an effective information flow and input supply mechanism. In the few instances where information and technology have been delivered, empirical evidence shows that Somali farmers do respond to these opportunities by changing farming practices to improve yields and income.

3.2 The Input-Supply Side

The bulk of input delivery in Somalia is vested in parastatal organizations. Until recently the Agricultural Development Corporation (ADC) had monopolistic rights over distribution of fertilizers and pesticides. The National Farm Machinery Supply Services (ONAT) used to supply a large segment of the available farm machinery services (mainly tractor tillage) to farmers in the Lower Shebelli area.

Since the breakup of the ADC monopoly, there has been some privatization of fertilizer and pesticide delivery. Private sector entrepreneurs are now providing most of the machinery services due to increased demand and the inadequacy of the ONAT supply mechanism.

Farmers report growing problems in obtaining machinery services when needed. ONAT gives first priority to parastatal farms and large cooperative farms. Since half of the 32 tractors in the Shalambood area are non-functioning, there remains little public sector capacity to meet small-farmer demand.

High profitability of machinery hire increases the likelihood of further privatization. The Project Design Team estimated returns from private tractor hire at 22 percent. This is two to three percentage points above prevailing commercial interest rates. Commercial credits provided to

buyers by the Somali Development Bank are another supply stimulus. Dealers report that about 75 percent of their current tractor sales are to the private sector.

The reaction to growing demand for and favorable economics return to investment in machinery services has been dynamic. Ford and Massey Fergeson have taken the lead in tractor supply. Deutz-Fahr has set up a tractor and implement assembly plant in Mogadishu. Of particular interest is the recent entry of a few public and private sector concerns into local manufacture of animal and tractor drawn implements, mainly using recycled scraps as raw material.

The positive income effects and credit financing for machinery hire have induced significant growth in private sector supply of services for tillage and land improvement; the total supply, however, remains inadequate to meet present and projected demand.

The total supply of nitrogenous fertilizer comes from two sources: (1) the output of a moribund and inefficient parastatal fertilizer plant whose production process consumes U.S.$2 of imported imputs for every U.S. $1 of output produced and whose cost of production is $0.30/kilogram. This is higher than the world market CIF price; (2) assistance provided through external donor foreign exchange programs and concessionary grants. The few fertilizer adopters in the Shalambood area complain that they are unable to obtain adequate fertilizer supplies. Total production of the domestic plant averages 1,400 tons per year. Its actual capacity is 50,000 tons.

Due to the unavailability of certified or registered seeds, over 60 percent of the farmers in the area use local seeds obtained either from their own farms, other farmers, or both. The rest of the farmers (less than 40 percent) use improved seeds, either exchanged or secured free from the ADC. Local seeds are impure and produce lower yields than would be possible with improved varieties (TAMS Report).

State subsidization of fertilizer and machinery service inputs is a disincentive to private delivery. ADC fertilizer prices are about one-half the world price. Machinery services are currently offered at So.Sh. 350 per hour by ONAT, a subsidized rate which does not allow for cost recovery. The current free-market rate of tractor-hire services is So. Sh. 800 to 900 per hour. Continued subsidization of government-supplied inputs will likely restrain growth of private sector input marketing. Nevertheless, ONAT does not compete well with the private sector. Although ONAT is less expensive, small farmers prefer private sector services

since they are more dependable. On the positive side, ONAT indirectly supplies mechanics to the private sector, by training young men who then often leave for higher paying private sector jobs.

Petroleum products are also marketed at subsidized prices, but a GSDR rationing system has placed a significant constraint on the effective supply. Diesel fuel for tractors sells for So. Sh. 22 per liter at government pumps, while the speculative free-market rate is So. Sh. 71 per liter.

A major issue concerns the modality of water supply. Farmers now receive irrigation water free of charge. Under these circumstances, economically rational farmers at canal heads will use water up to the point where their marginal revenue from the last unit supplied is zero. This is their optimal point. In achieving optimal water application, they reduce available supply to other farmers further downstream from the tertiary canal heads. Since the marginal revenue of water for downstream farmers is significantly greater than zero, they would benefit from paying the canal headers a price for each extra unit supplied. This price is the tail enders' own marginal revenue.

Water resource reallocation would theoretically continue until the marginal revenue of water for the tail-end farmers converges with that of the canal header group. A charge for water would cause the headers to use less water and tail-enders to use more water up to a point where the marginal revenue of the last unit supplied to each group is equated with the per unit water charge.

Under this scenario, the price mechanism would serve to allocate the scarce water resource more efficiently and more equitably than the present "no-cost" water system. Water user fees are, then, imperative for rationalizing water use, as well as for cost recovery in irrigation system operations. Farmers in the Shebelli area say they are willing to pay for water, if they are assured reliable delivery of the quantities they need (LTC report).

Policy goals related to input-supply are: (1) eliminating GSDR equipment hire and fertilizer subsidies as a further stimulus to private sector entry; (2) rationing hydrocarbon fuels by price rather than favoritism to reduce speculative demand and improve distribution and allocation efficiency; and (3) rationing water by price to improve equity and distribution efficiency.

From the foregoing discussion, it is evident that present levels of total input supply are inadequate to fuel agricultural transformation in the Shebelli area without further policy reforms targeted on improving resource allocation efficiency and private input supply.

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3.3 Private Sector Constraints to Further Agricultural Input Delivery

The favorable climate created by economic liberalization has generated a mild resurgence of private sector activity. Elimination of certain state monopolies, privatization of various state and parastatal activities, and exchange rate reform has begun to encourage the growth of small businesses, trades, and light manufactures, both in Mogadishu and in the interior, including small villages. To study this further, an inventory is needed of private sector urban-based services for agricultural development and rural-urban linkage in market towns near Shalambood - principally Genale, Merka and Shalambood towns.

Average private investment as a percentage of GDP has grown from 5.5 percent during the 1970-1980 period to 8.8 percent during 1980-1984 (National Development Stategy and Programme, Ministry of National Planning, 1985).

Another encouraging development is the growing share of commercial credit going to the private sector. In 1981, the private sector accounted for 35 percent of total lending; by 1984, the proportion was 83 percent (Goldensohn et al). Casual monitoring of business activity reveals a growing incidence of shops and warehouses with triple and quadruple digit dollar value inventories.

Major concerns which may hamper acceleration of favorable trends include the following:

3.3.1 Perceived Demand-Growth for Agricultural Inputs

The current low-level of input use among small farmers is a disincentive to growth in input supply. Importers and suppliers are, for the most part, still cautiously evaluating input demand prior to accumulating significant inventories of fertilizers, pesticides and other agricultural input commodities. Turnover rates for these inventories are traditionally lower than other investment alternatives, with attendent higher tied-up capital risks. Thus far, inadequate extension of available technologies, and lack of cash resources among small farmers, have clouded the demand and market picture for potential importers and suppliers.

Some have begun to test the market with limited imports of vegetable seeds, agricultural hardware, and other input commodities but are still moving cautiously until they obtain a clearer perspective on agricultural producer demand for these items.

3.3.2 Availability of Foreign Exchange. Importers have a number of foreign exchange acquisition options at their disposal:

- External accounts. Letters of Credit may be opened against dollar accounts supplied by hard-currency from expatriate workers abroad from which buyers purchase foreign exchange with Somali shillings. There appears to be no effective limit on this source, and exchange rates on this free market are between So.Sh. 150-160/U.S.$1.00. Jeddeh is the major center for this activity.

- Import accounts financed from proceeds unretained by the public sector (currently 50 percent) from legal exports. This source is available to finance imports of goods and services. Restrictions have discounted this free market exchange rate to a current level of So.Sh. 142-144/U.S. $1.00.

- Foreign exchange auctions restricted to commodity imports from eligible countries of source and origin within 45 days from date of auction. The present supply from this source averages about U.S. $4.5 million per month at exchange rates ranging between 125-130 per dollar. This source is subject, however, to periodic suspensions, continued donor largesse and program longevity.

- Donor-financed commercial import programs restricted usually to commodities of donor-country source and origin with rather lengthy procedural requirements. The exchange rate for these transactions is So.Sh. 90 to U.S.$1. This source appears to be drying up as the major donors are shifting their emphasis from commercial imports to foreign currency auctions.

The total supply of foreign exchange does not appear to be a constraint to most private sector operatives contacted. However, limited supplies of concessionary foreign exchange at below free market exchange rates creates a greater demand for fast-moving imports in preference to slower moving agricultural inputs. MOA reports that over 70 percent of foreign exchange obtained during the first seven months of auctions has been used for food imports, threatening domestic market prices and producer incentives. The MOA is concerned that food imports may need to be constrained through modification of the auction's commodity eligibility list (especially oil imports). This is an issue for policy dialogue.

There is a clear need for stable, and if possible, increased amounts of foreign exchange to be supplied through the auction mechanism to promote exchange rate

stability and lower the real cost of using foreign exchange to finance slow-moving stocks. It is recognized that the auction mechanism is a temporary expedient to soften the transition from artifically pegged to a market determined floating or more realistically established exchange rate.

3.3.3 Preferential Tariffs and Administrative Barriers A major concern is the present tariff structure which gives preferential treatment to the public sector. Private sector suppliers report being subjected to "administrative charges" of 40 to 150 percent on the value of their imports and to procedural delays in arranging licenses and clearances from various government departments. Public sector importers are not subjected to many of these import levies or to the large number of administrative oobstacles faced by the private sector.

3.3.4 Supplier/Producer Credit Access. State monopoly over the banking system, real negative interest rates which discourage private savings, and preference for borrowed capital in high-risk ventures during periods of high inflation constrain private input delivery.

On the input-demand side, small farmers in the Shebelli basin have very little or no working capital, and their access to seasonal credit is restricted to a very modest UNDP/FAO pilot program which operates through the Commercial and Savings Bank of Somalia (CSBS). In the Lower Shebelli region, no more than one out of every twenty small farmers is participating this program.

Shortage of working capital, credit, and knowledge of technology have restrained input demand growth while shortage of credit and and low-level demand have restrained input supply. The net effect of this paradoxical trap is failure to achieve Somalia's full agricultural growth potential.

A push-pull intervention strategy is needed. The catalytic elements of such a strategy would include: 1) demand-side push; 2) supply-side pull; 3) revolving seasonal credits for farmers; 4) guaranteed markets, and 5) investment credit to cushion private sector input suppliers' entry risks.

4. STRATEGY FOR STIMULATING SMALL-FARMER INPUT DEMAND AND PRIVATE SECTOR DELIVERY OF SUPPLY

4.1 Small-Farmer Seasonal Credit

Under the CSBS Small-Farmer Credit Program sponsored by the UNDP/FAO, institutional credit is furnished in kind (fertilizers and pesticides) to a selected group of participants. Loan approval, which must pass through two screening processes (the regional and central levels), is cumbersome. Eligible recipients are those with registered land, guarantees by the village headmen, and extension agent endorsement. To date 3.5 million shillings have been lent to 1,693 participants.

The pilot effort has achieved limited success in extending seasonal credit to small farmers, where previously none existed. Its major weakness has been the meager number of farmers reached, over-centralization of the loan-approval process, and the narrow range and low quality of inputs delivered. FAO plans to broaden the scope of eligible participants in the next phase of the project (April, 1987 start) to include those holding five to ten hectares in addition to the one to five hectare landholders already covered.

The Shebelli Water Management Project will stimulate demand for agricultural inputs by producing economically viable technical packages for improved maize and sesame production through adaptive research. During the project's implementation, short-term consultants will be engaged to evaluate the CSBS pilot credit program for small farmers, and to assess the credit needs of smallholders and private sector input suppliers in the Shalambood target area, using baseline data collected during the assessment of rural-urban linkage and urban services to rural development in market towns near the project area (Genale, Merka, and Shalambood). An expanded in-kind or cash credit facility, to increase small farmers' access to inputs furnished by private suppliers will be considered for inclusion in the design of Phase 2. Profit-funded credit could be provided to farmers by suppliers.

In preparation for Phase 2, Phase 1 third country training funds will be used to support CSBS study tours to observe possible credit program models such as the Agricultural Development Bank of Pakistan's mobile credit system and rural credit institutions in Bangladesh.

4.2 Supplier Credit

To encourage further supplier entry into agricultural input markets, it is proposed that the Phase 1 credit assessment investigate the feasibility of a modest revolving credit fund which could be administered through the CSBS at commercial interest rates during Phase 2. This fund could be used to finance equipment and plant procurement for selected private sector entrepreneurs wishing to launch input supply ventures. It could also be used to provide credit to small farmers through suppliers. Priority could be given to suppliers and distributors of biological and chemical inputs, agricultural machinery, machinery repair and hire services, and irrigation structures. The fund could be capitalized with both Somali Shillings and foreign exchange (the latter dependent upon whether the auction mechanism remains in place at that time).

Phase 2 program design and installation needs will be identified and determined by technical assistance contractor services procured for the small-farmer institutional credit assessment in 4.1, above.

4.3 Other Initiatives to Encourage Private Sector Growth

New initiatives are underway which, if enacted, may stimulate private sector investment. These include the upcoming private investment law, the foreign investment law, and the opening up of the banking system to foreign banks.

Within the context of these developments, there are some targets of opportunity for further encouragement of private sector activity which could be studied during Phase 1, and considered for inclusion in Phase 2. These are:

* Encourage more specialization in private sector investments by developing measures to reduce risks and improve profit margins.

* Encourage small and family run businesses to joint venture with larger Somali and foreign businesses. The forthcoming Foreign Investment Law may contain some important incentives to facilitate this effort.

* Set up easier credit terms for loans aimed at privatization especially of manufacturing parastatals such as the National Foundry and ONAT.

* Streamline and continuously monitor import procedures and clearly define fees, taxes, etc.

* Establish export-free zones, especially for industries requiring a high cost proportion of imports.

* Offer tax-free holidays especially to exported value-added goods.

* Possibly encourage establishment of another production-export oriented venture like Somalfruit. This could be another joint venture but be aimed at other crops such as citrus and mango.

* Continue to support and encourage the private sector reoriented Chamber of Commerce and possibly establish an Export Promotion Bureau within it.

* Establish a harvest credit policy to permit farmers to store grains longer, and receive higher prices.

* Institute measures to standardize agricultural equipment, especially tractors, to reduce the need for a wide variety of spare parts inventories. Stick with equipment known to Somalis. Also encourage establishing long term credit mechanisms to encourage supply of low turnover spare parts.

* Privatize ONAT by auctioned disinvestment.

* Streamline operations of the National Foundry to emphasize manufacture of agricultural implements and water pumps. Provide training in improved manufacturing procedures and systems. Other equipment production and repair activities should be undertaken on a cost plus basis to make services competitive with private sector operations.

* Improve access, through feeder and main road development to provide better linkage between the Project area and the Afgoi-Shalambood intersection.

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* Encourage Somali Airlines to provide export facilities and services, especially ones with a refrigerated and/or controlled atmosphere to promote export of perishables and stimulate production of high value, low volume outputs.

5. WATER RIGHTS LEGISLATION AND RIVER BASIN-WIDE WATER MANAGEMENT

5.1 Background: Contemporary Predicaments of Islamic Water Law

Water law is a complex inter-disciplinary subject at the interface of hydrology and engineering, agriculture, economics, political science and public administration. Islamic water law evolved during the early centuries of the medieval Islamic civilization in harmony with the growth of ideology, science and technology, and environmental diversity.

There are today over 45 independent Muslim states. Almost all of them, including Somalia, have declared in their constitutions that Islam is the state "religion" (Din, i.e., the whole system of behavior). This means, explicitly or implicitly, that all laws must be in conformity with Islam; otherwise they are, in theory, unconstitutional.

Contemporary water laws in Muslim states are, in reality, from mixed origins. Most often, they are haphazard adaptations of medieval Islamic or modern western water laws made under pragmatic pressures. They were made, perhaps consciously, by employing some of the "basic principles" (Qawaid) of classical Islamic legal philosophy and methodology, e.g., takhayyar (adopting whatever is assumed to provide "benefit or good"); or invoking the arbitrary authority of a Muslim government to promulgate laws and decrees in the pursuit of al-maslahah (public interest).

Water law in a Muslim country like Somalia must be an Islamic water law to be in harmony with the will of the people and to be obeyed and implemented.

5.2 Sources of Contemporary Islamic Water Law: Somali Context

There are several Muslim self-perceptions of the sources of Islamic Law. A dominant view focuses on ijtihad. This is the right of Muslims of every age to resort to "expert individual opinion", or "original interpretation",

on the basis of the Quran which is the primary source. This allows contemporary Muslims the right of ijtihad to reconstruct a modern Islamic water law. This subsumes the necessity to benefit from the Islamic legal heritage of the last 1400 years without being constrained by it. These individual opinions are consolidated as an "agreement or consensus" (ijma) of the Islamic legislators, the scholars and experts, and the community.

Another basic source of modern Islamic water law is the contemporary knowledge (i.e. ijtihad) of the sciences and engineering dealing with water. It is the function of ijtihad and ijma to harmonize the truths or laws of both the Quran and rational knowledge in deriving Islamic water laws. Such laws are subject to the constraints of the environment.

Somali Islamic water law may also use Somali customs, usages and conventions (adah, ta'amul). Somali socioeconomic, environmental, geomorphological and other variable data must also be used. However, non-Somali Islamic experts can also participate in the legal opinion-formation and decision-making processes.

Islamic legal philosophy recognizes that the non-Muslim peoples and nations have the best authenticated (burhan, proof) hydrosciences and technology which are "the Sunnah of God." They have indeed "brought under service" (taskhir) of man the forces and resources of the heavens and the earth. The Quran and the Prophet's "binding sunnah" make it an Islamic obligation (wajib) to benefit from these achievements while acknowledging their sources. Somali Islamic water law, to be workable and viable technologically and socially, must be a fully ijtihaddiyyah Law.

5.3 Development of Somali Water Law: Somali and International Efforts

The Water Law No. 13 of 1 August 1966, repealed by the Water Law No. 77 of 18 November 1972, are the two major laws of the last two decades. Between 1966 and 1972 at least a dozen other laws were enacted that govern or affect water resources. Most of these created "projects" and autonomous agencies under various ministries. Despite cooperative efforts, and even some legislation, these entities seem to operate with little or no coordination of policies and programs. Some have similar, overlapping, and duplicating functions. The defects and consequences of this system are numerous and costly.

There were four FAO missions to Somalia between 1981 and 1984 whose eventual goal was to assist in framing the first major water legislation since the Law No. 77 of 1972. Intensive discussions with GSDR personnel, and meetings with

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donor agencies and other countries led to the 1984 FAO Report and draft Legislation (TCP/SOM/2314). With only minor amendments to the above, a draft of the "National Water Law" (hereinafter called the draft Law) has been prepared by a Committee of the Ministry of Justice and Religious Affairs, headed by the Director of its Legislative Department). The primary responsibility for this draft formulation and facilitation of its passage through the Legislature rests with the Ministry of Minerals and Water Resources (MMWR). The draft Law, unless it is held up for reconsideration is almost ready to be sent by MMWR to the Council of Ministers to elicit opinions from all ministries. Upon approval by the Cabinet, it will be submitted for approval by the Standing Committee of the Peoples' Assembly which is empowered to direct legislative business when the full Assembly is not in session. If the President signs the enactment it would become the Water Law, and would explicitly nullify any other law that contradicts it in addition to the Law No. 77, which is currently in force.

The draft Law is a more unique and comprehensive water law than laws formerly enacted in Somalia. It is a response to a long-felt need emphasized repeatedly in recent years by donor countries and agencies as well as consultants. It would create an organizational system with statutory responsibilities for the formulation of national water policies, the preparation of a national water resources plan that must be revised every 5 years or as appropriate, the regulation of water abstraction and control of its use, and the coordination of water administrative units activities.

5.4 Conclusions

5.4.1 Water Law Impact. Some issues addressed in the draft Law (e.g., sectoral water allocation, and water pricing principles) are extremely complex and of momentous significance for the multi-national and bilateral efforts underway for water, agricultural, and economic development. An inadequate law will legitimize a course of action that could endanger Somalia's development strategy. It is of utmost importance, therefore, to evaluate the draft Law for its macro-economic and international impacts. These should harmonize with Somali goals for economic development. Consultations between the GSDR and the donor countries and agencies should be held before finalizing the draft Law. Specifically, AID should take the initiative in cooperation with the GSDR and other donors to facilitate the processes needed for the enactment of the Law.

5.4.2 Prerequisites for Islamic Water Law. A distinction must be made between "water law of Muslim countries" and the legislation of "Islamic Water Law". The impulse for socio-economic and technological development must be "willed from within" rather than grafted on through superficial donor institutions and infrastructures. Such an impulse willed from within and rooted in an indigenous philosophical foundation can be provided by Islamic Water Law. It is a branch of the "sacred" Shar'a (God-ordained or religious law) which can provide legitimacy, necessity, obligation, and motivation for multi-purpose development.

"Islamic" water law is not the medieval traditionalist or the colonialist Water Law in the Moslem Countries (2 vols) published by Caponera for FAO. Neither can it be found ready-made in the statutes of any country. Modern Islamic water law has to be developed, as before, as "professorial law" through interaction between Somali and other competent Islamic scholars. Their identification and association is crucial to impart popular legitimacy to this law. It is only Muslims respected for their Islamic piety, and profound knowledge of Islamic legacy and modern sciences integrated with it, who can and should be reponsible for the design of Somali water law; this, under Shar'a and its professors, does allow and welcome inputs from "foreign sources."

5.5 Critique of the Draft National Water Law

The current draft of the proposed new Water Law has some serious flaws of omission and commission in addition to many minor ones. The following critique focuses on a few major issues that AID-funded follow-on technical assistance could help the GSDR to address in the re-drafting of the law.

5.5.1 Sectoral Water Allocation. The draft law by and large rewards water-intensive, inefficient, and less beneficial users and uses of water. This is, or could become, a potential source of problems, fostering over-irrigation of some fertile lands and under-irrigation of others, and contributing to salinization. The proposed sectoral allocation priorities in the draft law conflict with the GSDR's of increasing production of import substitution crops rather than give higher priority to crops that increase export earnings. AID's agricultural strategy also promotes food self-sufficiency and thus import-substitution crops as a higher priority than horticultural exports. Irrigation of annual crops should be assigned a higher priority, based on rational economic criteria, than perennial crops. Sectoral and inter-sectoral water allocation should be based on objective criteria that use as parameters the land, water use efficiencies of crops, and

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domestic and international economic factors. The draft Law gives a rigid prioritization of sectors which are themselves not easy to define or are mutually exclusive. It is silent about intra-sectoral water allocation.

5.5.2 Water Pricing Policy. The draft Law includes some ambiguous and problematic provisions relating to pricing policy. Islamic law and the Somali constitution (Art. 42) consider water to be the property of the state. A distinction must be made, therefore, between the "pricing of water" and charging for the services needed to supply water. The "beneficiaries of the water resource development works are expected to contribute to the cost thereof" according to the draft Law. This legal provision is too limiting, particularly since Article 37 of the Somali constitution rightly makes it the duty of every "person" to contribute to state expenditures, and participate in the economic growth of the economy. Also, the draft law does not define "costs" or "beneficiaries", definitions of these terms should be added to Article 1. The universe of beneficiaries may need to be defined as including both direct and indirect beneficiaries, e.g., those benefiting from its primary and secondary effects. The rights of the state should not, and need not, be limited only to a contribution towards the capital cost of the development works, but rather, for example, should include charges for the recurrent costs of water delivery systems.

Furthermore, the draft Law uses concepts of economics incorrectly by assuming that the marginal cost of water supply only increases with the quantity supplied. The draft Law also allows "different categories of consumers" to be charged different "prices" without providing any criteria or rationale for that type of differential pricing policy decision. This could play havoc with national welfare and the spirit of the proposed law by allowing arbitrary rather than economically rational decisions. The draft Law should strengthen, on the other hand, the case for inter- and intra-sectoral comparison of costs and benefits, to maximize economic efficiencies in the allocation and use of water resources. There are, of course, instances when the market price of some water supplies should be kept comparatively low for equity reasons. Such decisions, too, should be brought within the purview of the national interest through a prescription of generalized and appropriate principles, criteria, and procedures of welfare economics.

5.5.3 Water Management Administration. The draft law, which is statutory law, seems to have become over-encumbered with the establishment of regulations and procedures which are the province of administrative law. Thus, for example, most of Articles 17 and 20 are unnecessary except for Article 17 (d) and the last sentence of Article 20 (a).

The draft Law rightly puts forth the purposes of the law, including water resources administration. However, he who wills the goals must also will the means to achieve them. The draft Law only increases administrative chaos, duplication, and costs. It proposes, for example, the establishment of three units of the "Water Resources Technical Staff Group." This apparently very large Group, with its own Director, is supposed to be established in the Hydrogeological Department which is headed by a Director. The Group has nationwide water-sector responsibilities as the operational arm of the proposed National Water Committee, whereas the Hydrogeological Department's work is basically restricted to groundwater. It is inappropriate that the Group should be housed within the Department. Furthermore, the Group has a "water resource inventory unit" and a "water rights administration unit", both vested with wide statutory mandates. The Department does undertake some groundwater inventory work and also has a water rights unit. It would be preferable for the GSDR to consider an alternative structure in which the Department would be merged with the Group as a first step in administrative rationalization of responsibilities.

The draft Law should be modified to set up a process for the reorganization of water-sector administration. Enactment of the water law should be conditioned upon the completion of administrative reorganization, without which the system may be able to muddle through, albeit with opportunities for real progress foregone.

5.5.4 Omissions in the Draft Law. The draft Law has ignored several key issues. These include the status of current water rights and the rights of customary water users; the transfer of water rights among users and uses; and the legal status of water user associations and other water management entities.

The draft Law must define the body of law applicable to the settling of water rights disputes. The Design Team recommends that the draft law be modified to read as follows: "Administration and adjudication of water rights in reference to this law will be based on the 'individual expert opinion' (ijtihad) based on the Quran, and modern science and technology. Recourse to any other source of law such as Somali customs and traditional Muslim water laws is not valid. As a binding authority, though, examples of such a recourse may be cited as precedents and cases in 'Muslim common law.'"

6. CIVIL SERVICE REFORM

The issues surrounding the Somali Civil Service have been well-studied separately by AID, and are not discussed herein in detail. The Design Team fully supports efforts by AID and other donors to encourage reform, including massive

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6. CIVIL SERVICE REFORM

The issues surrounding the Somali Civil Service have been well-studied separately by AID, and are not discussed herein in detail. The Design Team fully supports efforts by AID and other donors to encourage reform, including massive salary increases and the realignment of structures. This topic should remain at the forefront of any proposed issues for policy dialogue during the life of the project.

The problem of recurrent costs within the civil service administration is one that is germane to SWMP and one which needs to be addressed as a policy issue by the GSDR. There are too many government agencies with too many employees receiving too little compensation, insufficient government revenues, and too little attention being paid to the issue of recurrent costs within existing projects. In essence, projects fund programs and when projects cease, the GSDR appears to have little means to provide program continuity within its own ministerial structure.

This has created a situation that is perhaps unique to Somalia. On one hand, there is an Ordinary Budget that is inadequate to fund even a fraction of the operating costs of the economic and social ministries. On the other hand, there are over two hundred development projects with local cost budgets financed with aid-generated counterpart funds. Under the current system, these ministries can only function because of development projects' support.

There are a number of ways that the GSDR can take a more systematic approach to reducing the recurrent costs of its social and economic programs. These include (1) the increased use of cost recovery measures, such as user fees, (2) increased local contributions to development projects, and (3) the decentralization of government services and the funding of those services from increased revenue generation at the regional, district, and village levels. It is important that ministries begin to factor on-going sustainability costs into the design of projects--something that has not been done previously.

If policy changes concerning recurrent costs, increased civil service salaries, and increased revenues were implemented, the Ordinary Budget would be able to more adequately fund the on-going programs of the economic and social ministries as well as part of the recurrent costs of existing development projects. Ministries would then start thinking of development projects as the first stage of longer term GSDR programs, and efforts would be made to incorporate each project into the on-going programs of the ministries.

Design of the SWMP project recognizes the inadequacies of the current system. All project components will contribute to the strengthening of the Ministry of Agriculture and its existing departments. Institutional strengthening aspects of this project are in support of existing government agencies. SWMP is proposing the elevation of one existing MOA department to a directorate, and expanded staff for existing structures. In order to reduce the problem of recurrent costs, the following measures will be needed:

-passage of the water law (see Section 5, (above));

-collection of fees by the DILU and water users' groups.

Under this project, a water user fee structure is being recommended which would provide adequate revenues to finance the operating costs of the DILU (at the Central, regional and local levels).

7. PRIORITY AREAS FOR CONTINUING POLICY DIALOGUE

To maintain the momentum of agricultural economic liberalization and strengthen the readjustment process, the macro-economic policy dialogue should continue over the life of the project. Dialogue should be stepped up concerning reform of the legal and institutional aspects of water management.

The following is a list of key unresolved macro-policy issues affecting agriculture to be included in the on-going dialogue with the GSDR and other donors:

7.1 Macro-economic Issues

7.1.1 Unification of the foreign exchange rate according to market forces to stimulate exports and reduce food imports.

7.1.2 Careful monitoring of concessionary food assistance to minimize adverse price and production effects from oversupply,and elimination of maize imports.

7.1.3 Reduction of export tariffs on livestock to benefit from Somalia's comparative advantage and enhance competitiveness in world markets.

7.1.4 Privatization of the Hides and Skins Agency.

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7.1.5 Privatization of fuel import and distribution

7.1.6 Removal of ONAT subsidies to make private sector tractor services more competitive, and privatization of ONAT.

7.1.7 Promotion of interest rate policies which maintain real rates of interest after inflation to encourage private savings.

7.1.8 Removal of parastatal fertilizer subsidies to encourage private sector marketing.

7.1.9 Land-tenure reform and divestiture of parastatal farms and special interest cooperatives in favor of smallholders.

7.1.10 Tariff reform with uniform tariffs for public and private sector enterprises.

7.1.11 Stabilization of flow of and increase, if possible, in volume of foreign exchange supplied through the auction mechanism.

7.1.12 Reduction of administrative barriers faced by private importers.

7.1.13 Simplification of land registry procedures, and reduction of de facto costs of registration.

7.1.14 Institution of irrigation water charges based on marginal revenue pricing.

7.1.15 Establishment of sub-sectoral water allocation policies which promote import substitution crop patterns.

7.2 Legal and Institutional

7.2.1 Passage of a national water law with provisions for recovery of recurrent costs of water delivery services through user fees.

7.2.2 Regularization of ministries, projects and autonomous agencies.

7.3.3 Increased civil service salaries.

ANNEX I

INSTITUTIONAL ANALYSIS

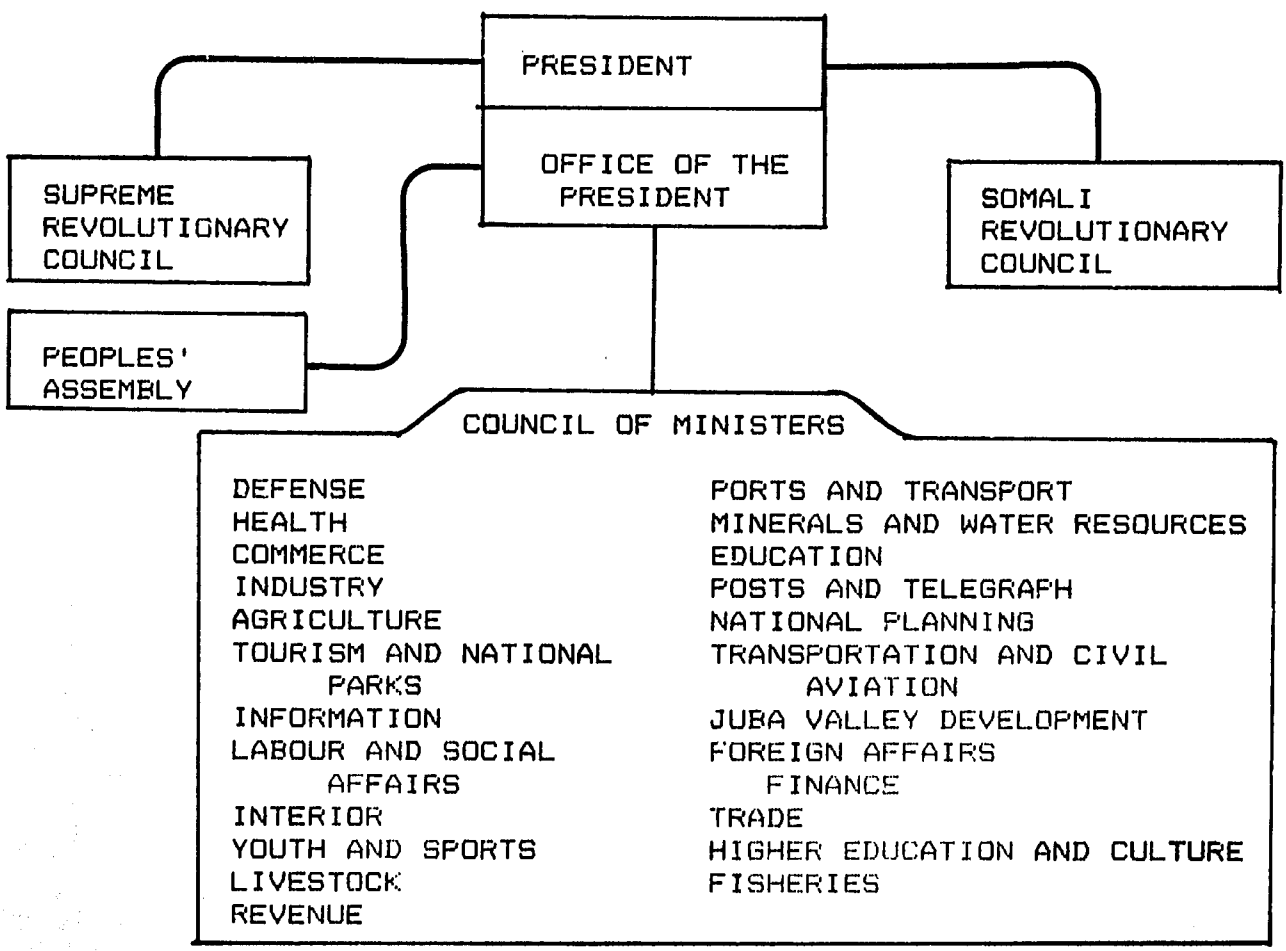
ANNEX I: INSTITUTIONAL ANALYSIS

1. INSTITUTIONAL FRAMEWORK

1.1 Present Institutional Framework for Water Resource and Agricultural Development

1.1.1 Central Government. The GSDR is composed of three main strata: the highest political authorities; an implementing level consisting of ministries, autonomous agencies, and joint projects; and local government--an extension of the central government. Policies are implemented and laws executed by the 24 civilian ministries which, together with the Office of the President and the Ministry of Defense, comprise the "central government" (See Figure I-1). In addition, over 60 "autonomous agencies" operate as parastatal or relatively independent public enterprises under the auspices of specific ministries.

Figure I-1: Somali Central Government (simplified)



- Ministries: Within each ministry are a Minister and normally a Vice-Minister, both of whom are appointed directly by the President. The Permanent Secretary coordinates the work of one or more Director(s) General--usually the key managerial positions within each ministry. Ministries are subdivided into departments, generally from four to eight and the departments may be further divided into services and sections. Each ministry, no matter how small, has its own administrative support sections. Lines of jurisdiction among many of the ministries are unclear, and there is some obvious duplication of effort. A number of ministries make decisions upon a common body of data or serve a common clientele. For example, eight ministries have significant responsibility for water resource development; two are concerned with transportation; four deal with major aspects of the rural economy. The trend toward increased fragmentation continues, despite the difficulties that result. This fragmentation makes it very difficult to coordinate sectoral development. The large size of the Council of Ministers restricts its ability to serve as an effective consultative, policy review and coordinating institution.

- Autonomous Projects: A large number of administrative units known as "autonomous agencies" have been created by legislation or decree and attached to one or another of the ministries. These agencies report directly to the Minister or Vice-Minister, not to the Director-General. Four types of autonomous agancies now exist: (1) non-revenue producing delivery agencies (e.g., the Somali National University); (2) "autonomous projects" or "joint ventures" based on agreements between the government and a donor organization or a private company (e.g., Somali Airlines); (3) manufacturing establishments (e.g., Jowhar Sugar Factory) and (4) financial institutions and trading companies (e.g., Hides and Skins Trading Agency). The latter two were expected to become financially self-supporting, but have not.

Legislation was initially designed to place the employees of these agencies under the same personnel system as that of ministries. Subsequent decrees and legislation have substantially altered the status of the employees of autonomous agencies. Autonomous projects currently avoid regular bureaucratic procedures of ministries and enable the projects to provide higher salaries and better benefits to their employees than do ministries. The projects have, in effect, become super-agencies attached to ministries. Each project maintains efficient administrative structures and procedures, financial autonomy, and a close link to the decision-making levels of government. By consequence, they have in certain instances rendered ministerial structures non-existent.

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Within the Ministry of Agriculture, a committee is set up to run and coordinate project activities. It is composed of the Permanent Secretary and Vice Minister of Planning of Agriculture, representatives of the Ministries of Finance and National Planning, and the Project Manager. The committee is empowered to decide on project policy, approve the budget, and advise on recruitment of senior staff and contract awards. The Project Manager, who reports directly to the Vice Minister of Agriculture for Planning, directs the day-to-day activities of the project. Progress of work is also monitored by this committee.

- Local Government: Somalia is divided into administrative Regions. The Shebelli River flows through three of these Regions--Hiraan (to the north), Middle Shebelli and Lower Shebelli. Each Region is subdivided into administrative Districts, eleven of which border the Shebelli River. The Ministry of the Interior supervises all local governments except the municipality of Mogadishu. Regional governments are headed by a Governor appointed by the President. The Governor is simultaneously Chairman of the Regional Development Council and head of the Regional Party Committee. In matters of administration, the Governor executes the orders and directives of the Ministry of the Interior. He also maintains direct contact with all central government bodies. He is responsible for supervising and coordinating all government activities in the Region.

The Regional Development Council (RDC) is charged with the region's administrative, security and development functions. In addition to the Chairman, the Regional Development Council consists of the Governor's political and administrative assistants; regional representatives of the ministries of Public Works, Agriculture, Education, Health, Mineral and Water Resources, and Livestock, Forestry and Range; local commanders of the armed forces; heads of social organizations; District Commissioners; Chairmen of the dstrict Peoples' Assemblies; and district executive officers. In effect, regional and district representatives of line ministries implement their program under direct supervision of their ministerial departments. For the SWMP target area in Shalambood, the RDC is not the effective implementing agency for any project activities, but needs to be kept informed of what is happening.

Responsibility for agricultural development in the project area rests primarily with the Ministry of Agriculture, assisted by parastatal and public agencies. The Ministry of Livestock, Forestry and Range, and the Ministry of Mineral and Water Resources are also involved in the agricultural sector, as are credit institutions.

1.1.2 Ministry of Agriculture. The Ministry of Agriculture, and its satellite organizations, has primary responsibility for the agricultural development of the target area. Development and management of surface water resources and irrigation, and the administration of land, agricultural research and extension are exclusively the responsibility of the Ministry of Agriculture. Supply of agricultural inputs, such as agricultural machinery services, seeds, pesticides, and fertilizers is also handled by the Ministry.

The Ministry of Agriculture operates through its own departmental, regional and district offices. In the Shalambood target area, the Department of Land and Water Resources (DLWR) and the Regional and District Agricultural Services have the major responsibility for coordinating agricultural services. DLWR is by far the most active and effective Department within the Ministry.

In addition, services are provided through the activities of subsidiaries and autonomous projects, as follows:

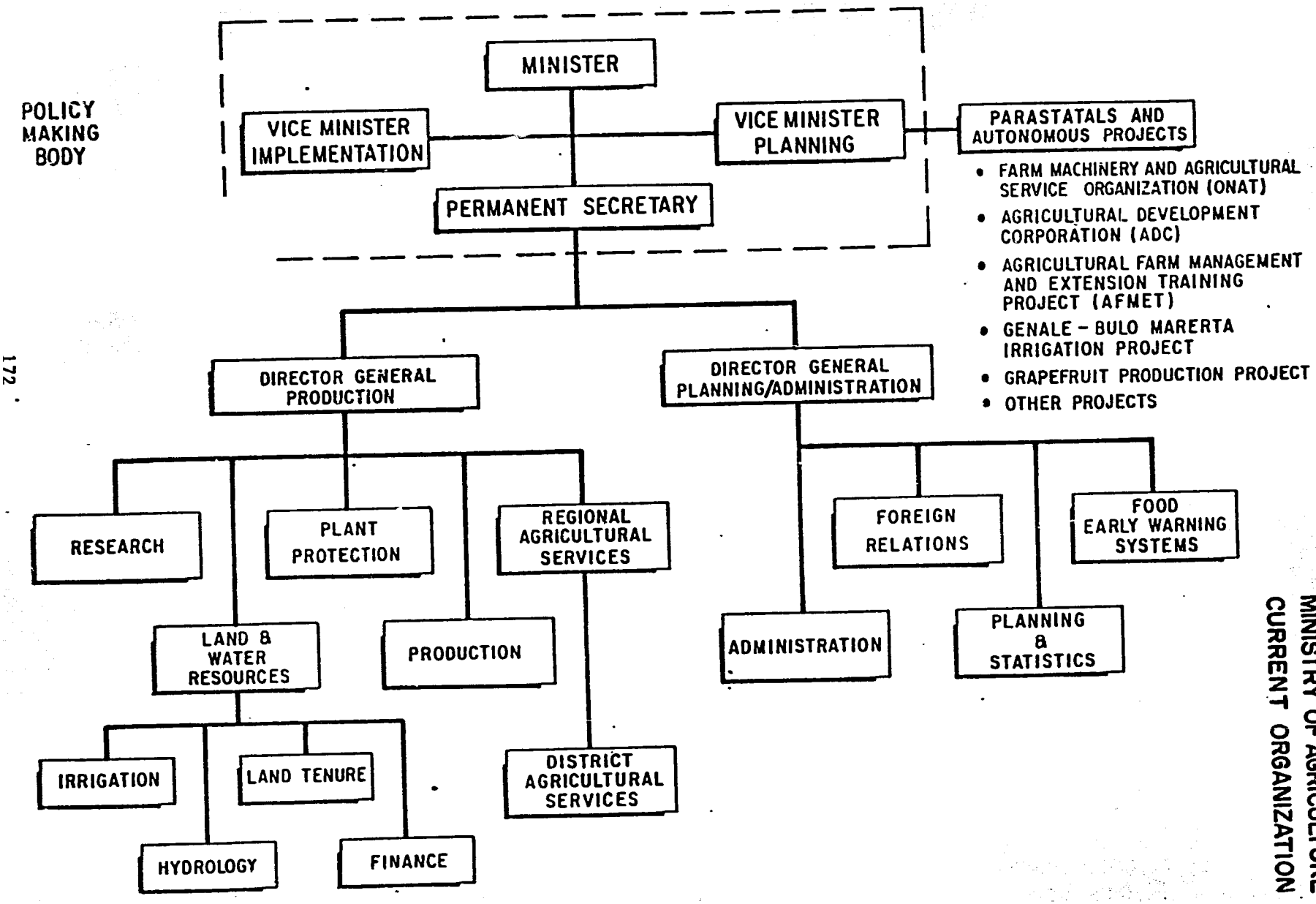
- Extension services are provided by the Agricultural Farm Management and Extension Training Project (AFMET);

- Agricultural research is carried out at the Central Agricultural Research Station (CARS) at Afgoi;

- Assistance in grain marketing, purchasing and storage is provided by the Agricultural Development Corporation (ADC); and

- Physical inputs such as agricultural mechanization services are provided by the Farm Machinery and Agricultural Services Organization (ONAT). Seeds are provided to producers through several channels, with the Seed Multiplication Center (SMC) at Afgoi playing a central role.

The principal policy and decision-making body within the Ministry of Agriculture is composed of the Minister and two Vice-Ministers. One Vice-Minister, in charge of planning, coordinates Ministry of Agriculture activities with the Faculty of Agriculture, and directs technical activities through the Permanent Secretary. The other is in charge of implementation, and also works through the Permanent Secretary. The Permanent Secretary coordinates and supports two Directors General: one in charge of Production, and one in charge of Planning and Administration. The Director General of Production directs the Departments of Land and Water Resources, Research, Production, and Plant Protection. The Director General of Planning and Administration is in charge of the Departments of Foreign Relations, Planning and Statistics,



MINISTRY OF AGRICULTURE
CURRENT ORGANIZATION

Figure I-2

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Administration, and Food Early Warning Systems (see Figure I-2). In the Region of Lower Shebelli, the Ministry is represented by an Agricultural Coordinator who administers local personnel and coordinates with the Regional Governor.

-The Department of Land and Water Resources (DLWR):

The Department of Land and Water Resources is responsible for data collection, operation, maintenance and management of surface water resources, irrigation systems, and implementation of government policy regarding land reform. It has responsibility for the operation and control of many of the major control structures on the main river stem in the Upper, Middle and Lower Shebelli. Its regional office in Genale, Lower Shebelli, is responsible for the management, operation, and maintenance of the Genale barrage and the primary and secondary canals in the Shalambood target area.

The regional and district staff of DLWR assume collective responsibility for each of the four sections within the department--Irrigation, Hydrology, Land, and Finance. Countrywide, a total of 218 staff are under the jurisdiction of DLWR working in 14 regional and 46 district offices. Along the main stem of the Shebelli River, DLWR, in effect, manages two sets of staff within its regional and district offices, both related to irrigation activities: those associated with the Canal Desilting Project, and water administrators. Approximately 131 staff scattered throughout 11 Districts in Hiraan, Middle and Lower Shebelli are responsible to the Director of DLWR and deal directly with water-related activities. (Irrigation districts' boundaries are basically the same as those of administrative districts, with a few exceptions.) Thirteen staff work in three districts plus the Duduble Flood Relief Channel in Hiraan Region. In Middle Shebelli, 43 work under the Jowhar area Desilting Project and 35 with the Jowhar Offstream Storage Project. In Lower Shebelli, 40 staff are employed in the regional and six district offices. They include the regional officer, three district officers and various skilled, semi-skilled and unskilled staff (see Table I-1). Regional Coordinators of other departments officially report to the Regional Coordinator for the Ministry of Agriculture, but usually deal directly with DLWR. The Regional Coordinator also maintains regular contact with the Director of DLWR. Despite the government decree to integrate all regional offices in Shalambood, DLWR kept its regional and related district office in Genale to be closer to the Genale Barrage.

A new barrage built at Kurtenwaare, south of the target area, is outside the control of DLWR. Kurtenwaare is an older (1976-78) scheme of the Settlement Development Agency (SDA) within the MOA, and to date the SDA maintains the barrage.

Table I-1: Department of Land and Water Resources: Regional and District Organization and Staffing along the Shebelli River

		Staff	
REGION: Hiraan			
REGIONAL OFFICE: Beletweyn			
DISTRICTS:	Beletweyn Buloburte Jalalaqsi	13	3 Districts and Duduble Flood Relief Channel
REGION: Middle Shebelli			
REGIONAL OFFICE: Jowhar			
DISTRICTS:	Jowhar	43	Desilting Project
	Balad	35	Jowhar Offstream Storage
REGION: Lower Shebelli			
REGIONAL OFFICE: (Merka)/Genale			
DISTRICTS:	Genale	16	
	Qorioley	6	
	Kurtunwaare	2	total of 40 in water distribution
	Afgoi	12	
	Sablale	2	
	Brava	2	
	TOTALS:	131	

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- Regional Agricultural Services: The Director of the Department of Production under the Director General of Production, coordinates the Regional and District Agricultural Services, which include 17 regional and 57 district offices throughout the country. The Regional Agricultural Services officer, representing the Ministry of Agriculture in the Lower Shebelli Region, also performs the duties of the District Agricultural Services Representative for the Merka District. The officer maintains an office facility in Shalambood and is assisted by three permanent staff, tut has no vehicle or driver at his disposal.

-Department of Research: Agricultural crop research in Somalia is the responsibility of the Agricultural Research Institute (ARI), a department within the Ministry of Agriculture. Research efforts have been assisted since Independence in 1960 by a number of international, bilateral and private organizations. The Director of ARI coordinates research at five experimental stations, one of which is the Central Agricultural Research Station (CARS) at Afgoi. The CARS facility, located about 80 kilometers upstream of Shalambood, has potentially 200 hectares available for crop production research for rainfed and irrigated farming; only 40 hectares are currently being used.

The Faculty of Agriculture of Somali National University , which concentrates on teaching, is involved in some aspects of crop research, mostly in collaboration with ARI at CARS.

Central Agricultural Research Station CARS. The CARS facilities include laboratories, workshops, stores, and a library, which is the only usable place for staff meetings. The station overall is in a seriously rundowm and deteriorated condition. The field drains no longer function and irrigation canals are partially filled with silt. Inadequate land leveling results in poor crop stands from water logging and non-uniform growth of surviving plants, both of which adversely affect trial results. The buildings remain structurally sound, but need to be completely refurbished. The road from the highway to the station is neither paved nor graveled and is in critical need of repair in several locations. The basic tillage equipment on site needs to be repaired and supplemented. Equipment, supplies and facilities are almost nonexistent.

Organization. The station was recently reorganized into 10 research sections: Agronomy, Plant Breeding, Soils, Irrigation, Forage, Vegetables, Fruits, Entomology, Pathology and Economics. Some of these sections (Economics, Forage) are at a rudimentary stage of development, and lack qualified staff and equipment. Five support service units, Administration, Farm Operations, Agricultural Machinery and Workshop, Essential Services, and Library assist research

sections in day-to-day activities. Attached to the station are also the Seed Production Unit and the inactive Research-Extension Liaison Unit, two benchmark villages, and selected villages for large scale evaluation of technology.

Professional Staff. The CARS staff is comprised of about 40 graduates with BS degrees in various agricultural disciplines, but predominantly in agronomy, obtained almost exclusively from SNU/FOA. Two agronomists, one horticulturalist and a plant pathologist obtained their B.S. degrees from universities in the USSR. There are all together only 5 graduates with M.S. degrees, all earned in foreign countries: a plant pathologist (Yugoslavia); soil scientist (Belgium); agronomist-oil crops (India); and sorghum breeder (India). Since the plant pathologist is currently preoccupied with administration, and sorghum will not be of concern to SWMP1, only the two remaining researchers with MS degrees in soils and oil crops can make significant contributions to the project's research program. However, the oil crops agronomist is being transferred to the FOA and will be able to work at CARS only part-time as will the other participating FOA staff members.

The Faculty of Agriculture does not have its own land, therefore all field trials are conducted at CARS in cooperation with the station's staff. Four of the FOA departments are in regular contact with CARS: Plant Production and Protection, Agricultural Chemistry, Rural Engineering and Agricultural Economics. Qualifications of FOA staff are enumerated in Annex N: Training Plan.

There are essentially no Somali Ph.D. scientists available for agricultural research and there is only one MS (soils) researcher working in a full-time capacity. Most of the professional staff are recent graduates with virtually no research experience. It is therefore obvious that any proposed research program will require external technical assistance to succeed.

In addition to the severe shortage of highly qualified personnel, available staff are generally engaged in private farming and/or second jobs to supplement their extremely low Civil Service salaries. Thus, absenteeism is widespread and it has a detrimental effect on research, where timeliness of treatments and observations are essential for obtaining standard results. To eliminate this problem, GSDR local cost funding in the SWMP1 budget will provide incentive allowances to all participating personnel.

- Autonomous Projects:

Agricultural Farm Management and Extension Training Project (AFMET): Extension services and activities are presently handled by AFMET through its National Extension

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Service. AFMET is a multi-donor project under the Ministry of Agriculture. Funding for AFMET 2 is proposed by IBRD and ADB but is not yet fully defined. AFMET 1 successfully initiated the establishment of an appropriate extension service and provides a sound basis on which to build the next phase.

AFMET began operations in 1981 and uses a modified form of the "training and visit" (T&V) system. The National Extension Service (NES) which falls under AFMET, administers the field offices. Regional Extension Officers (REO's), answerable to NES headquarters, supervise District Extension Officers (DEO's) who, in turn, supervise Field Extension Agents (FEA's). The REO's are supported by Subject Matter Specialists (SMS's), usually two (2) in number.

Although Lower Shebelli Region is one of the major foci of AFMET, the Shalambood target area is not fully covered by FEA's. Only one of the three operating in the district is working exclusively within the Shalambood target area. FUrthermore, the area is split between two Extension Divisions. Current coverage of FEAs is shown in Figure I-3.

The ratio of farm families to FEA's under AFMET varies, though the interim target is 800:1. Within the Shalambood target area, there are estimated to be just over 3000 farm families. The ultimate objective of the extension program is to improve the ratio to 500:1.

Under the T&V extension system, each FEA is to program visits to 48 farmers, one visit to each farmer in an two week period. Morning visits are to be supplemented by afternoon group meetings for all the Contact Farmers (CF) visited during the mornings and their "follower farmers (FF). Theoretically, each CF nominates nine or ten FF's. Within the Shalambood area, group meetings assume precedence over farm visits in some sections where "farmers" are laborers on plantations. Because the location of the laborers' plots may change from season to season, many are not reached by extension. Each contact farmer has a demonstration plot where improved husbandry techniques are employed, or sometimes an on-farm verification trial plot. These plots are commonly one "Jibal" (25 m x 25 m) in size. As the extension packages are as yet not finalized recommendations, demonstrations also have a role in the verification of technical packages.

AFMET's Extension Training Center (ETC) at Genale is the Regional Headquarters for extension in SHalambood. The REO (Lower Shebelli, SMS's, and DEO's (Merka 1 and 2) are based at the ETC Genale. The ETC is the site for the two-day, monthly training of the 45 FEA's in the region, and is also used for farmer training. Additionally, the ETC has a farm which is used for demonstrations. Some trials at ETC Genale are currently carried out by research personnel from

CARS, but the majority fall directly under extension. Currently, a total of 15 hectares are cultivated out of a potential area of over 100 hectares.

The AFMET program is generally considered to be successful, and a solid framework for extension. Yield surveys are built into the system under AFMET's Monitoring and Evaluation branch. The surveys reveal impressive yield increases for maize on contact farmer's plots, and adoption rates of certain techniques (for example, line planting) have also been very positive . In the Shalambood target area, however, the AFMET program has not yet been fully established, in terms of either personnel or facilities.

The major constraints to a more effective extension program within the target area are as follows:

- Insufficient numbers of FEA's;
- Lack of transport, office/house facilities and equipment for FEA's;
- Overly strict adherence to visit programs which could be temporarily suspended in "low seasons" to allow for extra FEA training;
- Lack of enumerators needed to monitor extension effectiveness and to survey the felt needs of the farmers;
- Need for an SMS qualified to advise FEA's in on-farm water management techniques;
- Inadequate facilities at ETC Genale;
- Paucity of research recommendations, especially for crops other than maize, stemming from underdeveloped research capacity and lack of a collaborative adaptive research policy;
- Poor coordination between research and extension, symbolized by an unutilized "liaison office" at CARS.

A proposed second phase of AFMET, to be implemented in late 1987, if approved, would provide IBRD funding to strengthen the extension system by, inter alia, increasing the number of SMS's and FEA's, building houses and offices, rehabilitating and expanding ETC Genale and establishing a Directorate of Research at the national level.

- Parastatals:

i. The Farm Machinery and Agricultural Services Organization (ONAT): ONAT is a government institution under the authority of the Ministry of Agriculture, although it reports to the Ministry of Finance on accounts and budgets. ONAT's primary activities are to provide tractor hire services to private farmers and government agencies; repair and maintenance of agricultural machinery; and training of

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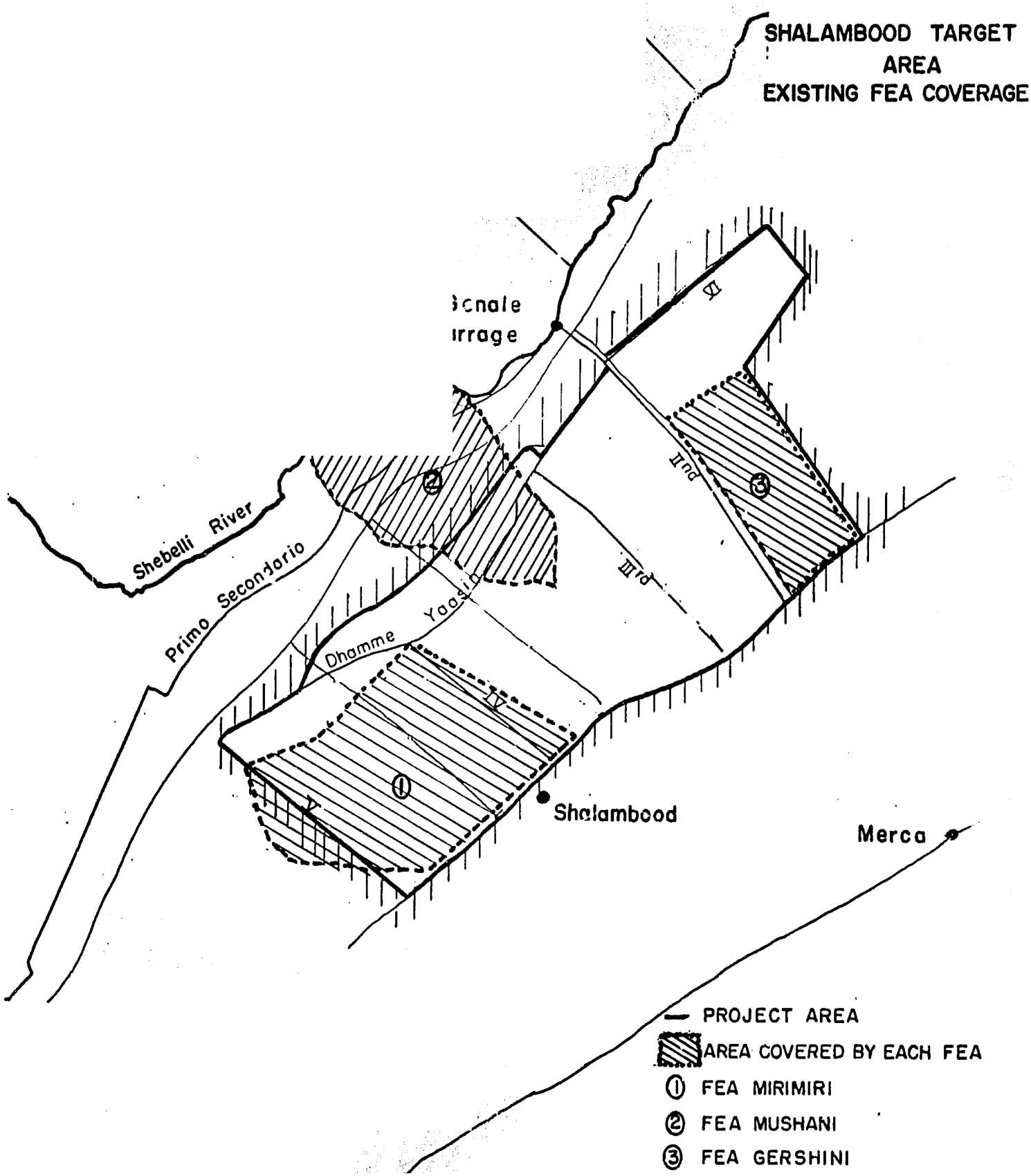
Figure I-3



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mechanics and operators. ONAT also undertakes land preparation and construction of irrigation facilities. ONAT has a regional office in Shalambood which serves the Merka district including the Shalambood target area. ONAT is further discussed in Annex H.

ii. Agricultural Development Corporation (ADC): ADC was initially created under the Ministry of Agriculture as the sole authorized buyer and seller of domestic food grains. In 1984 the law was revised and farmers are no longer required to sell to ADC. ADC is based in Mogadishu, with 34 field stations located throughout the country. A regional center is located in Shalambood, the collection point for the Shalambood target area. The current financial position of ADC is tenuous: the World Bank is supporting a major organizational study which should result in divestiture and improved operations. Again, Annex H provides additional information on ADC's status.

1.1.3 Ministry of Livestock, Forestry and Range (MLFR): The Ministry of Livestock, Forestry and Range is engaged in drilling wells for both human consumption and livestock watering in rural or pastoral areas. Small water reservoirs with earthen dams have also been built by agencies within the ministry to provide an adequate water supply during the dry season. The regional authority for the Ministry of Livestock, Forestry and Range for the Lower Shebelli is the regional Veterinary Service based in Shalambood.

The National Range Agency (NRA), is an autonomous agency under the MLFR. In the Shalambood target area, the NRA operates three nurseries (Shalambood, Qorioley and Genale) which provide seedlings for windbreaks, fuelwood and agroforestry plantations in the area.

1.1.4 Ministry of Mineral and Water Resources (MMWR): The Ministry of Mineral and Water Resources is responsible for providing water for both human and livestock consumption. At the ministerial level, the primary task is to direct and monitor the activities of the Water Development Agency (WDA) plus three municipal water agencies. From 1979 to the present, USAID has provided direct institutional and financial support to the WDA through the Somalia Comprehensive Groundwater Development Project. The Ministry is also responsible for proposing legislation dealing with community water supply and has taken the lead in promoting the new draft National Water Law. The Ministry's Hydrology Department, which was established in 1978, is responsible for research and hydro-geological data, the design and implementation of groundwater exploration projects, and advising on water legislation and follow-up policies.

The Water Development Agency's original mandate included research into water resources, collection and evaluation of water resource data, preparation of comprehensive plans for the proper use of water resources, coordination of water use within Somalia through project preparation programming, and execution and construction of water supply facilities. While there is nothing in its mandate to preclude the management of surface water resources, it has restricted its application of the law to groundwater resources. This is due in part to the mandate of the Ministry to which it is attached, and in part to the fact that surface water management was already under the purview of DLWR within the Ministry of Agriculture.

A National Water Data Center Project, which began in 1986, was established under AID and UNDP funding to centralize the collection and interpretation of relevant water data. Theoretically responsible to both the Ministry of Agriculture and the Ministry of Mineral and Water Resources, this project is supposed to take into consideration both groundwater and surface water resources toward the development of a national master plan for water resources.

The preparations for a new National Water Law are concentrated in the MMWR. This Ministry is responsible for leading the discussions with other ministries on the proposed articles of the draft water law.

1.1.5 Ministry of Juba Valley Development. The Ministry of Juba Valley Development was recently established to regulate the development and utilization of the Juba River. It is understaffed and undergoing major growth pains. A major 1987 IBRD-funded study of the "Organization and Management of the Power Sector" is likely to result in a reorganization of this ministry to respond to projected needs if the Bardhere Dam is built.

1.1.6 Ministry of Industry. The Ministry of Industry maintains control over the operation of the cotton factory, including the Balad barrage on the main river stem--the major upstream control structure not under the jurisdiction of DLWR within the Ministry of Agriculture.

1.1.7 Other Public Entities. Agencies other than those already mentioned are also involved in water resource development. The Ministry of the Interior represents local communities' interests and itself promotes and initiates small scale water supply projects in the rural areas. The Ministry also performs coordinating functions, raises funds and organizes self-help labor for relevant activities, mainly at the regional and district levels. The Ministry of Health's role includes control and surveillance over water quality and advising on environmental and sanitation issues. The Ministry of National Planning has responsibility for

coordinating overall economic planning activities in all sectors, including water supply and sanitation. Somali communities actively participate in water resource development and management. Appointed local level water committees are responsible for coordinating the water-related activities of several villages and hamlets.

Additionally, there are several small public institutions in the Shalambood target area that are engaged in farming. These include the state farms and special interest cooperatives discussed in Annex H, as well as other cooperatives and water user groups discussed in Annex M. Currently, as a result of fragmentation in water resource management, there is little communication and collaboration between the various groups.

1.1.8 Mixed Public/Private Joint Ventures/Somalfruit. Somalfruit is a large, mixed public/private agro-industrial joint venture. It is responsible for the purchase, export and marketing of bananas (and more recently some watermelons) produced by private farmers. It is headquartered in Mogadishu and maintains three branch offices, including one in Shalambood. The company is comprised of independent Italian shareholders (60 percent) and the National Banana Board (40 percent).

Somalfruit is a high-tech, profitable operation that serves as a focal point of activity in Shalambood. It rents tractors and other equipment to small farmers and cooperatives in the area during the frequent nonavailability of ONAT machinery. Somalfruit is also the major wage employer in the Lower Shebelli Region. It is an example of successful large-scale agricultural production in the Lower Shebelli.

1.2 Structural Issues

1.2.1 Coordinated Planning and Project Collaboration along the Shebelli River. A primary shortcoming in the design and development of water resource management has been the failure to design effective institutions for the coordinated planning, regulation and administration of regional water systems. The most important elements in water resource management are, without doubt, the abilities to base policy and planning on realistic assessments of available water resources and to institutionalize mechanisms for optimal allocation of those resources. A fragmented approach to either infrastructural development or water resource management may lead to over-allocation of water resources, distortions in technical planning, consequent shortfalls in productivity, and high degrees of conflict among those populations which depend upon regular access to water.

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Development activities along the length of the Shebelli River are proceeding without any significant degree of coordination between projects (ref. Annex K). While extensive resources have been devoted to project planning and implementation, existing hydrological models which form the basis of long-term projections for the viability of those projects could be rendered meaningless without the creation of institutionalized mechanisms for inter-project coordination. The need to coordinate upstream and downstream development activities is a necessary precondition for the success of SWMP or any other project along the main river stem. Seasonal water allocation must be undertaken on the basis of joint assessments of resource availability and demand.

Additional factors contribute to the desirability of strengthening centralized water resource management along the Shebelli River. None of the existing projects along this river is of sufficient scope to be able to support the high recurrent costs associated with infrastructural development, agricultural extension, farm credit, mechanization, and human resource development that are common needs. Fiscal and human resources of government ministries and agencies are extremely limited at present, and such services as do exist are poorly coordinated in their fields of intervention.

It is inevitable that some degree of fragmentation of administrative responsibility will occur in resource systems that have major impacts on a variety of public and private sector constituencies. Nonetheless, improved coordination is a prerequisite for optimal development. Planning horizons and operating efficiencies may be dramatically broadened where institutional provisions exist for the sharing of basic technical information, the negotiation of competing interests, and the sharing of costs for communal needs.

In the case of the Shebelli River basin, there are specific problems with the current system of water resource management. First, there is no single institution responsible for coordinating the utilization of surface water and groundwater supplies, although both are being used for irrigation. These two functions are housed within two separate ministries: the Ministry of Agriculture, and the Ministry of Mineral and Water Resources, respectively. Secondly, the control of surface water for irrigated agriculture is fragmented; only five of the seven main barrages on the main river stem are under the direct supervision of the Department of Land and Water Resources within the Ministry of Agriculture. What happens with the other two can have a significant impact on water availability for downstream users. All control structures on the main river stem--the barrages and head regulators--need to be transferred to the jurisdiction to the same agency for the

entire river, if national basinwide irrigation management policy is to be developed and implemented.

1.2.2 Ministries, Departments, Autonomous Agencies and Development Projects. As discussed in Section 1.1 above, a large number of administrative units known as "autonomous agencies" have been created by legislation or decree and attached to one or another of the ministries. The total number of autonomous agencies is now over 60 with an estimated workforce of over 30,000 employees. Within the Ministry of Agriculture, these agencies report directly to the Vice-Minister for Planning. They function outside the normal administrative framework in at least two ways:

(1) They avoid the regular bureaucratic bottlenecks of the ministry by avoiding ministerial departments and reporting directly to the Vice-Minister. These agencies and projects are more than (perhaps redundant) parallel structures to ministerial departments; they, in fact, supercede departments by not reporting to either a Director General or the Permanent Secretary.

(2) Employees of these autonomous agencies and projects are no longer considered civil servants and fall outside the government personnel system. They currently command much higher salaries and greater benefits than do regular government employees.

The effect of this system is to render any parallel Departmental Authority practically useless. Significant aspects of Departmental activities function independently from the Ministry's own program. Budgeting, program development and administration, rather than being supervised by the Director for Production within his departmental jurisdictions, function outside existing departmental channels.

Even more divisive factors within ministries are the income and benefits inequities between the employees of "projects" and the civil service. In accordance with IMF standby agreements, the GSDR has not raised civil service salaries since 1981. As a result, real salaries of civil servants are only about 20 percent of what they were in 1982 and are only a fraction of what is needed for subsistence. According to Ministry wage scales now in effect, secondary school graduates with a degree from the agricultural school now earn a government salary of So.Sh. 800 per month. Those educated to a B.S. level in such fields as engineering and perhaps with some graduate level training earn So.Sh. 1,600 per month. Both amounts are clearly inadequate. The Design Team estimates that a typical university graduate is likely to be spending So.Sh. 20,000-30,000 per month to support a family. Civil servants can survive only by having second jobs or by having their incomes supplemented from sources other

than the salary component of the Ordinary Budget. A major source of supplements is counterpart funds generated by non-project foreign assistance, which become "project allowances" for project personnel.

It is apparent that the widening differential between ministerial compensation and that of "project" employees of the government has had certain consequences. Those employers that offer higher total compensation are able to recruit the best of each new cadre of graduates. In addition, there have been a considerable number of transfers of experienced and capable employees from the ministries to agencies and projects.

Line ministry employees are paid from the GSDR "Ordinary Budget". It is estimated that in 1986, the Ministry of Agriculture's receipts from the ordinary budget were less than one sixth of receipts from the counterpart funds that support MOA projects ("A Study of the Recurrent Costs of Development Projects in Somalia" n.a. n.d.). These counterpart funds make up the well funded Domestic Development Budget (DDB) that can be used to supplement salaries and fund such key non-salary expenditures as fuel, vehicle maintenance, utilities, and building and equipment maintenance. Since Ordinary Budget funds are known to be limited and salaries can be only a fraction of what is needed for subsistence, ministries allocate as much staff and office space as possible to development projects that can draw from the DDB.

This has created a situation in which, on one hand, there is an Ordinary Budget that is inadequate to fund even a fraction of the operating costs of the economic and social ministries; on the other hand, there are over two hundred development projects with local cost budgets financed with aid-generated counterpart funds. Under current policy guidelines, the ministries can only function because of development projects.

From a developmental perspective, the situation is counterproductive; the development program consists almost entirely of non-sustainable development projects. There are few sustainable government programs in the economic and social sectors. Ministries and donor agencies must begin to integrate development projects into their on-going programs and to channel counterpart funds through the Ordinary Budget. Projects must begin to collaborate more fully with directorates and departments while moving toward full integration within the ministerial structure.

1.2.3 Fragmentation of Agricultural Research and Lack of Coordination with Agricultural Extension. Agricultural research is currently being undertaken by three agencies within the GSDR: the Agricultural Research Institute (ARI), the Agricultural Farm Management and Extension Training

Project (AFMET), and the Somali National University. ARI, actually the Department of Research within the Ministry of Agriculture, coordinates research at five experimental stations. The bulk of the research funded through the ministry structure and not yet "projectized" is conducted at the Central Agricultural Research Station (CARS) at Afgoi on 40 hectares of rainfed and irrigated farm land. The majority of regular civil service (i.e. non-project) personnel is also located at that site--80 kilometers upstream from Shalambood. Research at other sites has generally been set up as a separate project site outside of the Department, e.g., Bonka Research Station in Baidoa has been supported by AID's Bay Region Development Project and will soon move to IBRD sponsorship under AFMET 2. In other words, the ARI has slowly been dismantled in the expedience of donor-funded projects, leaving CARS and a few ministerial personnel to try to develop and implement a cohesive agricultural research strategy for Somalia.

Few direct institutional linkages between these agencies now exist, although some informal relationships have evolved. Probably the most significant is the informal personalized linkage between the FOA and CARS. The FOA has the staff, CARS has the facility, and a collaborative relationship between the two agencies has evolved. There is little formal or informal collaboration, however, between CARS and the agricultural research component of AFMET and, at times, there appears to be competition between their staffs. The empty Research/Extension Liaison building at CARS symbolizes the lack of cooperation between the two.

In addition, the training provided under the AFMET project has been traditionally directed to rainfed agriculture. Agricultural development under irrigation has specific demands, including those related to irrigation water management, without which the extension effort cannot contribute to the achievement of production objectives.

2. INSTITUTIONAL FRAMEWORK: SHEBELLI WATER MANAGEMENT PROJECT

The GSDR Ministry of Agriculture shares AID's concern over the ineffectiveness of its programs due to institutional fragmentation and and the inequities and ineffiencies of the line ministry/"donor-funded project" dichotomy. Through collaboration in the design of SWMP1, the MOA and USAID/Somalia have identified a new framework that will not only greatly increase the likelihood of success of SWMP1 interventions, but assure that they are sustained over time.

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The proposed reorganization will establish two new Directorates, as follows:

- The DLWR will be elevated to the status of a Directorate of Irrigation and Land Use. It will retain all of its current functions and will, in addition, take over a number of others. It will be headed by a Director General, who will report directly to the MOA Permanent Secretary.

- The Department of Research will be elevated to the status of a Directorate of Research, retaining all of its current functions and slowly gaining back some that have been moved out to projects. Its Director General will also report to the Permanent Secretary. The creation of this Directorate will be funded by IBRD under the umbrella of AFMET 2; its creation will greatly enhance AID-supported efforts under SWMP's adaptive irrigated agricultural research component.

In order to alleviate inequities, line ministry personnel assigned to these ministries will receive project-level remuneration, to be mutually agreed upon by AID and the GSDR. This step should enhance the new Directorate's abilities to attract and maintain qualified staff, and represents a modest start on Civil Service Reform within the MOA.

This proposed new organizational structure is presented in Figure I-4. A discussion of the new structure and functions and their specific relationship to implementation of SWMP1 follows.

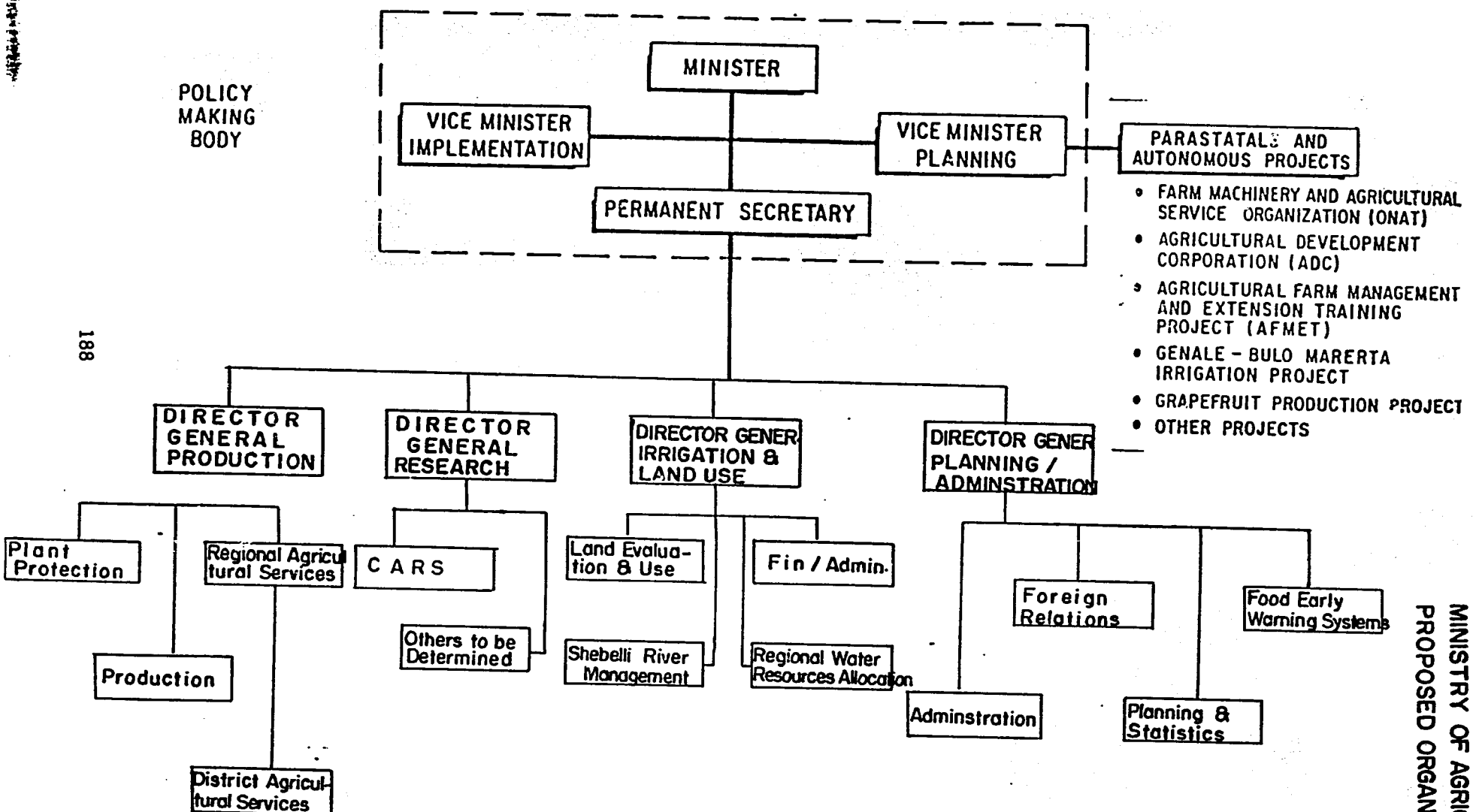
2.1 Directorate of Irrigation and Land Use (DILU)

As reflected in Figure I-4, the DILU will initially be composed of four departments: Department of Shebelli River Management (SRM), Department of Regional Water Resources Allocation (RWRA), Department of Land Evaluation and Use (LEU), and the Department of Finance and Administration (F&A).

Existing personnel of the DLWR (ref. figure I-3) will be folded into the Directorate, and new graduates recruited. In addition, due to the economic upturn of the Somali economy, a number of well-educated professionals have recently begun to return and approach the Ministry for work, so although new recruitment of personnel will be needed to staff the new Directorate, the MOA is convinced that the effort will be successful.

Figure I-4

MINISTRY OF AGRICULTURE
PROPOSED ORGANIZATION



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2.1.1 Department of Shebelli River Management (SRM). The new Department will take over part of the responsibilities of the DLWR and will, over time, become responsible for the rehabilitation, construction, maintenance, operation and management of:

- all the control structures (barrages and weirs) located on the main stem of the Shebelli River; this includes the Settlement Development Agency, and the Balad barrage, currently managed by the Ministry of Industry;

- the off-stream storage reservoir(s) and flood control facilities; and

- the head regulators controlling the discharge of water from the Shebelli into the main (primary) canals for irrigation.

As described in Sections 4.1 and 5.1 of the Project Paper, as the focus of the Basinwide River Management Component, AID will provide SRM with long- and short-term technical assistance. Early in the project, prior to signing of the major long term TA contract, organizational sepcialists from WMSII or an IQC firm may be recruited to assist the DILU in better defining the task of this (and other) departments.

Creation of this department within the new DILU is an important first step toward the regularization of water resource management along the Shebelli. The current problem of recruiting highly qualified personnel will be alleviated to the degree that project level remuneration is maintained. The Director of the SRM will be one step closer to the MOA's top decision-making levels than the current Director of DLWR. Procurement, however, may still be a problem, unless the SRM is ultimately granted delegation of authorty outside of the GSDR procurement authority. If the DILU is ultimately allowed to collect water fees--instead of the Ministry of Revenues--for delivery of services, this would deal constructively with the problem of recurrent costs. It would also provide for direct accountability to water users' groups and the irrigation farmers responsible for paying those fees.

2.1.2 Department of Regional Water Resources Allocation (RWRA). Geography, indigenous social organization, and previous experience with irrigated agriculture allow for the identification of discrete sub-regional zones in the development of the Lower Shebelli. Technical and administrative requirements necessitate the existence of sub-regional institutions for the management of each of the separate command areas along the course of the river. While all command areas along the river and their

existing irrigation systems will not be rehabilitated simultaneously, it is nonetheless possible to recommend a uniform hierarchy of institutions at the sub-regional level. One of these will manage the Shalambood target area.

The RWRA will take in many of the existing regional and district-level personnel of the DLWR. It will continue the DLWR's responsibilities for the maintenance of the primary and secondary irrigation canals along the Shebelli that are currently being carried out as the "Desilting Project", including repair and operation of the regulators, and all of the turnouts and miscellaneous structures on these canals. THis activity will continue to be organized by regions and districts corresponding to GSDR administrative subdivisions.

Shalambood--and other donor-assisted command areas--will be accountable to the Director General of the DILU, who will administer sub-projects through his Departmental Directors and regional and district branches of the new RWRA. Within their own project zones, these local offices will, over time, assume technical and administrative responsibilities for infrastructural rehabilitation, operation, and maintenance, and will act on behalf of the resident communities in coordinating DILU irrigation support services to the region. Regional branches will be responsible for monitoring of contractors hired for infrastructural improvement and advisory services, and will report to the Director General on their performance, progress, and implementation concerns.

While the Ministry of Agriculture will assume pivotal responsibility for technical and administrative staffing of RWRA's regional and district offices, local participation needs to be maximized through the establishment of regular communication channels which can ensure that the representatives of local populations and local organizations (village councils, traditional elders, and water users' organizations, etc.) will have needed input into project decisions and their implementation (e.g. water allocation and pricing). Toward this end, official government policy should actively promote the strengthening of azienda-level water users' groups which currently manage tertiary canals and watercourses, and the DILU should consider allocating some or all secondary canal operations and maintenance responsibilities to these users' groups. These water users' groups should be linked by strengthened inter-azienda committees which bring together all interested groups along a secondary canal: smallholders, large farmers and leadership from agricultural and special interest cooperatives and government and institutional plantations.

Local water users' groups will have two key roles in the improved management system. Through channels of communication established by the DILU, they will lend valuable support to the technical administration of sub-

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regional infrastructure, the assessment of local water requirements, the maintenance of canals and irrigation facilities, and the communication of DILU policy and management decisions to their members. As administrative institutions in their own right, they will constitute local, quasi-indigenous institutions which can assess and collect users' fees to be remitted to DILU, settle disputes, allocate water, and address equity issues and, wherever possible, resolve land tenure and boundary disputes. A number of these functions are currently being undertaken by such groups. By emphasizing their active participation in sub-regional development, the DILU can increase its organizational efficiency and promote significant savings in recurrent costs.

Formal linkage of water users' groups with DILU's district and regional branches (with Shalambood as the test case) would also serve an important control function in the development of water management and allocation policy. As direct participants in local management, water users' groups would be well placed to assess the feasibility of policy decisions, to mobilize support for project activities, and to effectively balance any tendencies toward over-centralization of decision-making. In turn, providing for maximum flow of information and participation by indigenous organizations in DILU decision-making could dramatically increase the likelihood of sustained cooperation and development.

2.1.3 Department of Land Evaluation and Use (LEU)
This department will take over all responsibilities of the former DLWR Land Resources and Registration Office, including land registration. It will benefit from a major UNDP/FAO-funded project "Land Resources Survey for Land Use Planning" (SOM/86/010) which has as its immediate objectives:

1) A national capability for land resource survey and land use planning, paying particular attention to:

   - appropriate institutional arrangements;
   - training of personnel;
   - development and standardization of methodology; and
   - storage and retrieval of land resource data.

2) Correct land use planning, based on surveys of the land resources and other relevant physical and socio-economic factors which will be undertaken in two selected regions or sub-regions in Somalia, one of which will be the Lower Shebelli Region.

3) An awareness of the principles of correct land use planning among the various Government agencies and projects concerned with planning and utilizing the land resources of the country.

The UNDP/FAO will provide two-to-three years each of five long-term technical advisors to the LEU, including a Chief Technical Advisor/Land Evaluation Expert, a Land Resources/Remote Sensing Expert, a Soil Survey Expert, a Land Use Planner, and a Cartographer. Some 54 months of third country fellowships and procurement of vehicles, office and technical equipment, aerial photography and satellite imagery, and microcomputers are also in the UNDP project's budget.

The LEU will continue to emphasize land tenure and land registration with its capability upgraded by the assistance decsribed above. Prior to the inception of the UNDP project, upon request from the GSDR, AID will provide short-term technical assistance for a land registration campaign in the Shalambood target area. This new Department would be fully involved in that campaign.

2.1.3 Department of Finance and Administration (F&A). The F&A will serve as a staff office charged with all personnel, administrative and financial control functions for the Directorate. Because of these functions, the department will thus play a critical role in the annual planning and budgeting process for SWMP's DDB and OB funds. Through the long-term TA contract funded by SWMP, AID may support short-term technical assistance to this department to enable it to adequately support the technical departments of the DILU, and to assess whether it could be upgraded to handle water users' fee collection and reinvestment (which could currently be a Ministry of Revenue function).

2.3 Directorate of Research.

Agricultural research activities proposed for SWMP1 will require the upgrading of the Central Agricultural Research Station at Afgoi. A key assumption in project design is that AFMET2, supported by the World Bank, will continue to improve the quality of research and extension services through:

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- consolidating and selectively expanding the agricultural extension system;

- strengthening research support to extension; and

- introducing a mechanism for improving research coordination and extension linkages.

The World Bank will take the first step toward institution building in agricultural research by supporting the MOA's newly established Directorate of Research and by supporting dryland research activities related to that Ministry. This Directorate will manage a project fund for commissioning adaptive research on critical production issues. Overall policy guidance and ultimate responsibility for implementing the project would rest with the Ministry. With IBRD funds, the present AFMET Project Management Unit would implement complementary extension and extension training to disseminate in other irrigated areas lessons learned by the adaptive research and extension funded by the SWMP1 project. Over the next few years, it is hoped that all formerly projectized research stations and activities will slowly move back into the ministerial ranks.

The research/extension linkage will need to be forged at national, research station and regional levels. Though the IBRD is the major donor supporting extension basinwide, SWMP1 pilot activities in the Shalambood area will be AID-funded to avoid bottlenecks in project implementation. Accordingly, SWMP1 will support and encourage collaboration between research and extension efforts within the Shalambood target area, including training for extension agents and Shalambood smallholders at ETC Genale, trials on Shalambood farmers' fields, and demonstrations on the ETC Genale fields. This will allow for grassroots participation by the local farming community in regional adaptive research and extension activities, so that agricultural research will be based on a realistic assessment of farmers' risks, access to resources, and appropriate costs.

It is important that SWMP1 deliver pragmatic adaptive research, targeted to the Shalambood target area and towards solving on-farm water and crop management problems extendable eventually to the whole Lower Shebelli.

On-farm water management and water users' groups will be initially linked by collaboration between CARS and AFMET in SWMP research and training activities. In the long term, since improving on-farm water management will increasingly be an extension system responsibility, longer term mechanisms to link water users' groups with extension and research will need to be developed. Hands-on experience during SWMP1 will ultimately define whether the research-extension linkage should become the responsibility of the new

Directorate of Research or some other unit within the MOA.

For the forseeable future, the National Extension Service will remain under the umbrella of AFMET as a "project" within the Ministry of Agriculture reporting directly to the Vice Minister. The Design Team strongly recommends, however, that serious attention by the MOA and IBRD be given toward regularizing the extension service within the ministerial structure.

ANNEX J

IRRIGATED AGRICULTURAL PRODUCTION IN SHALAMBOOD AND RESEARCH/EXTENSION PROPOSALS

ANNEX J: IRRIGATED AGRICULTURAL PRODUCTION IN SHALAMBOOD AND RESEARCH/EXTENSION PROPOSALS

1. GENERAL CHARACTERISTICS OF THE SHALAMBOOD TARGET AREA

The primary agricultural significance of the Shebelli River basin lies in its potential for irrigated production. Annex K provides a description of the land use and characteristics of land along the Somali portion of the river. This annex will describe existing agricultural activities and constraints in the Shalambood target area.

Present land use in the Shalambood target area is characterized by the predominance of irrigated annual crops. Table J-1 presents the coverage of the 3804 hectare portion that TAMS studied.

Table J-1: IRRIGATED ANNUAL AND PERENNIAL CROPS, SHALAMBOOD

	Ha.	% of Irr. Crops	% of Annual Crops
IRRIGATED CROPS	3804	100	-
Annual Crops	3534	93	100
Partially Irr.	2439		69
Marginally Irr.	1095		31
Perennial Crops	270	7	

SOURCE: TAMS, Annex II, p. 19

Wholly rainfed agriculture is virtually absent. Maize and sesame are the predominant crops, accounting for over 86 percent of the total area under cultivation. Other crops include vegetables, watermelons, and some legumes.

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Table J-1 also breaks out the two types of irrigation practiced in the area. "Partially irrigated" refers to those areas with viable access to irrigation canals. "Marginal irrigation" refers to those areas which receive irrigation water only in cases of unusual surplus water availability.

The area has a margin of 27 percent uncultivated land suitable for agriculture, so that some expansion of the cropping area would be possible with increased water supply (e.g. through trans-basin transfer of Juba River water to supplement the Shebelli's main stem flows). Combined with the potential for increased cropping intensity through improved farming practices, a substantial agricultural development of the area is feasible provided the required irrigation water is made available.

1.1 Soils

1.1.1 Previous Works on Soils of the Shalambood Target Area. The soils of the Shalambood target area have been studied in increasing detail at intervals since 1961 when an AID-financed team carried out a generally optimistic reconnaissance of the alluvial clays of the Juba and Shebelli valleys. The 1968 FAO survey by Lockwood mapped soils at the 1:500,000 scale. This survey formed the basis of most subsequent soils work, and identified the Saruda and Golweyn series which dominate the target area. Further work on these two soils was carried out at Afgoi and Balad by Hunting Technical Services in 1969 and at Bulo Marerta by Citaco in 1974. In 1978 the substantial MMP report on the Genale-Bulo Marerta project included a 1:500,000 soils map and identified 11 soil series. The report concluded that 90 percent of its 67,400 hectares study area would be irrigable, and identified 8 target areas totalling 30,000 hectares for rehabilitation. Of these, the MMP report itself examined one area (Qorioley). The remaining seven areas (including the Shalambood area which forms one component of SWMP) were examined and mapped at a scale of 1:10,000 by the TAMS team in 1985-86, using air photos flown in 1985 at that scale.

1.1.2 Salient Features of the Shalambood Target Area Soils. The soils of the Shalambood area developed mainly in the heavy clay older alluvial deposits of the Shebelli River, which consist of deep layers of brown to dark greyish brown calcareous compact clay, often over 7 meters thick, which overlie other mixed alluvial layers which extend down to a depth of some 250 meters. Within the old alluvium are remnants of old river channels and stratified levee deposits of which surface areas of more varied and sometimes less heavy soils have formed.

The dominant soils of the Shalambood project area, covering 61.1 and 21.7 percent respectively, are Saruda and Golweyn series, both classified as chronic vertisols in the FAO/UNESCO 1:500,000 world soil map legend. These developed in the compact clays of the older alluvium. The remaining 17.2 percent is mapped as

Shalambood series, an often less heavy and more stratified soil classed as a Cambisol, which is associated with the levee deposits mentioned in the previous paragraph.

Vertisols have very distinctive morphologies and properties which set them apart from other tropical soils, profoundly influencing their agricultural value and the way they have to be managed. They normally have clay textures (i.e., over 40 percent claysize particles), but their distinctive properties are due to the fact that the dominant clay mineral is of the montmorillonite type which expands on wetting. Expansion is due to entry of water molecules between the alumina and silica layers which make up each clay flake. Conversely the clays, and thus the soil as a whole, shrink in volume on drying. Shrinkage of the soil mass results in the formation of deep wide cracks which are a distinctive feature of Vertisols in the dry state. Vertisols are defined according to the depth and width of the cracks they produce.

Swelling on wetting, and shrinkage on drying, leads to a mixing of the upper soil horizons as soil material from the surface horizon falls down the cracks or is washed into them. The soils of the target area normally crack to a depth of 1-2 meters, and soil mixing in this way results in a fairly uniform profile to about this depth. Thus, vertisols are considered to be "self-mulching" to a certain extent. The pressures produced by expansion after new material has fallen down into the cracks leads to a general heaving and movement of the soil, resulting, on the soil surface, in the formation of a distinctive gilgai micro-relief comprised of small mounds and depressions. Heaving and soil movement have a widespread influence on all construction work; without adequate foundations, houses and roads move and crack.

The advantages of the target area soils include the fact that they are relatively homogenous, so that development does not have to take into account frequent soil changes over short distances, and relief is generally flat. To some extent, soil mixing and the formation of a surface mulch of looser soil reduces the need for conventional tillage operations.

The disadvantages of the target area soils include their wide range of physical properties which varies from very hard consistency when dry to stickiness when wet, with very low surface infiltration rates and subsoil permeabilities once initial wetting has closed the cracks. Organic matter levels are fairly low, and soil fertility status is limited by low nitrogen and phosphorus levels. The dominant physical and chemical characteristics of these soils are discussed further in the following sections.

1.1.3 Physical Soil Characteristics Affecting Irrigation Practices, Crop Production and Soil Management. Textures of the Golweyn and Saruda series, which together comprise 83 percent of the Shalambood target area, are almost exclusively clays with clay contents in the range of 45-75 percent. The main dry season cracks are commonly over 5 centimeters wide at the surface and 1-2 meters deep. The structural aggregates (peds) visible in these soils in the dry state are angular blocks, which become prismatic with depth, with a surface which is less compact with a granular to blocky structure. The structural units are defined by a three dimensional network of cracks produced on drying, but because the cracks disappear when the soils are wetted and swell, the structure is ephemeral. New cracks formed on subsequent drying may be in a different place, and since organic matter is low and spread down the profile instead of being concentrated in a relatively thin topsoil, organic matter binding to form structural units is weak and typical topsoil crumb structures are absent. Soil structure in relation to surface infiltration is discussed in Annex K.

Soil consistencies, and hence tillage and handling properties, change dramatically with soil moisture content. In the dry state, the soils are very hard. When wet, they become very plastic and very sticky, and may cling to cultivation implements. Tillage operations are best carried out at intermediate moisture operations are thus need to be carefully timed in relation to soil moisture contents.

Surface infiltration rates, once initial soil wetting closes soil cracks, is very slow indeed, and subsoil permeabilities, as determined by very low hydraulic conductivities, are also very low indeed for wet soils. Infiltration rates and measured hydraulic conductivities for the Shalambood target area are presented and discussed in relation to surface and subsurface drainage in Annex K. Subsoils, in particular, have high bulk densities, and their compact nature appears to account for the fact that observed plant root depths in the target area are mainly within the 0-50 centimeter soil layer.

Clay soils of this type hold large amounts of water at saturation, typically 50-60 percent by volume, but most of this water is held very tightly by the soil. At wilting point (when plants have extracted all the water they can) the remaining 30-40 percent of soil water is held at too high tensions to be of use to plants. The amount of water held at saturation which is actually available to plants is therefore not great, being typically about 20 percent for Saruda series. This implies only moderate available soil water capacities and, particularly in relation to a generally modest rooting depth, a need for fairly frequent irrigation scheduling.

1.1.4 Chemical Soil Characteristics Affecting Crop Production in the Target Area. The soils are slightly alkaline, since the pH values in water are generally in the range 8.0-8.5. The exchange complex is base saturated, dominantly with calcium. Calcium carbonate nodules often occur.

The cation exchange capacity (CEC) is high due to the presence of montmorillonite, e.g an average CEC of 65 milli-equivalents per 100 grams is given in the MMP report. This should ensure adequate retention of added cations in fertilizer (including ammonium).

Organic matter, and hence total nitrogen levels, are low to very low. Organic matter is probably less than 1 percent in most target area soils, and C:N ratios of above 11:1 are quoted. Nitrogen appears to be a major limiting factor and is the major (and often the only) fertilizer nutrient applied in the Shebelli basin.

The little information available on phosphorus in the Shalambood target area soils suggests that phosphorus levels are probably also generally low and, after nitrogen, the major fertility constraint in the target area. Laboratory analyses of available phosphorus, using the Olsen method, indicate variable but generally low figures. Currently phosphorus is sometimes applied to bananas in the area, either as DAP (diammonium phosphate) or as a mixed fertilizer, but the amount of phosphate used appears to be very subordinate to the amount of nitrogen applied. It is recommended that the adaptive research to be carried out during SWMP Phase 1 pay particular attention to the responses of cereals and other crops to modest phosphate applications, and to nitrogen-phosphorus interactions.

Potassium availability in the soils of the target area appears to be currently satisfactory at present low yield levels, but this may change as heavier demands are put on the soil.

Sulphur does not appear to have received attention as a plant nutrient in the Shebelli area, but the sulphate content of irrigation water probably ensures that crops receive an adequate supply of this element. Groundnuts have a high sulphur requirement and any shortage might first be detected in yields of this crop.

With the exception of molybdenum, all trace elements are more available in acid soils than in alkaline soils. At the slightly alkaline pH levels common in the Shalambood target area soils, with pH values of 8.0-8.5 being common, trace element availabilities will require more attention than they have received so far. Iron and zinc levels, in particular, may prove to be deficient. Chlorosis indicating iron deficiency has been observed on groundnuts in the area, and it is recommended that adaptive research during Phase 1 pay attention to trace element investigations and trials.

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As in any irrigation scheme, current soil salinity levels in relation to the quality of irrigation water to be used are of fundamental importance. Salinity problems are discussed in Annex K which deals in turn with irrigation water salinity and quality, groundwater salinity, current soil salinity levels, future soil salinity levels under continued, irrigation and soil salinity in relation to crop growth. The current level of salinity in the upper horizons of the target area's soil is still low, even after 60 years of irrigation. Soil salinity levels can be expected to remain at an acceptable level if river water is used in amounts sufficient to give a small surplus for leaching, but the lower quality groundwater must be used with some caution.

1.2 Farm Management Practices

Irrigation water in the Shalambood target area primarily comes from run-of-the-river diversions. Groundwater is used only as a supplemental source of irrigation for banana and other perennial crops. Annual crops are irrigated by a form of "wild flooding" characterized by application of 25 to 30 centimeters of water in a basin approximately one jibal in size (1/16 hectare), regardless of the slope and levelness of the field. This practice normally results in inundation of crops and often seriously effects yields of crops, such as maize, that are sensitive to prolonged flooding. Most farmers irrigate their fields once or twice each season, depending on water availability. Single pre-season irrigation is most common with sesame, but a number of other crops, including tomatoes and watermelons, are also grown using this method.

No recognizable crop rotation is practiced due to the predominant role of maize and sesame, grown mainly as single subsistence crops. Some 25 percent of farmers practice intercropping of maize with other crops, such as sesame, cowpeas, mungbeans, tomatoes, watermelon, etc., and, less frequently, intercropping sesame with various other crops. Intercropping is usually carried out at random with respect to time and method of planting as well as plant distribution.

Most of the field work is done with hand tools by family and/or hired labor. Tractors and machinery are mainly used in land preparation, e.g. plowing, harrowing, bunding, flood bank ridging, and leveling. Only a limited number of large-scale farmers, state farms, and cooperatives own farm machinery. Medium-scale farmers and some smallholders resort to tractor leasing for land preparation. Animal traction has not been successfully introduced.

Only 10 percent of farmers use improved seeds. The rest of them use local seeds from their own stock or those obtained from other farmers. The use of fertilizers (in any event almost exclusively urea), pesticides, and herbicides is extremely limited.

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The absence of an effective crop rotation as well as an integrated pest control program, combined with the overall lack of agricultural inputs, has resulted in high levels of pest infestation, and a high population of weeds, insects, and diseases, soil fertility depletion, and a steady decline of yields. Present animal husbandry does not contribute effectively to crop farming, except that it uses crop residues (particularly maize straw) as fodder. Excrements are not utilized as fertilizer.

1.3 Potential

Crop production can be increased primarily by increased yields since basinwide water supply does not currently allow for increased hectarage. The existing low cropping intensity of 90 percent for small farmers and 57 percent for large farmers (1 crop/year = 100 percent; 2 crops/year = 200 percent) in terms of total cultivable area indicate that there is a significant potential for increased production through more intensive use of the land available for cultivation. Instead of just one crop, it is theoretically possible to grow at least 2 crops each year on the same land.

The current low yields of maize (about 800-1500 kg/ha) and sesame (250-300 kg/ha) could be markedly increased by adequate use of inputs, such as irrigation water , good quality seed of improved crop varieties, appropriate fertilizers and pesticides. Additionally, increases can be obtained by better management practices including proper land preparation, timely planting of adequate crop populations, proper spacing, timely weeding, and irrigation. Yield losses could be greatly reduced by means of better harvesting techniques, proper post-harvest treatment, and safe storage. Farm manure could play a significant role as natural fertilizer and an effective tool in improving the chemical and physical properties of the soils.

1.4 Constraints

At present, a number of limiting factors prevent farmers in the project area from increasing their crop production. Among the most important ones are:

- Erratic and inadequate supply of irrigation water and improper on-farm water management;

- Very limited availability and affordability of good quality seeds of improved crop varieties (only a limited quantity of one improved variety of maize is available, and no improved sesame varieties);

- Lack of knowledge and experience concerning the proper use of inputs and appropriate management practices;

- Limited availability and affordability of mechanization, spare parts and fuel;

- Lack of capital for the provision of inputs and mechanization;

- Lack of training; and

- Socio-economic constraints which prevent farmers from adopting certain technologies and practices, (e.g. no use of animal traction for field operations and farm manure processing).

Many of these constraints can be eliminated or reduced to manageable levels through supportive adaptive irrigated research, extension activities, provision of inputs, and training.

2. HORTICULTURAL PRODUCTION AND MARKETING

Production of fruits and vegetables is relatively new to the Shalambood target area. Large scale production, except for bananas, only began during the last 10 years (Jaffe, 1984). Horticultural crops are of less importance to the area than maize or sesame, accounting for approximately 15,000 tons of production compared to 18,000 tons of maize and sesame in 1985 (TAMS, 1986). The majority of the horticultural hectarage was planted in vegetables (391 hectares) with perennial fruits having only 270 hectares (of which 95 percent planted in bananas).

Cool and warm season vegetables are grown with tomato, watermelon, peppers, onions, cowpea and mungbean dominating. Minor vegetables found in the area are: carrots, beets, swiss chard, lettuce, radish, lima bean, eggplant, squashes and hyacinth bean (Table J-2). Perennial fruit production, other than bananas, is confined to: grapefruit, mango, papaya, guava, coconut and avocados. Only bananas, grapefruit, papaya and avocados (1 orchard) are planted in an organized manner. The rest are old trees planted for shade or growing wild along water courses.

2.1 Vegetables

2.1.1 Tomatoes. Tomatoes are grown both for fresh marketing and for processing. The main production period is during Der season (September-December) with some processing tomatoes grown in the Haggai (June-July, a light rainy season which follows the gu season's heavier rains). Two varieties dominate production: Roma VF (processing), and a local type of cherry tomato (fresh market). All seed is imported from the U.S., Italy, India or Kenya. Production per hectare is low at only 1-5 tons.

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Tomatoes are either direct seeded or are transplanted into a flood irrigated field. The crop is produced in residual moisture which causes moisture stress to the plants in the dry season. Little or no fertilizer is used, and pest control is confined to whitefly (Bemista tabaci) which transmits Curly Top Virus (CTV). Control measures are not on effected a regular schedule, so results are inconsistent. The local cherry tomato variety has developed tolerance of CTV, thus growers prefer this variety.

Production is sold locally to private sector traders for fresh marketing or to the processer. There have been problems with the processing market (ref. Patterson et al, 1984), so growers are currently selling more for fresh marketing.

2.1.2 Watermelon. Watermelons are planted during the Der season to reduce risk of pest problems. The main varieties grown are Charleston Grey types which are both exported and sold domestically. The crop is monocropped or interplanted with tomato and maize. Spacings vary from 2 m x 1.5 - 2.0 m. Few pest problems have been observed, except for blossom end rot related to moisture stress. Watermelons are produced on residual irrigation as are tomatoes.

Fruit produced for Somalfruit is shipped from the production region for export. Other growers sell their production to wholesalers either before or after harvest.

2.13 Cowpeas and Mungbeans. These legumes are intercropped with maize during the Gu season. Planting takes place when the maize is approximately 45 centimeters tall and is applied at the rate of 15 kg/ha. of seed. Dry seed is harvested 80-90 days after planting; green shelled seeds and foliage are not consumed. Local cowpeas are spreading, non-climbing, red-seeded types. One semi-erect variety was released by CARS, but no seed is available. Mangbeans are green shelled and erect plants.

2.1.4 Miscellaneous Vegetables. The remaining vegetable are grown on a smaller scale. These are mainly monocropped in bunded beds (3 x 4 to 4 x 4 meters in size). Vegetables are grown in the Gu and Der season, with principal production undertaken in the Der.

Table J-2

Vegetables and Fruit Grown or to be Explored in the Shalambood Target Area

Crop (# Scientific Name)	Grown in Proj. Area	To be Explored	Grown in Country	Fresh Market	PROPOSED PURPOSE: Processing	Export	Fresh Market	Processing	Export
Vegetables									
Tomato (Lycopersicon esculentum)	x		x	x	x				
Eggplant (Solanum melongena)	x		x	x					
Irish Potato (Solanum tuberosum)			x	x					
Sweet Pepper (Capsicum annum)	x		x	x					
Hot pepper (Capsicum frutescena)		x	x	x					
Watermelon (Citrullus lanatus)	x		x	x		x			
Muskmelon (Cucumis melo)		x					x		x
Honeydew (Cucumis melo)		x					x		x
Cucumber (Cucumis sativa)		x	x	x					
Squashes (Cucurbita spp.)	x		x	x					
Onions, dry and green (Allium cepa)	x		x	x				x	x
Beets (Bets vulgaris)	x		x	x					
Swiss Chard (Beta Vulgaris)		x	x	x					
New Zealand Spinach (Tetragonia tetragoniordes)		x		x					
Radish (white and red) (Raphanus sativas)	x		x	x					
Chinese Cabbage (bok choi) (Brassica rapa)		x					x		
Chinese Cabbage (bok tsai) (Brassica rapa)		x					x		
Lima Bean (Phaseolus limensis)	x		x	x					
Common bean (Phaseolus vulgaris)		x		x			x		
Pigeon Pea (Cajonus Cajun)		x					x		
Cowpea (Vigna unguiculata)	x		x	x					
Mung bean (Phaseolus aureus)	x		x	x					
Hyacinth bean (Lablab vulgaris)	x			x					
Lettuce (head) (lactuca sativa)	x		x	x					
Lettuce (leaf) (Lactuca sativa)		x					x		
Okra (Abelmoschus esculentus)		x	x	x			x		
Carrot (Daucus carota)	x		x	x					
Sweet Potato (Ipomoea batatas)	x		x	x					
Cassava (Manihot esculenta)			x	x					
Fruit									
Grapefruit (Citrus paradisi)	x			x				x	x
Oranges (Citrus sinesis)		x	x				x		
Limes (Citrus spp.)	x		x	x		x			
Lemons (Citrus limon)		x					x		
Bananas (Musa spp)	x		x	x		x			
Papaya (Carica papaya)	x		x	x					x
Guava (Psidum guajava)	x		x	x				x	
Avocado (Persea americana)	x			x					x
Coconut (Cocoa nucifera)	x		x	x					
Mango (Mangifera indica)	x		x	x	x				x
Tamarind (Tamirindus indica)	x		x	x					

Sources: MMP, TAMS, Patterson & Hassan and others

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2.2 Fruit

2.2.1 Grapefruit. Grapefruit is the only fruit (apart from bananas) grown on a large scale in the target area. Most groves are 30 to 40 years old. Groves are planted at 125-156 trees per hectare and are basin irrigated. Main harvests are in May-June and December-January with yields of 5-8 tons/hectare. Fruits were exported to Italy in the 1960-70's, but shipments have stopped as the result of a drop in quality. The EEC provided support to the MOA to establish a grapefruit nursery at Genale in 1972 as a means of producing budded seedlings for the region. Ten thousand plants were produced in 1978, and by 1985 57,000 plants were available for distribution. The plants are 2-2.5 years old on rough lemon or Sour Orange rootstocks. The main varieties are Marsh Seedless, Triumph, Foster, Walter Ruby and local Marsh Seedless. Variety evaluation and cultural practice research is underway on the following varieties: IPC, Shambar, Ruby, Little River, Red Blush, David Seedless, Thompson, Marsh seedless and local Marsh Seedless.

2.2.2 Papaya. Local papaya is a mixture of varieties introduced by the Italians. No effort has been made to maintain separate identity. Flesh color varies from almost white to dark red and skin color ranges from orange to dark green. Hawaiian types have been imported and are found in the market.

Papaya is planted in 4 x 4 meter spacings with basin irrigation. Plantings are generally small with a few plants on each farm. Somalfruit exported papaya in 1984, but ran into disease problems and is re-evaluating its export program. Yields range from 5-6 tons/hectare/year.

2.2.3 Limes. Small limes are grown for the domestic and export market. These are planted small groves or individual trees. The export trade is dried limes for the Middle East. Future expansion is possible if quantities and quality can be maintained.

2.2.4 Mangoes and Guava. No effort has gone into improving mango or guava production. All trees are large, grown from seed and not grafted. Production is sold domestically, but there might be a possible export market. Market research and a selection program would be needed.

2.2.5 Avocados. An orchard of avocados exists in the target area. Additional plantings are not planned. There may be a market for increased production, but this would require research. Variety selection is critical under Shalambood conditions if plantings are to be increased.

2.3 Potential Horticultural Crops

The Shebelli River basin, and the [illegible] ea in particular, are well adapted to growing a wide range of fruits and vegetables. Constraints on diversification are water availability, knowledge of markets, and identification of new crops. Vegetable and fruit marketing studies both for domestic consumption and export are essential during Phase 1 of the project. Jaffee (1984) made several suggestions for possible markets and products.

1. Papaya for the November-March period to Europe.

2. Mangoes to the UK, France, West Germany and the Netherlands for December-February.

3. Citrus to Europe when the other members of the EEC are not producing.

4. Grapefruit, limes, mango, watermelon, pepper and tomatoes to Saudi Arabia, North Yemen, Djibouti and the United Arab Emirates.

Funding is provided under SWMP1 for a short-term consultancy to research these and other market possibilities early in the project. He/she will research European and Middle East imports of food stuffs from African, Asian and South American countries to determine if shortfalls occur. Speciality markets for fruits, vegetables and flowers could provide an outlet not being used at the present.

Export markets are difficult to establish, require a good organization, sufficient dependable production and adequate quality control. Domestic markets are easier to accommodate in the short run. Over the last three to five years new and more abundant horticultural crops have come on local markets. Indications are that expatriate and upper class communities will purchase additional commodities. The marketing specialist will assign a priority to exploring what domestic expansion is possible and for what crops.

2.3.1 Vegetables. Vegetables provide the best opportunity to increase returns and offset costs of the irrigation investment in the short run. Two vegetables, muskmelon and honeydew, are adapted to the area, have similar cultural practices to that used for watermelon and require the same post-harvest handling. Cultivar evaluation is necessary before production can be stimulated. Varieties from the Western and Eastern United States and Europe will be evaluated early in the project. This coupled with a positive response to the marketing studies will provide the stimulus necessary for raising muskmelon and honeydew.

Tomato production can be increased in the target area if a market is available. Varieties will be evaluated for yield, pest resistance, drought tolerance and salt tolerance. Hot peppers and onions are grown in the project area for fresh marketing. Demand for dried peppers and onions exists in the export market, but no processing capacity is available in Somalia. The production of these vegetables could increase rapidly if the processing industry could be introduced or revived. Solar drying can provide a cheap and efficient means of producing a good product for the market. The short-term marketing specialist will evaluate market potential and processor interest before screening new cultivars for drying.

Chinese cabbage (bok choi) and leaf lettuce are not grown in Somalia, but should be evaluated for the domestic market. Somalis prefer white lettuce and pay a premium for it. Chinese cabbage and some leaf lettuces are light in color and may fit local requirements. Chinese cabbage is the better possibility since it can be easily shipped. Leaf lettuce, on the other hand, is very perishable.

New Zealand spinach and pigeon pea are not locally grown, but can be produced in the area. New Zealand is easy to grow, ships well and can be substituted for regular spinach. The expatriate community would probably provide a market for this vegetable. Pigeon pea and common beans are good protein sources, but the market potential needs exploring.

Swiss Chard, cucumbers. and okra grow in the Lower Shebelli area. Market potential is questionable, but they will grow in the area.

2.3.2 Fruits. Perennial fruits in most cases require several years to reach production stage. If included in SWMP at all, it is advisable to concentrate on fruits that have a sizeable production. Grapefruit provides the best opportunity for export in the short run. Planted area is increasing and will be in production within 5-7 years. No exportable fruit is placed on the domestic market or processed.

Papaya, especially the Hawaiian types, have good export potential. The fruit is of more acceptable size and is not as soft as local types. Little research information is available on papaya in Somalia, but they are widely grown. Planted area would need to be increased and a marketing infrastructure developed for export. Somalfruit is the most likely exporter in the short-term.

Oranges are not grown in the Shalambood target area, only in the northern part of Somalia. There have been problems producing them at CARS, and the general opinion has been that no potential exists around Shalambood. If varieties are carefully selected there is potential, but this is a long-term effort. If the project were to support establishment of new

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cultivar evaluation trials at CARS or at ETC Genale to evaluate yield and pest problems, the grove would take 5-7 years to come into production, so plenty of time would be available to explore markets.

Lemons and Persian limes (Citrus latifolia) are potential fruits not grown in the country. The project could support screening of cultivars at the same time as oranges for adaptability, yield and pest susceptibility. No domestic market exists at present, but one can be developed. Export possibilities might lie in the future.

An avocado orchard is planted in the target area. The fruit is sold locally with a small export market. A small evaluation of cultivar might be appropriate, but only if personnel and funds are available. Efforts should be placed on other fruits first.

Guava, mango and tamarind are grown in the area as scattered trees. The SNU Faculty of Agriculture is starting a small research program with mango this year. No research exists for the other two fruits. It is recommended that published material from other countries be collected and analysed before doing any evaluations of these fruits. No planting is warranted until more is known about the domestic and export markets.

2. SUPPORTIVE ADAPTIVE RESEARCH

2.1 Research Strategy

The objective of the SWMP supportive adaptive research component is to address specific constraints on the yields of irrigated smallholder farmers with research, extension and training activities. Within the Shalambood target area, an increased number of Farm Extension Agents will undertake socioeconomic and agronomic monitoring of greatly expanded on-farm verification trials by Contact Farmers, feeding results from and into station-based trials at ETC Genale and the CARS research trials at Afgoi. These efforts will provide packages for dissemination by AFMET extension agents. National strategic research planning and budgeting will be undertaken by the newly created Research Directorate in the Ministry of Agriculture, supported by IBRD funds.

Work under this component will focus on developing a progressively more fine-tuned research agenda, which includes irrigation software and crop-soil-water response as key components. Research results will be reviewed annually, and a rolling three-year plan developed. As production-oriented research results come on line, design of research trials will

be both further refined but also expanded, focusing on practical applications which will provide farmers with real and measureable results.

Technical packages will be based on existing cultural practices, introducing only one or two techniques per season as farmers gain confidence in FEAs. AFMET research has produced some encouraging initial results with maize varieties, for example, through support from AID's recently completed Agricultural Delivery System Project. These initial "tech paks" will be cross-tested with various irrigation techniques in various micro-environments to determine optimal water regimes. Over time, full production packages will be developed that can be introduced on a widespread basis. The important point to be made is simply that no particularly new or exotic crops will be introduced in the early years. The focus will be on doing more with what is already there.

2.2. Proposed Research Framework.

The proposed research program will focus on overcoming constraints which at present limit small farmers' irrigated production in the Shalambood target area. It is anticipated that farmers outside the project will eventually benefit from the program as well, particularly through AFMET extension activities funded by IBRD.

Because of the complex nature of research and the difficulties associated with the transfer of results to farmers, the proposed research will use a team approach.

The purpose of the research is to develop discrete packages of management recommendations. Some GSDR researchers will focus on only one package while others may be participating on several teams, depending on their specialization. These packages will initially be commodity-based, focussing on maize and sesame in early years. Results found promising in the station-based trials at CARS will be subject to on-farm verification trials in the Shalambood target area. The CARS results will be channelled to the extension personnel at ETC Genale , who will assist in organizing verification trials on Contact Farmers' land and later demonstration trials at ETC Genale. Tests of individual components (planting, fertilizer use, pest control, etc.) through verification trials will in principle use the same research-extension channels. Field Extension Agents will provide feedback from farmers, but most researchers will become familiar with farmers' needs for research during the supervision of on-farm trials.

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TABLE 11: PROJECTED EXPENDITURES ADAPTIVE IRRIGATED AGRICULTURAL RESEARCH COMPONENT
(U.S.$ 1,000 @ So.Sh.90 = U.S. $ 1.00)

LINE ITEM	TOTAL UNITS LOP	1987 AID	1987 GSDR	1988 AID	1988 GSDR	1989 AID	1989 GSDR	1990 AID	1990 GSDR	1991 AID	1991 GSDR	1992 AID	1992 GSDR	SUB-TOTALS AID	SUB-TOTALS GSDR	TOTAL U.S.
1. PERSONNEL		406.4	49.8	345.2	139.7	666.8	200.4	772.4	200.4	490.4	139.7	298.2	119.5	2979.4	849.3	3828.7
Expat. L-T	16 PY	380.0	30.0	282.0	60.7	564.0	121.4	564.0	121.4	282.0	60.7	103.0	40.5	2175.0	434.6	2609.6
Agronomist	4 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	680.0	0.0	680.0
Soils Spec.	2.5 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	0.0	0.0	0.0	0.0	425.0	0.0	425.0
Agr.Econ.	3 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	0.0	0.0	510.0	0.0	510.0
PSC Proj.Coord	1 PY	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	0.0	200.0
FSU Support		180.0	30.0	27.0	60.7	54.0	121.4	54.0	121.4	27.0	60.7	18.0	40.5	360.0	434.6	794.6
																0.0
Expat. S-T	35 PM	26.4	0.0	13.2	0.0	52.8	0.0	158.4	0.0	158.4	0.0	145.2	0.0	554.4	0.0	554.4
IARC/CRSP	-	0.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	250.0	0.0	250.0
GSDR L-T		0.0	19.8	0.0	79.0	0.0	79.0	0.0	79.0	0.0	79.0	0.0	79.0	0.0	414.8	414.8
CARS		0.0	16.3	0.0	65.0	0.0	65.0	0.0	65.0	0.0	65.0	0.0	65.0	0.0	341.3	341.3
AFMET		0.0	3.5	0.0	14.0	0.0	14.0	0.0	14.0	0.0	14.0	0.0	14.0	0.0	73.5	73.5
2. TRAINING		0.0	1.8	0.0	7.1	0.0	7.1	0.0	7.1	0.0	7.1	0.0	7.1	0.0	37.3	37.3
CARS		0.0	0.9	0.0	3.4	0.0	3.4	0.0	3.4	0.0	3.4	0.0	3.4	0.0	17.9	17.9
AFMET		0.0	0.9	0.0	3.7	0.0	3.7	0.0	3.7	0.0	3.7	0.0	3.7	0.0	19.4	19.4
3. COMMODITIES		0.0	0.0	1275.1	353.0	65.9	14.4	198.9	190.7	58.9	17.0	58.9	18.5	1657.7	593.6	2251.3
CARS	var	0.0	0.0	1209.3	178.0	65.9	14.4	198.9	15.7	58.9	17.0	58.9	18.5	1591.9	243.6	1835.5
AFMET/ETC	var	0.0	0.0	0.0	175.0	0.0	0.0	0.0	175.0	0.0	0.0	0.0	0.0	0.0	350.0	350.0
FOA	var	0.0	0.0	65.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.8	0.0	65.8
4. CONSTRUCTION		201.4	291.4	0.0	529.2	0.0	222.2	0.0	0.0	0.0	0.0	0.0	0.0	201.4	1042.8	1244.2
Buildings	var	201.4	291.4	0.0	529.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	201.4	820.6	1022.0
CARS Irr.Sys.	var	0.0	0.0	0.0	0.0	0.0	222.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	222.2	222.2
5. OTHER		0.0	65.8	0.0	463.0	0.0	338.0	0.0	338.0	0.0	338.0	0.0	338.0	0.0	1880.8	1880.8
CARS (OE)		0.0	43.8	0.0	375.0	0.0	250.0	0.0	250.0	0.0	250.0	0.0	250.0	0.0	1418.8	1418.8
AFMET/ETC (OE)		0.0	11.1	0.0	44.5	0.0	44.5	0.0	44.5	0.0	44.5	0.0	44.5	0.0	233.6	233.6
FOA Res.Sup.		0.0	10.9	0.0	43.5	0.0	43.5	0.0	43.5	0.0	43.5	0.0	43.5	0.0	228.4	228.4
6. CONT & INF. TION		0.0	0.0	81.0	74.6	75.1	80.2	153.1	116.0	118.4	108.1	98.7	133.5	526.3	512.4	1038.7
GRAND TOTAL		607.8	408.7	1701.3	1566.6	807.8	862.2	1124.4	852.2	667.7	609.9	455.8	616.5	5364.8	4916.1	10280.9

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SWMP 1 research activities will be guided by four long-term U.S. advisors: a Research Agronomist, a Soil Scientist, and an Agricultural Economist. A U.S. Anthropologist with experience working with water users' associations in Asian or African irrigation systems and an On-farm Water Management Specialist will be hired under the Basinwide Water Management component of SWMP 1. They will serve as advisors to both DILU and the SWMP agricultural research term at CARS in Afgoi, and will be the resident advisors responsible for developing an in-depth assessment of local organizations needs and capabilities as input into basinwide water management plans and adaptive irrigated research. They will also work closely with landless labor camps, women farmers, and contract laborers with small plots, and large and small farmers, to develop profiles of their needs and constraints as input to agricultural research designs, SWMP 1 policy dialogue, and baseline studies, monitoring, and evaluations. Additional support to the program will be provided by short-term consultants, several of whom will undertake repeat visits periodically throughout the project. Illustrative short-term requirements include: sesame improvement, plant protection, soil fertility, vegetable production, and mechanization.

Work on first packages (maize and sesame) will start with the commencement of the project. At first, CARS and FOA personnel, the long-term SWMP researchers at CARS, and the Local Organizations Advisor will undertake a baseline study of the Shalambood target area, including data on farm practices, time/labor budgets, and off-farm income-generating activities that contribute to seasonal agricultural labor constraints. The Advisors and their counterparts will then review all available information concerning individual crop packages outlined in the PP outputs section. The sources will include the current crop management recommendations (CARS/AFMET), recent research results at CARS and AFMET, experience of successful farmers from the project area and elsewhere, technologies and practices successfully used in comparable conditions elsewhere, recent publications, and other sources.

When the review and evaluation of available information is completed, first provisional packages will be formulated and the missing components determined. Short term technical assistance from CIMMYT, ICRISAT, and centrally funded AID Collaborative Research Support Projects will be used to obtain varieties for testing and to fill other gaps as needed. The provisional packages will be tested as soon as possible through on-station (at CARS) and on-farm trials in Shalambood target area, and the missing components gradually completed through additional research. Thus, step by step the packages will be improved, tested and delivered to farmers.

Research design of package recommendations will be based on a standard matrix approach. Following are several themes which will be investigated on a matrix basis. Each has a main component and several subcomponents:

Land Form and Irrigation Practices

a) Land (leveling, bunding, furrowing, drainage, etc.)
b) Furrows (sloping, sizings)
c) Water Response (timing, ponding quantity,)
d) Irrigation Methods (surge, furrow, modified drip)

Maize

a) Varietal Improvement (screening, adapting)
b) Agronomy (planting dates, spacing, fertilizing, weeding, irrigation, protection, etc.)

Sesame

a) Varietal improvement (screening, selection adaptation, etc.)
b) Agronomy (micro-components as for maize)
c) Varietal introduction (especially ones that draw salts from soils)

Legumes

a) Varietal improvement
b) Agronomy

Forages/Fodder

a) Agronomy
b) Animal nutrition

Cropping Systems

a) Crop rotations
b) Intercropping

Vegetables

a) Varietal improvement
b) Agronomy

Farming Systems

a) Surveys, economic and financial analysis (including farm budgets, domestics markets)
b) On-farm trials

Irrigation and related land practices will be a priority agenda of supportive adaptive research. Land leveling and furrowing affect many aspects of the soil-water-crop relationship. Both can cause uneven water distribution throughout the field which results in reduced yields. Various methods of leveling and furrowing applicable to small farm conditions will be tested. Yield response of main crops to various irrigation techniques will be tested under on-station and on-farm conditions. The problems of drainage, erosion, irrigation water efficiency, proper sizes of basins and slopes, as well as mechanization of furrowing will be also investigated.

Soil fertility aspects will be studied from the viewpoint of FSR. Soil samples will be collected from the fields of Contact Farmers participating in on-farm trials and analyzed in the upgraded laboratory at FOA. Special attention will be given to salinity problems and to the status of micro-nutrients, about which there are no available data. Yield response curves of main crops to higher doses of fertilizers (NP) will be developed and cost-effectiveness in small farm conditions determined. The use of animal manure and its residual effects will be studied.

Maize will continue to be a focus of the adaptive irrigated research due to its unsurpassed inherent potential for increased production in favorable conditions. It has the greater capacity among the available crops to transfer a proper combination of inputs into a high yield. To determine the proper combination of inputs and practices, and its cost effectiveness in small farm conditions, will be the main task of the maize package of management recommendations. The maize breeding section will focus on screening and adapting high yielding varieties from CIMMYT and other international institutions, the agronomy section will determine the proper seedbed preparation, methods and dates of planting, plant populations, use of fertilizers and pesticides, and irrigation techniques (frequencies, timing, quantities, etc.). Higher doses of N and P fertilizers in various combinations and the use of animal manure will be tested. Also various methods of weeding such as hand, herbicide, and animal traction will be compared as to cost-effectiveness.

Sesame, currently the second most important crop in the target area, and the most important Der season crop, will receive full attention in Phase 1. The inherently low-yielding varieties very prone to shattering cannot be expected to produce significantly more even with more irrigation water available. They do not respond to fertilizers. A short-term TA sesame specialist will review the possibilities for increased sesame production, procure high-yielding varieties from international sources (e.g. Texas A & M University; or IDRC) and design a program for screening tests and adaptation.

Several alternative oil crops will be also tested. Safflower, like sesame, can be grown well on heavy soils under a system of pre-planting irrigation. With 90 day varieties, methods of cultivation in the project area could be similar to those for sesame, but yields superior. BRADP has noted, however, that its thistles make safflower difficult to harvest. Sunflower is being successfully grown on the Seed Multiplication Farm near Afgoi. Despite the heavy alkaline soils, Sunflower is well adapted to growing conditions in the Shebelli River basin. Management requirements are similar to that of maize. Short-season varieties will be selected to minimize the risk of drought, avoid wind damage, and enable early cropping to avoid possible bird damage. Castor has already been grown commercially in the area during the 1940's

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and 1950's. The reported average yields of 150 to 200 kilograms per hectare (hulled seed) indicate the suitability of the area for castor production. The short-season dwarf varieties will facilitate hand harvesting and avoid the risk of drought to which this crop is susceptible. Groundnuts are not ideally suitable for the heavy soils of the project area, however, they have been successfully grown in similar conditions in other countries (Sudan, India) and several varieties are being tested with some success at CARS. High level of management is required on heavy soils to achieve good yields. Because of the production problems associated with heavy soils, particularly with respect to irrigation and harvesting as well as the risk of water shortages and drought, only the short-season Spanish-Valencia bush types will be screened. Proper planting dates in view of favorable soil-moisture conditions required at the time of harvesting will be determined.

Legumes, particularly the grain types such as cowpeas and mungbeans have been an important part of the farmers' diet and cropping system. One semi-erect variety was released by CARS; other varieties are being tested, and so are several introduced varieties of mungbeans. A larger assortment of grain and green legumes will be introduced and screened if domestic market studies indicate potential. Residual effects on subsequent crops and soil fertility would need to be studied.

Vegetables are being successfully grown in the basin, and have a great potential for development under favorable marketing conditions. However, cultivar evaluation is necessary before production can be stimulated. Varieties of tomatoes, watermelons, muskmelons, and honeydew will be evaluated for yield, pest resistance, drought tolerance, and salt tolerance during the latter part of Phase 1. Chinese cabbage and New Zealand spinach will be introduced and tested.

Forage Crops. The overall shortage of grazing and forage supplies indicates potential for increasing forage availability. The inclusion of a short-season drought-tolerant forage crop in the late Gu season would help increase forage availability. A milled cereal/legume forage crop would provide high quality fodder. Crops will be selected that require minimal management and can be cut early. Bulrush millet appears to be the most suitable and practical cereal crop, and the bonavist bean the most suitable legume. Additional components of the forage mixes will be tested as well. The laboratory unit for feed analysis provided by the project will facilitate nutritional evaluations. Economic feasibility of forage production under irrigation will be evaluated by the SWMP research team.

Other ancillary research activities will deal with post-harvest treatment and storage, pest control, bird control, the development and testing of implements and machinery appropriate for small farm operations. The existing Seed Unit,

refurbished by this project, will produce foundation seed of released improved varieties and provide safe storage of the available germplasm. Studies will be conducted on crop rotations, cropping patterns, intercropping, and farming systems best suitable for the project area in long-term (10 years) perspective.

2.3 Phase 2: Possible Research

Rice is a crop well suited for cultivation of the heavy clay soils in the project area. Upland rice is more suitable because its required method of irrigation is similar to that of other annual crops. Therefore it can be more easily introduced into the present farming system. Upland rice is being cultivated to some extent in adjacent areas. During Phase 2, available varieties may be screened to watch the water availability limitations. Proper planting dates would need to be set to avoid the hazard of damage by birds.

Cotton is ideally suited for the project area, but it requires considerable care and good management. It may, therefore, be considered for development in Phase 2. Medium staple upland types appear to be most suitable for testing. Cotton has a long history of partially successful production along the Shebelli river.

It is anticipated that this approach to the research and technology transfer combined with incentives for achievement will motivate participating staff and generate early results.

3. PROPOSED EXTENSION ENHANCEMENTS UNDER SWMP1

The objective of an improved extension program within Shalambood target area is to achieve increased and sustained crop yields through the dissemination of appropriate technology. This will be attained through improvement of the linkage between extension and research.

There are three main focal points for the improvement of the extension program. These are the target area itself, ETC Genale, and CARS at Afgoi. A number of the proposed interventions, however, could be covered under an AFMET Phase 2, therefore coordination between the SWMP 1 and AFMET 2 projects is essential.

3.1 Shalambood Target Area

Within the target area it is necessary to improve the coverage of farmers to achieve a wider dissemination of technology. It is proposed that this be effected by increasing

the number of FEAs from two to four which will achieve the interim AFMET target ratio of 1 FEA to 800 farm families. The ultimate objective is to improve the ratio to 500:1, and this should be achieved during the second phase of SWMP. It is considered, however, that the project should stay within the current AFMET ratios at present so that it avoids becoming too atypical.

The FEA's appointed should be of proven ability, and have had a significant period of field experience after graduation from an agricultural high school. They could be transferred to Shalambood from within the region.

The proposed siting of FEA's is shown in Figure J-1 and compared with existing coverage in Figure J-2. The proposed siting divides the target area, provisionally, into four zones, bordered by main canals. The FEA's will work exclusively within the target area. The extra FEA's can be absorbed without creating a need for the establishment of a new Extension District. It is proposed that the Extension District boundaries be altered so that the proposed target area falls, in its entirety, under the Merka I District. So that Merka I does not become overloaded, it could shed 3 FEAs to other Districts.

Mobility of the FEA's will be improved by the provision of motorbikes and fuel. Each FEA will be further provided with a low cost office/house unit built by IBRD/AFMET 2. The FEA's will be fully equipped by the project with tape measures, balances, mosquito nets, protective clothing and other necessary equipment. The basic training and visit schedule should remain as it is at present, though it is recommended that the system be temporarily "suspended" during part of the Jilal (dry season) so that in-service training courses can be held at ETC Genale or AFMET in Afgoi. These courses are necessary to supplement the education received by FEA's in agricultural high school. Particular training needs include on-farm water management and horticulture (especially vegetables).

FEA's could be allocated to the target area even before the arrival of SWMP's long term advisors, to establish the basis for a rapid take-off. It is essential that funding of FEA's, apart from possible incentives, be channelled through AFMET to ensure the continuity of chain of command.

Figure J-I

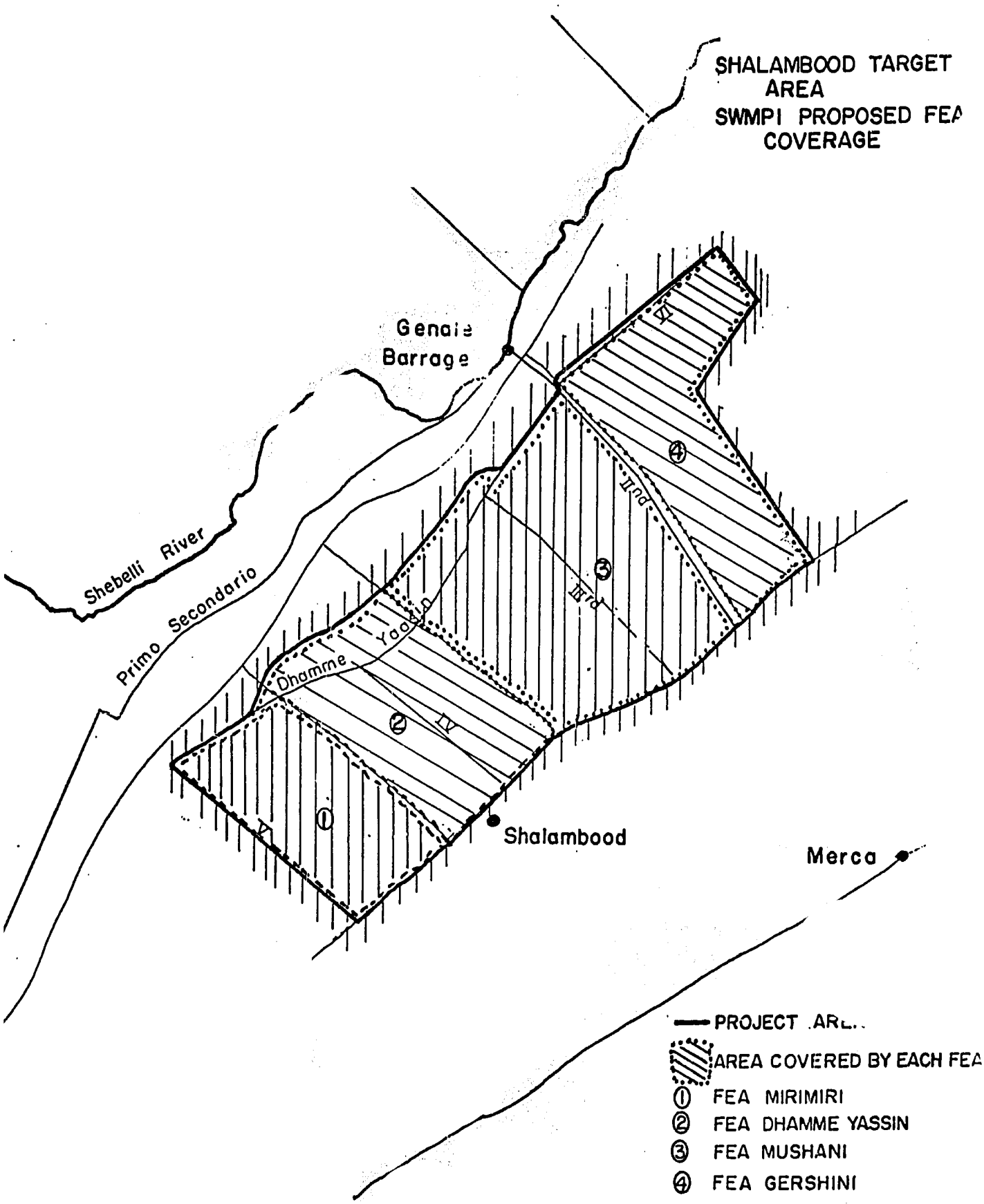

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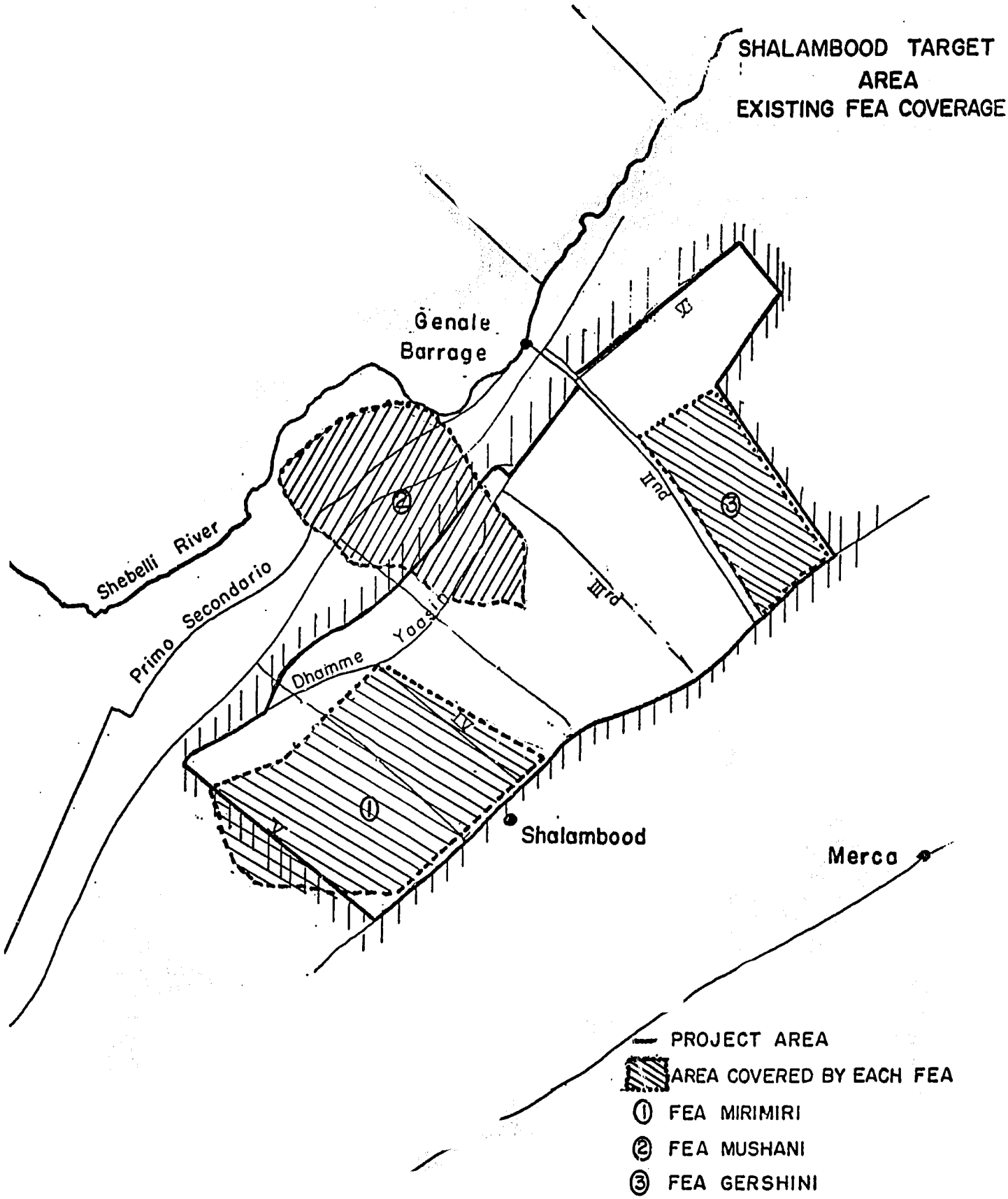
Figure J-2



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3.2 ETC Genale

The Extension Training Centre at Genale is the focal point for training, local administration, and collaborative on-farm trials which will link extension and research in Lower Shebelli. The Centre requires rehabilitation and the second phase of AFMET proposes to develop the facilities- both buildings and the provision of farm machinery. However it is proposed that AID funding provide for an office/house unit at ETC specifically for research workers from CARS while on field visits to ETC and the target area. After proving tech paks have been developed through trials at CARS and on-farm verification trials in Shalambood, domenistration fields will be developed on the ETC Genale farm.

Research workers from CARS should become more involved in the monthly training of the FEA's, and could combine this activity with visits for supervision of on-farm trials in Shalambood.

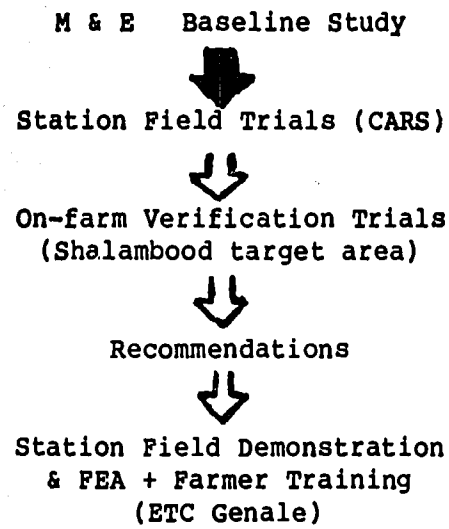
The training capacity of ETC Genale needs strengthening; at present, for example, Subject Matter Specialists are in short supply. An SMS qualified in on-farm water management is at the regional level. This has also been proposed under particularly needed AFMET Phase 2. SWMP 1 will fund local salaries for 4 SMS at ETC Genale Agronomy, Plant Protection, FSR and in-Farm Water Management.

3.3 Afgoi.

The AFMET Phase 2 proposal addresses the problem of research planning and research-extension coordination at a national level, by proposing establishment of a new Research Directorate in the Ministry of Agriculture.

The research coordination committee, lead by the SWMP long-term research advisors and their counterparts at CARS, will define objectives or and coordinate the development of appropriate irrigated adaptive research for on-station trials at CARS, and on-farm verification trials under the extension system on Shalambood small holders' fields. Feedback from these trials and the field surveys should then form the basis for the development of technical recommendations and further trials. After testing on-farm, recommended tech paks should be demonstrated on the ETC Genale farm and used for farmer training at ETC Genale. Figure J-3 below illustrates the processes by which recommendations should be developed.

IGURE J-3: PROCESS OF RECOMMENDATION DEVELOPMENT



As a result of a strengthened research program and better research-extension interaction, the quality of extension messages and trials at all levels will be improved. There is an urgent need for research to keep pace with the extension service and to support it. In the short term, use of existing research findings and "best farmer technology" can bridge the gap before new research findings become available. The differential between actual and potential yields in the target area is very considerable at present. It is to be hoped that recommendations can be developed rapidly, on a regional basis, covering a wider range of crops with comprehensive husbandry packages, and thus enable the extension service to achieve accelerated impact.

4. PRIVATE SECTOR INITIATIVES FOR SUPPORTING AGRICULTURE

Public sector agencies such as ADC, ENC, ONAT, the National Foundry and AFMET, and WAGAD, for example, have become increasingly less efficient in servicing the agricultural sector. The GSDR has already started efforts to relieve some of the agencies of such responsibilities. There is thus a gap for the private sector to fill. Annex H, Policy Analysis, provides some recommendations for Phase 1 policy dialogue regarding incentives which could increase private sector involvement in agricultural input and marketing activities. This section provides more detail as to the forms that increased private sector services could take.

The private sector will play an increasingly more important role in providing such inputs as improved seeds, pesticides (insecticides, fungicides, etc., but not herbicides), fertilizers, tools, equipment and tractors for land preparation, cultivation and harvesting; irrigation equipment such as slide gates, motors and pumps (mechanical and manual); processing and storage facilities and equipment; transport; and rental and maintenance service involving tractor and implement usage, irrigation equipment and canals.

Likewise, the private sector could provide more profitable markets for primary outputs including maize, sesame, banana, papaya, grapefruit, watermelon, mango, limes, assorted fresh vegetables, (e.g. tomatoes), stover or fodder, and agricultural plantwastes (spent banana plants, straws, etc.). Increased involvement by the private sector will, through distributing greater quantities of better quality inputs, encourage farmers to increase quantity and quality of production over a wider variety of crops. This will in turn improve availability of raw materials for the fresh and processed markets.

Constraints most reducing farmer use of agricultural inputs currently include: high cost; low availability; low suitability; lack of knowledge of existence, sources, benefits and/or usage; and lack of farmer demand seen by suppliers. Those constraints related to outputs include: existence of competitive imports and for imports over locally produced varieties, lack of technical know-how needed for quality control and processing, poor availability of raw materials and supplies, and lack of market information. Constraints related to fruit and vegetable production and marketing include all the above plus insufficient resources directed to research, training and extension; poor hygienic conditions and infrastructure in local markets; and high air cargo costs and low capacity (TAMS, Annex VI).

Outlined below are some of the more important targets of private sector opportunity which could bring an immediate positive impact to the Shalambood target area and which will be during Phase 1.

4.1 Input Supplies

4.1.1 Improved Seeds. Two avenues will be explored which could increase usage of improved seeds and plant stocks (through grafting etc.) by farmers under SWMP 2. Many importers are now supplying farmers with very limited quantities of vegetable and grain seeds but they hesitate to import large quantities due to low investment turnover rates. Providing credit to farmers for seed purchase and to importers on a more guaranteed sales basis, will provide the "push-pull"

mechanism described in Annex H, Policy Analysis, to stimulate greater usage. Importers would be encouraged to provide improved distribution, extension, and training. USAID/Somalia is currently funding, through TIPCO, a policy issues study related to agricultural production inputs. To supplement that study, the long-term SWMP1 research advisors will undertake an updated comprehensive needs assessment of agricultural inputs, needed in Shalambood by: type, variety, quantity, packaging, and time of distribution. The resultant report will provide guidance to importers, distributors, CARS and AFMET. The Phase 1 credit study to funded as a short-term TA activity, will propose workable "push-pull" mechanisms to provide guaranteed sales for new, more high risk items.

The second avenue for obtaining improved seeds is to encourage an international seed company to joint venture with a local firm to produce improved vegetable, grain and legume seeds in Somalia, conduct field and demonstration trials, and set up a workable distribution system. The international partner would have technical expertise, experience and products applicable to Somalia's agricultural needs. A survey of international firms, including Kenya Seed Company, followed by Somali investment incentives promotion, and facilitation with Somali investors would be needed. Short-term technical assistance, possibly through the non-profit Industrial Development Council, could be provided to help assess possibilities for such a joint venture. AID's Policy Initiatives and Privatization Project has a contract with TIPCO to fund consultants who could undertake such a study. The Seed Multiplication Center in Afgoi would, if allowed by the Ministry of Agriculture to be privatized, be a logical focal point for this venture. This divestiture should be considered during Phase 1 policy dialogue and studies.

4.1.2 Fertilizers. The primary route for obtaining applicable fertilizers is through importation by the private sector. Again, a "push-pull" mechanism would be needed to create demand and enable increased importer supplies, distribution networks, and technical assistance to meet that demand. This importation would need to be financed in such a way that importers could avail themselves of economics of cost through using international competitive bidding not tied to credit and/or foreign currency schemes. Short-term technical assistance could be provided to assist in these efforts, again, most appropriately through TIPCO consultants already funded by AID's Policy Initiatives and Privatization Project.

The parastatal, Somalia Urea Production Plant, started production in 1984. While it was able to produce about 25,000 tons in 1985, or about 50 percent of capacity, it has experienced frequent power cuts and non-availability of imported chemicals and raw materials, reducing output considerably in 1986. This plant was initially expected to be a primary supplier to other PTA (Preferential Trade Area) members in East Africa and to serve as a foreign exchange

earner for Somalia. Tanzania, who was to be a supplier of natural gas to the Somalia operation, is now planning its own urea plant which would compete with Somalia and cause production efficiencies of the Somali plant to fall even lower.

While urea, at about 46 percent nitrogen, is not a replacement for complete fertilizers, this operation should be monitored to see if its continued possible availability can supplement domestic fertilizer supplies.

A private sector firm near Shalambood is presently setting up a humus production operation utilizing discarded banana plant material to partly replace fertilizers as well as as to build up soil structure and soil water retention. The long-term research team at CARS will monitor this operation and provide limited technical assistance, if needed, to determine if and when a commercial venture could be implemented for supplying other farms.

4.1.3 Pesticides Most of pesticides would need to be supplied through importers by utilizing a "push-pull" mechanism in Phase 2 to foster private establishment of a target area distribution system and joint public/private technical assistance program.

The long-term resident CARS researchers will also conduct a Phase 1 needs assessment of pesticides and provide guidance to importers. The USAID/Somalia pesticide management guidelines will be the basis for this effort. Ciba Geigy seems to offer the best guidance for determining local needs, but this should be verified and updated if necessary.

4.1.4 Tractors, Implements, Tools. Aside from ONAT, the primary source of tractors and tractor implements is through importers or Somalfruit. Tractors are used mostly on larger farms, with more limited access for small farmers after the larger farmers' needs are met. While importation is increasing to meet demand, a private joint venture with a German firm has set up operations near Moagdishu to assemble tractors and implements. This local effort could result in reduced tractor and implement costs to farmers , since labor costs are less in country and some parts will be made locally. The primary obstacle to increased sales by this joint venture is Somali's limited experience with this tractor brand. Competition from Somalfruit imported tractors, which are lower in cost despite being assembled before importation, will be a major consideration in the Shalambood area.

Some implements and many agricultural tools are made in Somalia from recycled metal by private metalworking shops and the National Foundry, a parastatal mandated to be a self-sustaining profit-making operation. Limited technical assistance from UNIDO and the long-term research team at CARS would help the Foundry better meet local demand, especially as regards improved quality and diversity of implements. Although

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marketing and a Contact Farmer system is planned by the Foundry, these efforts would need to be monitored by the SWMP-funded research team. Short term technical assistance could be provided to the Foundry marketing staff by AID's Policy Initiatives and Privitization Project, if necessary, to ensure that the quality of implements needed are obtained and maintained. Similar assistance could also be given to private shops.

Tractor services, although not adequate to meet small farmer needs during times of land preparation, are obtained from ONAT, a parastatal, and several private tractor owners. Even if ONAT is required to raise its fees to the level of those charged by private operators, this will not greatly increase the availability of its tractors, due to lack of spare parts and skilled mechanics.

ETC and the long-term research team at CARS will monitor private tractor operations to determine problems, recommend solutions (if possible), and contribute proposals for longer term solutions to Phase 2 design. Efforts will also be made to find ways to use tractors more than the present 6 to 8 months per year, so as to reduce overhead costs and provide needed crop harvesting, threshing, transport services, etc., and overcome farm labor shortages.

4.2 Handling of Agricultural Production

4.2.1 Marketing. Other than the surveys by Jaffee (1984, 1985) on marketing of fruits and vegetables and a survey of the Somali food industry (Patterson et al 1984), no up to date analysis of market opportunities and needs has been undertaken. In 1984, Jaffee suggested research on both local and export markets be undertaken before extensive plans are made to produce, process, and market additional and new crops. SWMP 1 will provide for short term consultants to undertake such surveys. These surveys will concentrate primarily on markets for which a demand has been established, and less so on possible markets where demand is unknown.

4.2.2 Transport. Privately owned trucks exist to transport inputs and outputs throughout the Mogadishu-Afgoi-Shalambood corridor. Availability of spare parts and fuel, and the poor road conditions between Shalambood and Mogadishu, are the primary obstacles inhibiting better utilization of transport. Somal fruit is financing repair and rehabilitation of the major road linking Shalambood to Mogadishu. Construction of additional feeder roads will be considered during design of SWMP 2.

4.2.3 Storage. Few storage facilities for fruits and vegetables exist. Somalfruit is planning a cold store in Mogadishu for local exports markets. The design team was told

that another private sector firm is planning to construct a cold storage facility in Mogadishu. There is no confirmation that such plans and/or study exist. Short-term technical assistance in post harvest storage may be provided in the later years of SWMP1, to assess possible new needs in this area, including needs for improved on-farm storage if diversified production so warrants.

4.2.4 Processing. Processing of target area maize and oil seeds is confined mostly to grain milling undertaken by small private local wet and dry process millers. Sesame oil and cake production is carried out by a number of small expelling operations, and the large oil seed processing plant in Mogadishu. The latter was recently divested to the private sector by the Ministry of Industry.

Fruit and vegetable processing outputs as described in Patterson, 1984 have not changed much. ITOP still has many of the same problems even though its ownership has been taken over by the National Cooperative Union. Unless drastic changes are made in management, organization and planning, few benefits for the agricultural sector will come from this operation.

A private firm is planning to set up a 4 ton per day finished fruit juice concentrate plant near Afgoi. Local and export markets are being considered, but more market research seems warranted before further investments are made. It does promise to offer a very good alternative to the ITOP operations. This planned operation, and other fruit and vegetable operations located by Patterson and Fahiye in 1984, will be monitored by the long-term research team at CARS to determine market opportunities for target area farmers. Efforts will also be made to encourage processors to provide credit in the form of seed, agricultural chemicals, extension, transport, and written contracts with guaranteed prices.

Also included is a list of other possible private sector opportunities which will be explored during Phase I. Insufficient data including market information existed during the design phase to make more precise judgements about possible private sector involvement.

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Table J-3: Examples of Private Sector Firms Providing Inputs & Purchasing Outputs

Private Sector Firm	Seeds		Pesticides		Fertilizers		Tools/Equip.		Tractors		Processing Equip.		Consultants	Processors
	Import	Local	Import	Local	Import	Local	Import	Local	Import	Rental	Import	Local		
Gezira Store (Mohamed Abucar Mahad)	x						x				x			
Massey Ferguson Sales (Farah H. Shirwa)									x					
Jirdeh Hussein & Co. (Oman Hussein)									x					
Ciba-Geigy (Ismail Mohamed Omar)			x		x		x							
Juba Stores							x				x			
Indian Ocean Company									x	x				
Omaha			x				x							
Somali Processing Fruit Company														x
National Foundry								x				x		
LADAN Commercial & Industrial CO.														x
ITOP														x
OK Product (Hashim H. Ali)														x
Horn Advertising & Marketing Co.													x	
SEPCOM							x		x		x			
Arab Essa Company	x						x							
Somalia Urea Plant						x								
Agro Service (So) LTD						x								
Bashir Khalif														
Osman Horsi														

ANNEX K

ENGINEERING/INFRASTRUCTURE ANALYSIS

ANNEX K: ENGINEERING/INFRASTRUCTURE ANALYSIS

1. SHEBELLI RIVER MANAGEMENT

1.1. Hydrology

1.1.1 Surface Water. The Shebelli River originates in Ethiopia, enters Somalia at Ferar, near Belet Weyn, and travels about 800 kilometers before terminating in a swamp, about 30 kilometers from the Indian Ocean (see Figure K-1). About one-third of the total drainage area of 300,000 km^2 is located within Ethiopia. Normally, about 90 percent of the discharge of the Shebelli River is derived from the catchment within Ethiopia; Figure K-1 shows the small contributing drainage area in Somalia. A hydroelectric project is currently under construction in Ethiopia on the Shebelli River or one of its tributaries. Nearing completion, this project is understood to have a capacity of 150 megawatts. The Design Team was not able to obtain precise information on the Government of Ethiopia's plans for irrigation development downstream of this dam. The Phase 1 Project Agreement will thus include a covenant that the GSDR, acting through the IGAAD forum, will initiate discussions with Ethiopia concerning riparian rights on the Shebelli in order to afford more precise planning for Phase 2.

At Ferar, the Shebelli is at about 300 meters elevation. Over the next some 30 kilometers to Belet Weyn, it falls to 176 meters, but over the next 750 kilometers, the slope is less than 15 cm/km. Figure K-2 shows a longitudinal section of the river in Somalia, and Figure K-3 is a plan view of most of that reach.

It is customary in Somalia to differentiate between the reach from Balad upstream, designated as Middle Shebelli, and the reach from Afgoi downstream, called Lower Shebelli. This distinction is based on administrative regions. There is no apparent hydrographic variation from Belet Weyn down to at least Falkeerow. Figures K-2 and K-3 show approximately the administrative line of demarcation.

The river discharge has been measured at Belet Weyn since 1951, and a water level recorder is located at that station. Water level is read two or three times daily at 6 additional locations as follows: Bulo Burte, Mahaddey Wein, Balad, Afgoi, Awdheegle, and Kurtenwaare.

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TABLE 10: PROJECTED EXPENDITURES BASINWIDE RIVER MANAGEMENT COMPONENT
(U.S.$ 1,000 @ So.Sh.90 = U.S. $ 1.00)

LINE ITEM	TOTAL UNITS LOP	1987 AID	1987 GSDR	1988 AID	1988 GSDR	1989 AID	1989 GSDR	1990 AID	1990 GSDR	1991 AID	1991 GSDR	1992 AID	1992 GSDR	SUB-TOTALS AID	SUB-TOTALS GSDR	TOTALS U.S.$
1. PERSONNEL		416.0	117.0	666.8	199.1	1095.6	320.1	936.8	311.8	494.8	260.9	146.8	260.2	3756.8	1469.2	5226.0
Expat.L-T	18 PY	350.0	50.0	482.0	114.1	858.0	195.1	752.0	161.8	376.0	80.9	94.0	20.2	2912.0	622.2	3534.2
RB Mgmt	4 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	680.0	0.0	680.0
Hyd/Const.Eng.	2.5 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	0.0	0.0	0.0	0.0	425.0	0.0	425.0
Irr.Dist.	3 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	0.0	0.0	510.0	0.0	510.0
OnFarm Wtr Mgt	3 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	0.0	0.0	510.0	0.0	510.0
Local Org.	1 PY	0.0	0.0	85.0	0.0	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	170.0	0.0	170.0
FSU Support		300.0	50.0	45.0	101.1	81.0	182.1	72.0	161.8	36.0	80.9	9.0	20.2	543.0	596.2	1139.2
Merka Support		50.0	0.0	12.0	13.0	12.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	74.0	26.0	100.0
Expat.S-T	62 PM	66.0	0.0	184.8	0.0	237.6	0.0	184.8	0.0	118.8	0.0	52.8	0.0	844.8	0.0	844.8
GSDR L-T	-	0.0	67.0	0.0	85.0	0.0	125.0	0.0	150.0	0.0	180.0	0.0	240.0	0.0	847.0	847.0
2. TRAINING		0.0	0.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	50.0	50.0
Somalia S-T		0.0	0.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	50.0	50.0
3. COMMODITIES		500.0	500.0	603.0	280.0	70.0	0.0	124.5	280.0	70.0	0.0	70.0	0.0	1437.5	1060.0	2497.5
Vehicles	-	0.0	0.0	110.0	280.0	0.0	0.0	54.5	280.0	0.0	0.0	0.0	0.0	164.5	560.0	724.5
Radio Comm.	-	0.0	0.0	293.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	293.0	0.0	293.0
Computer etc.	-	0.0	0.0	150.0	0.0	20.0	0.0	20.0	0.0	20.0	0.0	20.0	0.0	230.0	0.0	230.0
Tech. Equip.	-	0.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	250.0	0.0	250.0
Heavy Equip		500.0	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0	500.0	1000.0
4. CONSTRUCTION		0.0	0.0	0.0	575.0	0.0	600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1175.0	1175.0
Headquarters		0.0	0.0	0.0	575.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	575.0	575.0
Housing		0.0	0.0	0.0	0.0	0.0	600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	600.0	600.0
5. OTHER		0.0	0.0	330.0	403.0	340.0	403.0	490.0	406.0	100.0	406.0	100.0	406.0	1360.0	2024.0	3384.0
Lump Sum Payment Aerial Mosaics Computer Model		0.0	0.0	300.0	3.0	300.0	3.0	450.0	6.0	60.0	6.0	60.0	6.0	1170.0	24.0	1194.0
Operating Exp		0.0	0.0	30.0	400.0	40.0	400.0	40.0	400.0	40.0	400.0	40.0	400.0	190.0	2000.0	2190.0
6. CONT & INFLATION				80.0	73.4	154.3	136.6	244.5	158.9	143.3	145.9	87.5	186.8	709.6	701.6	1411.2
TOTALS		916.0	617.0	1679.8	1540.5	1659.9	1469.7	1795.8	1166.7	808.1	822.8	404.3	863.1	7263.9	6479.7	13743.6

242

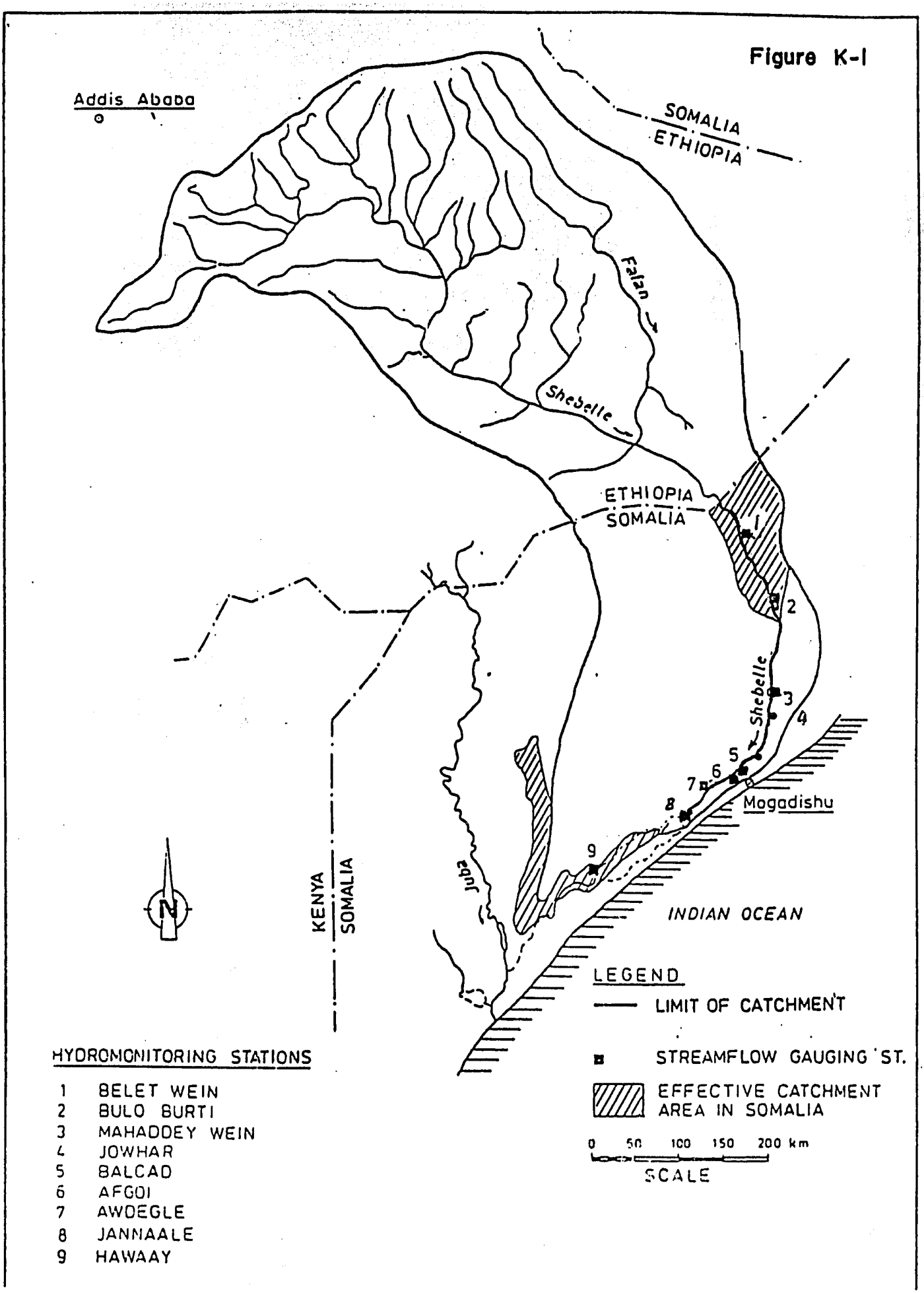


Figure K-I
Addis Ababa
SOMALIA
ETHIOPIA
Falan
Shebelle
ETHIOPIA
SOMALIA
1
2
3
4
5
6
7
8
9
Shebelle
Mogadishu
Juba
KENYA
SOMALIA
INDIAN OCEAN
N
LEGEND
LIMIT OF CATCHMENT
STREAMFLOW GAUGING ST.
EFFECTIVE CATCHMENT AREA IN SOMALIA
0 50 100 150 200 km
SCALE
HYDROMONITORING STATIONS
1 BELET WEIN
2 BULO BURTI
3 MAHADDEY WEIN
4 JOWHAR
5 BALCAD
6 AFGOI
7 AWDEGLE
8 JANNAALE
9 HAWAAY

243x

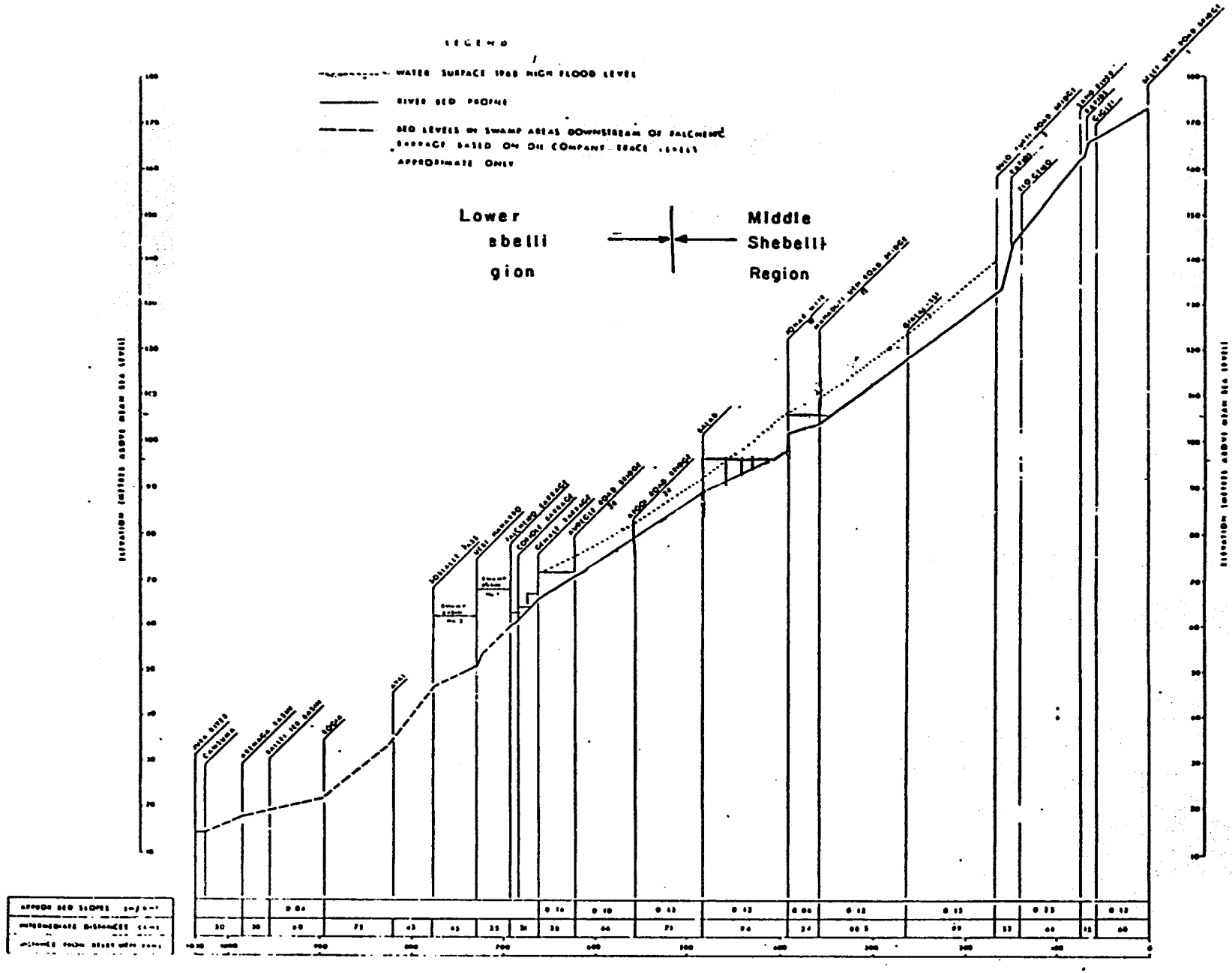

LEGEND
WATER SURFACE 1968 HIGH FLOOD LEVEL
RIVER BED PROFILE
BED LEVELS IN SWAMP AREAS DOWNSTREAM OF FALCHEMO BARRAGE BASED ON OIL COMPANY TRACE LEVELS APPROXIMATE ONLY
Lower Shebelli Region
Middle Shebelli Region

Figure K-2

In addition, staff gauges are located at the sites of two projects as follows:

Jowhar Off-Stream Reservoir (JOSB):
at Sabbun (intake to JOSR);
at Jowhar Reservoir itself;
at Jamaeco Misra (outlet from JOSR).

Duduble Flood Relief Project (DFRP):
upstream and downstream from the gated control structure.

The annual flow of the Shebelli River at Belet Weyn is estimated to be 2226 MCM (or an average of 70.6 m^3/s). The corresponding value at Afgoi is only 1491 MCM/year (or an average of 47.3 m^3/s). The reduction of 33 percent of the flow is only partly attributable to abstractions from the river for irrigation, as there is only limited irrigated development along that reach. Some of the water loss can be attributed to evaporation and overbank flooding, but most of it is probably the result of infiltrations, thus contributing to the recharge of regional aquifers. Figure K-4 is a plot of the flow cariation along the course of the Middle Shebelli River. On October 5, 1977, the record flow of 349 m^3/s at Bulo Burti was reduced to 140 m^3/s at Mahaddey Weyn.

At Afgoi, the beginning of the Lower Shebelli, the river can be completely dry in January-February. Highest flows occur in September-October, with values reaching about 120 m^3/s (1973). Figure K-5 shows the monthly variations of the flow at Afgoi.

The average flow, amounting to 124 MCM per month at Afgoi, if regulated, could fully irrigate over 60,000 hectares (in two seasons).

1.1.2 Sediment Transport. The Shebelli River carries large amounts of fine sediment in suspension. Although sufficient data have not been collected to construct sediment rating curves, a number of measurements have indicated concentrations as high as 5,000 to 10,000 ppm, especially during the occurrence of floods. THere is evidence that this has become more pronounced in recent years as a result of the progressive degradation of conditions in the watershed. Large portions of the silts and clays in suspension are deposited in the irrigation canals, leading to rapid impairments of their capacity to convey water. The average sediment transported during the 1980-84 period past the Sabuun Weir was estimated to be 13 millions tons/year, with an average flow of 68 m^3/s.

1.1.3 Salinity. The quality of Shebelli river water is acceptable for irrigation purposes during most of the year, and particularly during the Der flood season from August through October, when the electrical conductivity is in the neighborhood of 0.5 mohms/cm. The Gu season flows (March/April- June) are

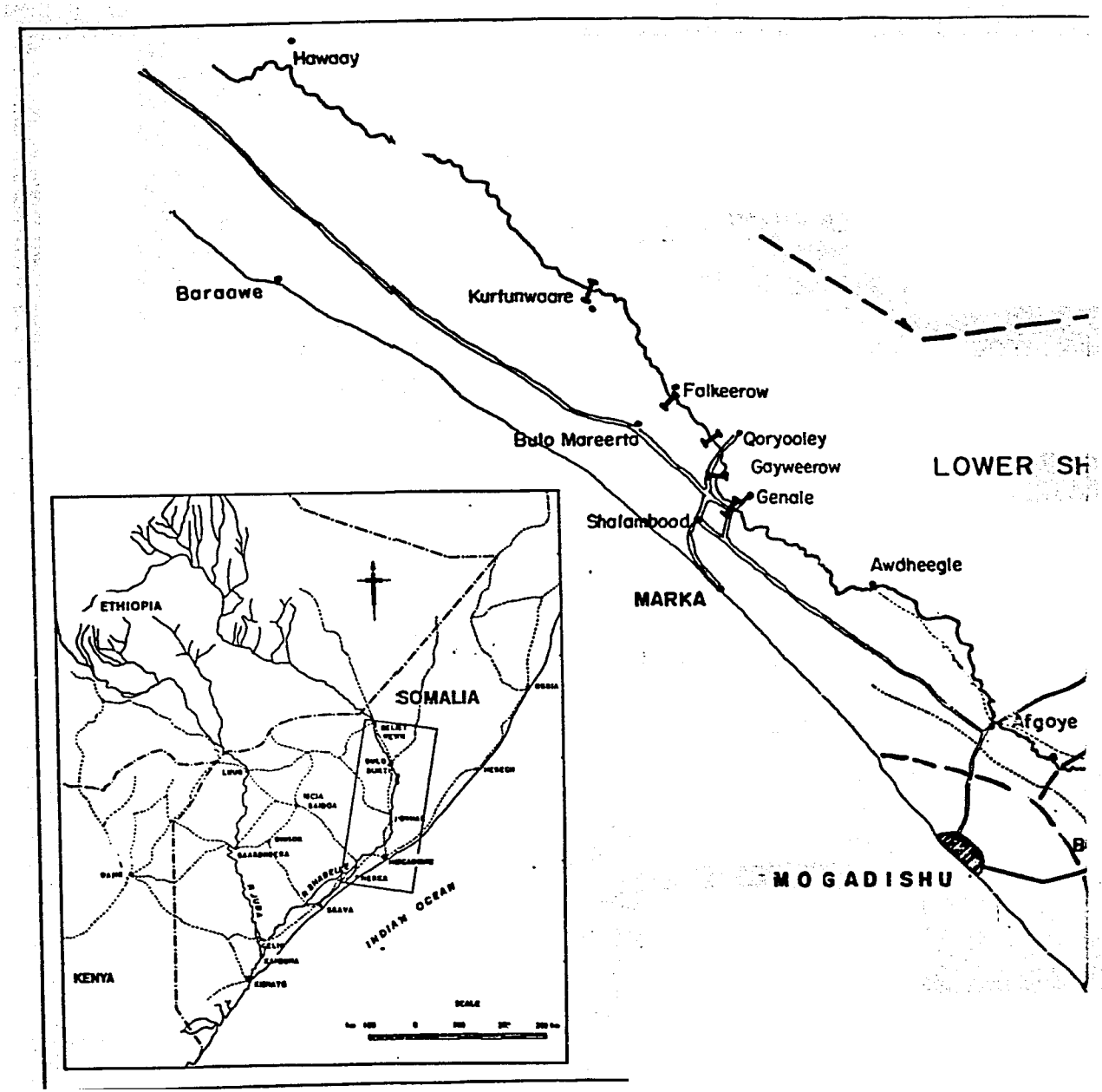
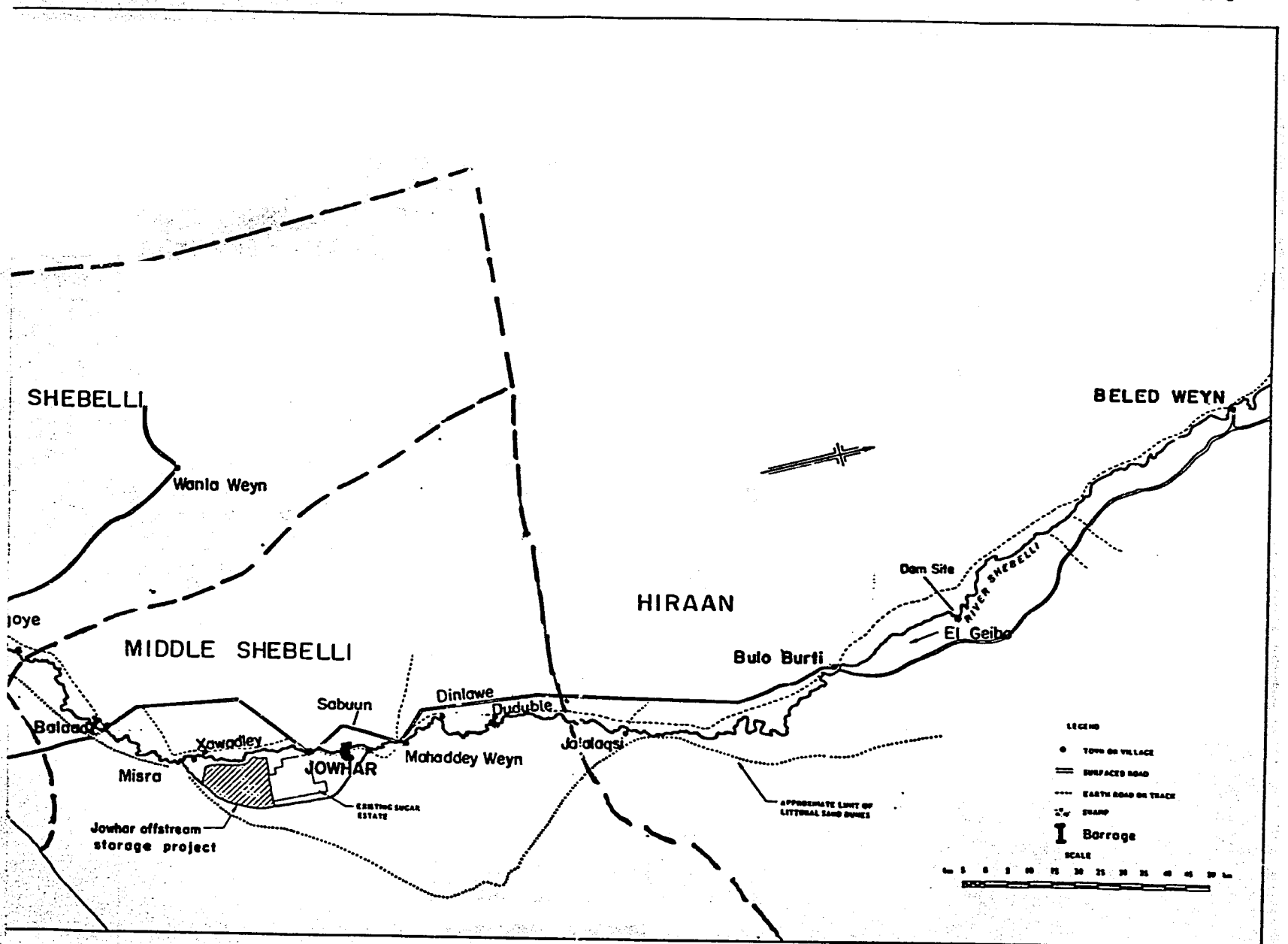

Hawaay
Baraawe
Kurtunwaare
Falkeerow
Bulo Mareerta
Qoryooley
Gayweerow
Genale
Shalambood
LOWER SH
Awdheegle
MARKA
Afgoye
MOGADISHU
ETHIOPIA
SOMALIA
KENYA
INDIAN OCEAN
SCALE

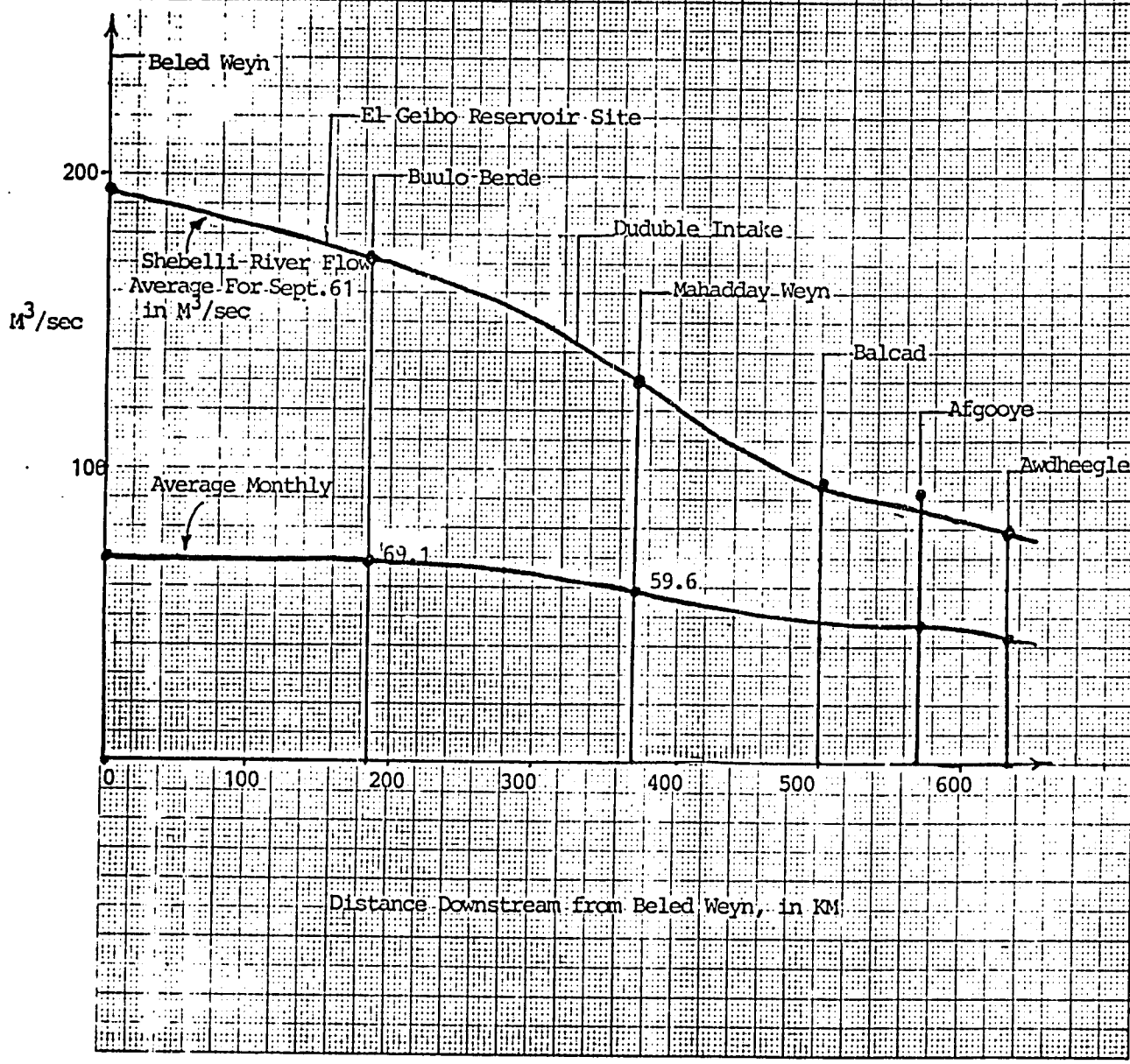
Figure K-3



SHEBELLI RIVER

National Brand 12-108
Made in USA

Figure K-4



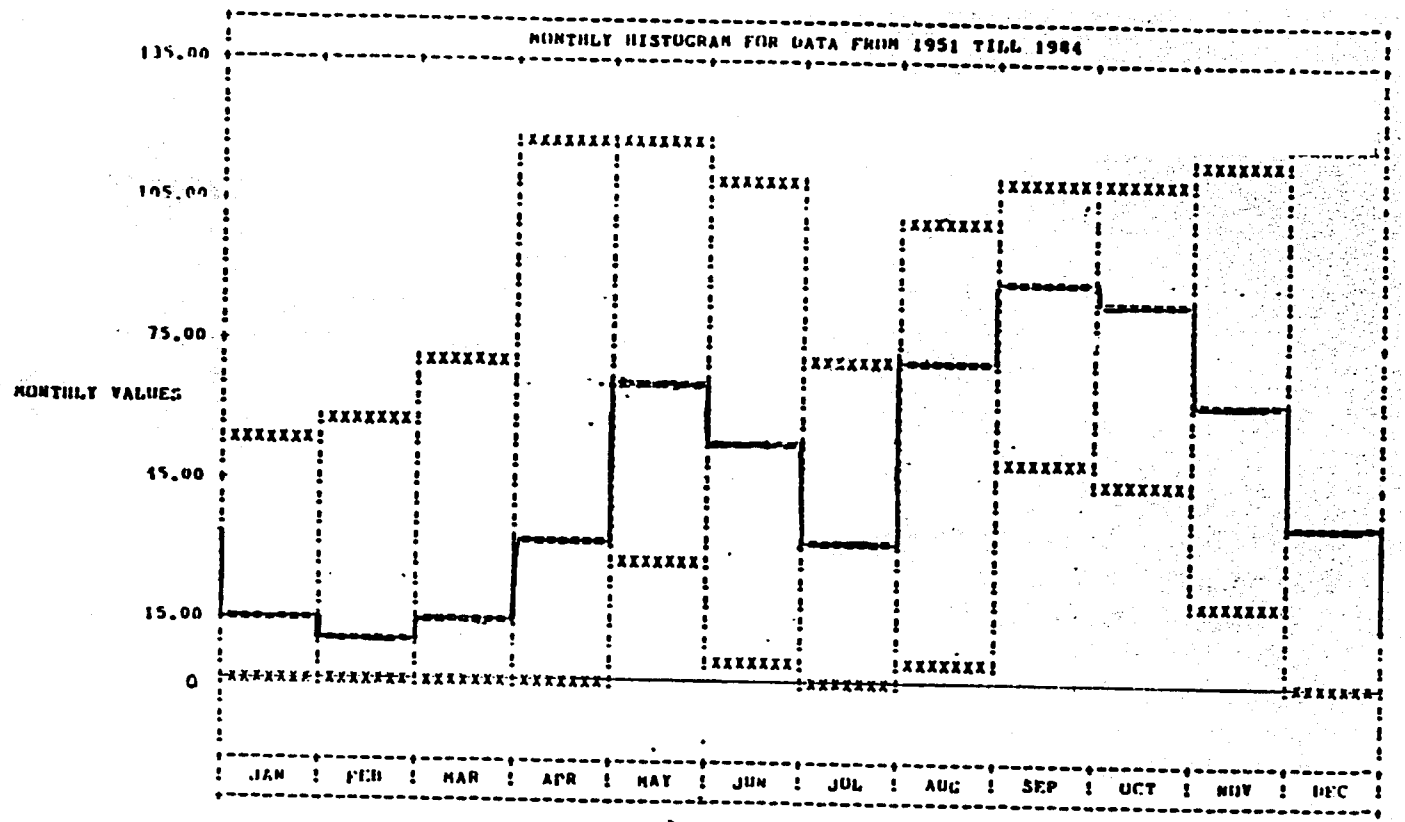
10 Millimeters to the Centimeter

SHEBELLE WATER STRATEGY STUDY AND DUDUBLE FEASIBILITY STUDY SOMALIA - MONP

AFGOY
SHEBELLE RIVER

STATION CODE: AFGO ELEVATION: . . M LATITUDE: LONGITUDE:
RIVER BASIN : SHEBELLE
DRAINAGE AREA: 278000 KM2

DISCHARGES (CUBIC METRES/SECOND) EXTENDED DATA (PREL.



SYMBOLS : X EXTREME VALUE

= MEAN VALUE

ANNUAL VALUES :

MEAN	47.28
MAXIMUM	71.07
MINIMUM	24.71
STANDARD DEVIATION	13.30

sometimes associated with high salinity. This occurs after the river dries up completely during part of the preceding dry season (December-February). Then, for periods of up to 2 weeks, electrical conductivity can reach 1.5 and, exceptionally, 2.5 mohms/cm. When this occurs, the river water is not diverted for irrigation, and farmers wait until the water has washed the salt deposits away, before using the river water for irrigation again.

1.1.4 Groundwater. Extensive groundwater surveys have indicated the presence of a groundwater table located at relatively shallow depths under the irrigated areas. Figure K-6 is a map of the groundwater table as observed in November, 1977. In Figure K-7, a section taken across a NW-SE line passing through Shalambood shows that the aquifer is recharged by percolation from the irrigated areas. The total recharge from a 67,400 hectare area is estimated to be about 50 to 70 MCM per year, of which only 17.6 MCM are currently abstracted by pumping from tubewells. Some of this water can probably be used to supplement surface water irrigation supplies during the dry season, but adaptive research will be needed, as Shebelli groundwater has a higher salinity than the river water, and must be used with caution (see Figure K-8).

1.2 Control Structures

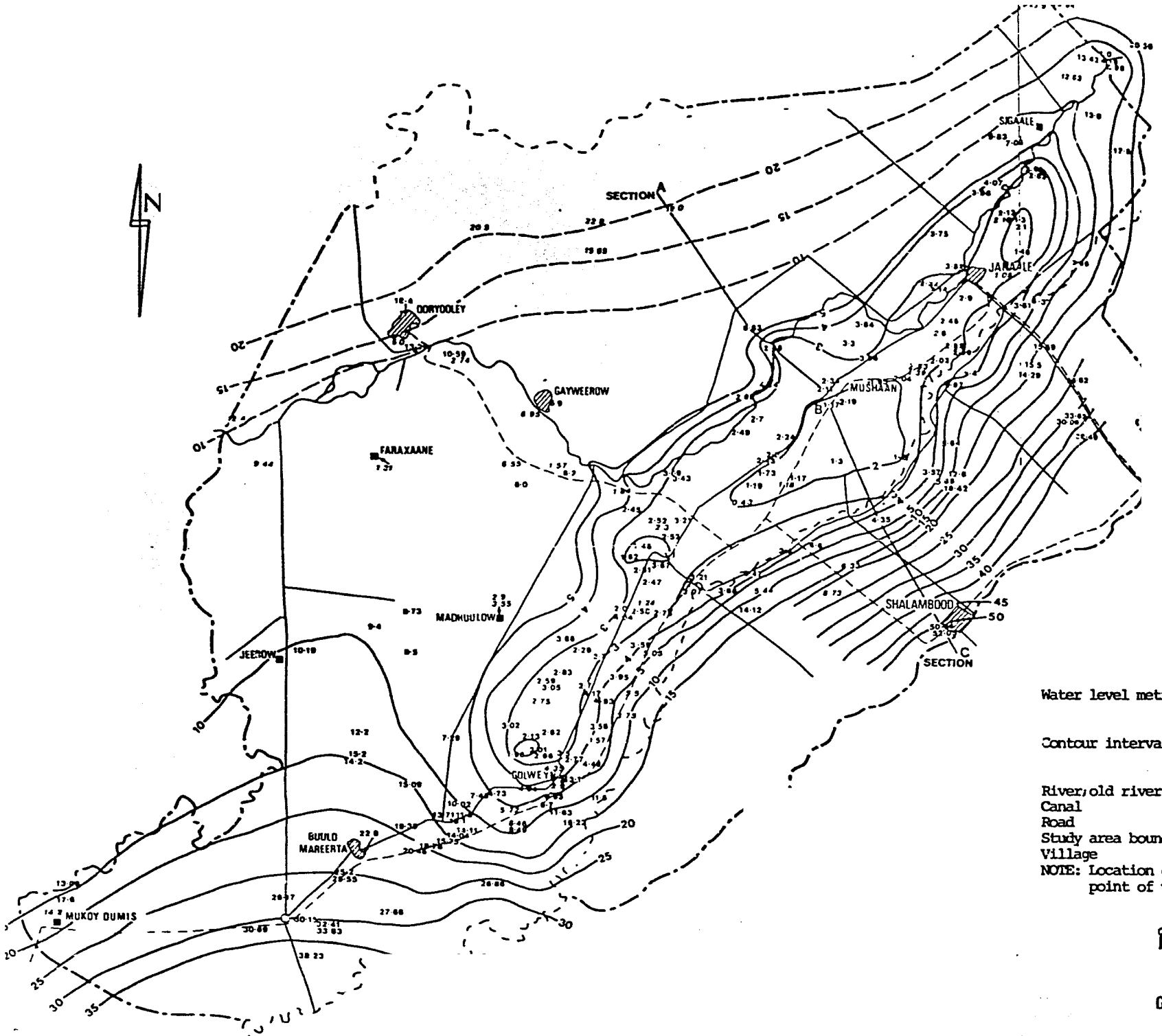
The Shebelli River has long been used for irrigation. Construction of modern control structures along the river started in the late 1920's, and much of the flow can now be controlled (or at least could be, if the structures were in operating order). Location of the control structures is indicated on Figures K-3 and K-9.

* Some 15 kilometers upstream from Mahaddey Weyn, the Duduble Flood Relief Project provides for the discharge away from the river of up to 40 m^3/s whenever the Shebelli flow exceeds 100 m^3/s. This facility, completed in 1985, prevents overbank flooding along the downstream reaches. An operation manual for this facility is available.

Consideration is currently being given to the provision of a reservoir to store spilled flood flows at Duduble, to be returned to the river during the December-February dry season.

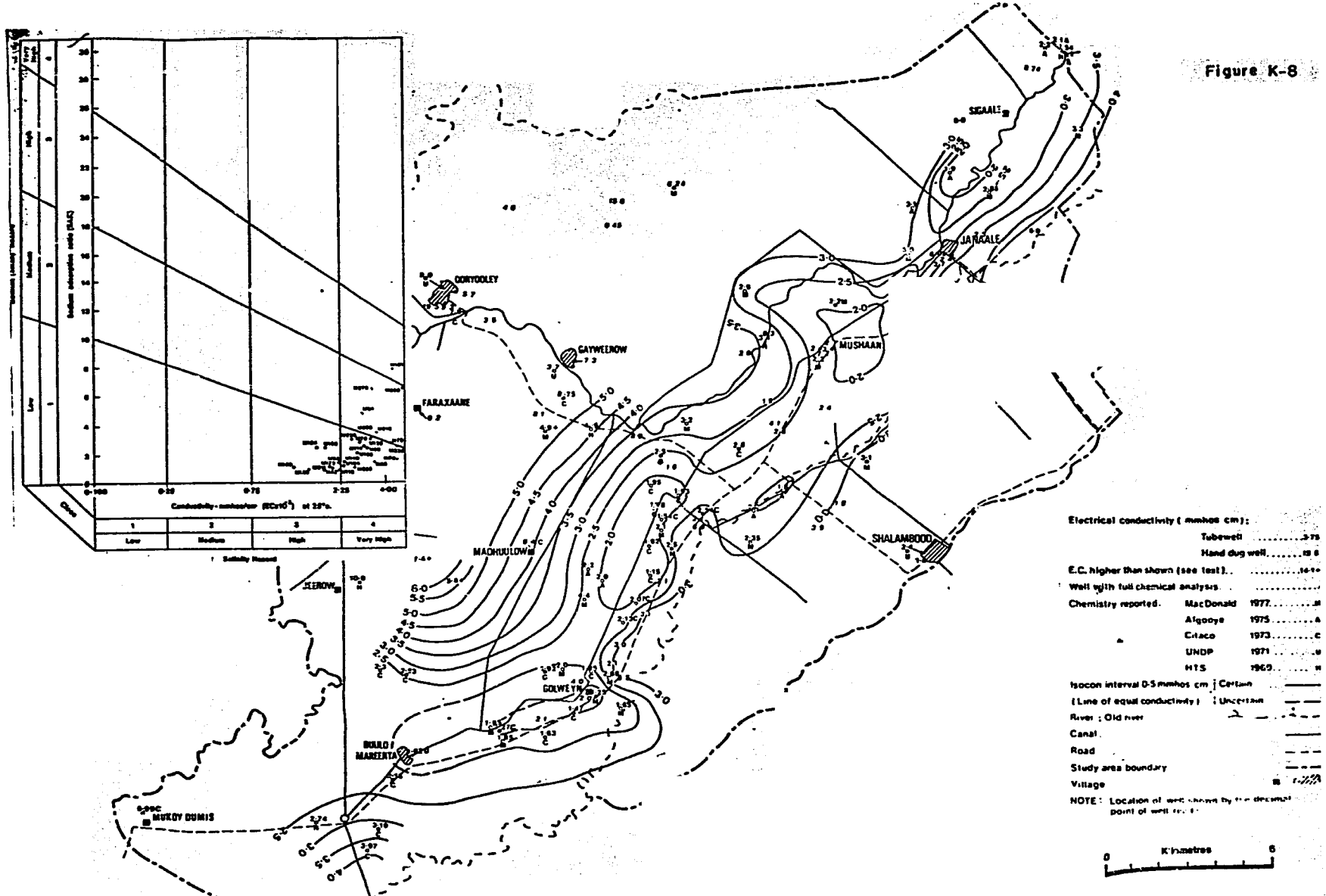
* At Sabuun, an ungated overflow weir, with its crest at elevation 105.22 meters raises the level of the river, for diversion to the Jowhar Sugar Estate..

Figure K-6



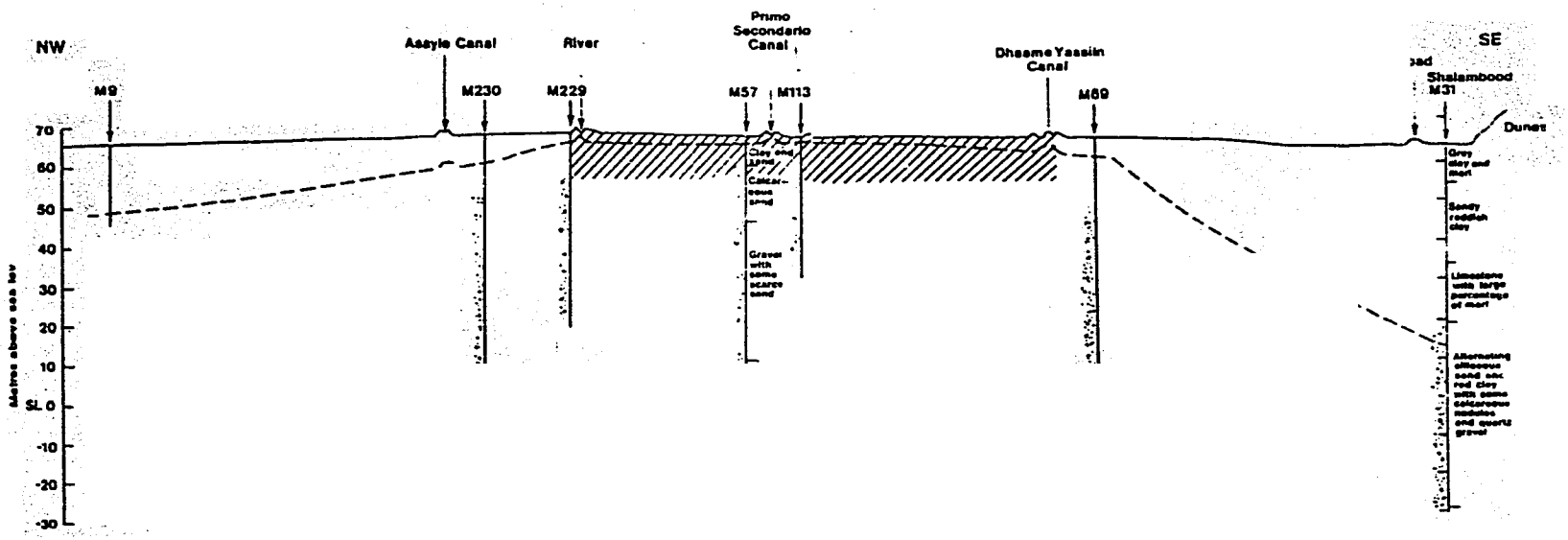
GROUNDWATER PIEZOMETRY

Figure K-8



GROUNDWATER CHEMISTRY

Figure K-7



Probable location of aquifer penetrated by tubewells....

Level of water in aquifer .....

Main area of Recharge

0 kilometres 2

CROSS SECTION SHOWING RECHARGE AREA OF AQUIFER

* From the Sabuun Weir, water can also be diverted by means of a gated regulator into a 24 kilometer canal to the Jowhar Off-Stream Storage Reservoir, where water is stored near the end of the Der flood season, to be released by gravity during the December-February dry season for low flow augmentation in the Shebelli River through another gated structure. The reservoir has a useful volume of 200 MCM and, after allowance for evaporation and seepage (which are considerable), can provide 30 MCM per month to the Shebelli. This project was completed in 1980, and an operating and maintenance manual is available.

* Near Balad, a barrage completed in 1980 can raise the river level by about 6.2 meters and regulate the intake level at about elevation 95.6 m for diversion to the Balad irrigation project and a number of other canals further upstream. The barrage is provided with eight sluice gates and five low level outlet gates that can be operated with electrical power from the generating plant at the nearby textile factory, or manually (if necessary) in an emergency. Rating tables are not available.

* At Genale, a barrage completed in 1927 raises the river level by about 4.6 meters and regulates the level of the Shebelli River, for diversion to the Dhamme Yassin main canal and the Primo Secondario canal by way of two gated regulators. The barrage also permits flow-through of the Shebelli through eleven rectangular sluices on the left side of the barrage (looking downstream), three low level outlet galleries, 11 submerged rectangular sluices with gates, and 11 uncontrolled spillway openings located immediately above them. Although the barrage still seems to be structurally sound, most of the mechanical equipment is damaged or inoperable. No operating data are available. Water control by means of the Genale barrage is extremely difficult and limited at present.

* About 15.7 kilometers downstream from the Genale barrage, another barrage, completed in 1980 across the Shebelli River near Gayweerow, provides for the control of the river level for diversion through a regulator to the downstream reach of the Primo Secondario canal, and to other irrigation canals including one which leads to a small storage reservoir. Since construction was just completed, it is assumed that an operation manual with discharge rating curves (or tables) is (or will be) available.

* Another 10.5 kilometers downstream, near the village Qorioley, is located a barrage of the same vintage as t Genale barrage, although smaller and simpler. It raises the water level of the Shebelli River by about 1.2 mete and controls it for diversion through a gated regulator to the main Liibaan canal, and for flow tnrough nine gated sluices of the remainder in a downstream directio As for the Genale barrage, no operating instructions or flow rating tables are available. The gates and other mechanical equipment are in a state of disrepair, and effective control will be possible only after repair an rehabilitation.

* Another 8.4 kilometers downstream of Qorioley, near the village of Cabdi Cali, the Falkeerow barrage, constructed in the 1930's, raises the river level by about 3.1 meters and provides for control of the Shebel water level and diversions to the Bokore main canal through a gated head regulator. The mechanical gate equipment provided at the nine openings is in disrepair and the concrete apron downstream from the barrage requires extensive rehabilitation. Operating instructio and rating tables are not available.

* The last barrage on the Shebelli river is located abo 7 kilometers from the village of Kurtenwaare. Completed in 1983, this barrage has 8 (or 9) gates. The barrage h not been officially commissioned because of malfunction of the gate lifting mechanisms. Discharge rating tables are not available.

Operation and maintenance of all the structures describe above fall under the responsibility of the Department of Land and Water Resources (DLWR) of the Ministry of Agriculture (MOA), with the exception of:

- the Balad Barrage, operated by the Ministry of Industry and
- the Kurtenwaare Barrage, operated by the Settlement Development Agency (SDA) of the MOA.

Irrigated Areas

The structures described above were intended to provide control of the water level at key locations along the Shebelli River, and control of the amount of water diverted through the main canal regulators and of that passed through the structure to serve diversion facilities located downstream. In addition to the areas irrigated by gravity from these control structures, some 330 pumping installations abstract water directly from the river for irrigation supply of smaller schemes.

The areas served by the gravity control structures are given in Table K-1.

The values shown in Table K-1 for the various irrigated areas are approximate, as no complete land use survey is available for the Shebelli Valley. However, they show that the acreage served by irrigation facilities is about twice that which can actually be supported by the limited water resources available. About two thirds of these lands receive their water from canals supplied by one of the seven barrages and weir, and the remaining third from some 330 pumps that draw water from the river and discharge into water courses and farm ditches.

Of the 132,000 hectares cultivated and under irrigation, about 120,000 hectares are planted in annual crops such as maize, sesame, sorghum, rice, pulse crops and vegetables. The remaining 12,000 hectares are in perennial crops (mainly bananas, and some grapefruits).

Figure K-9 shows the distribution system to the 60,000 hectares (net) served from the four barrages from Genale to Falkeerow. Aside from the inability fo effectively operate the control mechanisms at the barrages, the distribution systems are in very poor condition. The management of water distribution is practically impossible, and irrigation takes place very inefficiently. The application of water to the parcels is neither uniform nor timely, and crop yields are low. As stated in 1.1.1 above, the water supply from Afgoi (upstream of Genale) to the end of the Shebelli system is only sufficient to double crop 60,000 hectares, thus this wastage is greatly constraining production.

1.4 Present Operation and Deficiencies

1.4.1 The Duduble Flood Relief Project. The new Flood Channel Relief Project at Duduble was in operation during 1986, and river water in excess of 100 m^3/s was discharged over the 10-kilometer long flood channel toward the apparent wasteway that was part of the plan, but unfortunately the water could not be drained away because of higher topographics ground than had been anticipated by the designers. The flood waters returned toward the road from Jowhar to Bulo Burti and severely damaged a 10 kilometer stretch of the road. The DLWR constructed a dike along the road to prevent the recurrence of such an event.

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Table K-1

Areas Irrigated from the Shebelli River

Irrigated Zone	Gross Area in ha.	Mode of Service
Upstream from the zone of influence of Sabuun Weir	11,000	67 pumps 22 small canals
From Sabuun Weir	23,100	Sugar Estate canals, Baarow Weyne, etc.
Downstream from Sabuun Weir to Mahaddey Weyn and N. of Jowhar	3,600	20 pumps
From Balad Barrage	7,300	General Daud canal
Above Afgoi, and down to zone of influence of Genale Barrage	21,000	210 pumps + Sigaale and Giddu canals
From Genale Barrage	24,000	Dhamme Yassin Canal, Asaile Canal, Primo Secondario
From Gayweerow Barrage	12,200 *	
Downstream from Gayweerow Bridge, above Qorioley	7,200 *	Wadajir Canal
From Qorioley Barrage	11,400 *	Faraxaane
From Falkeerow Barrage	12,700 *	
From Kurtenwaare Barrage	6,000	Kurtenwaare Sablale Brava
Hawaay Scheme	4,000 ±	13 pumps
Total Gross Area:	150,000 hectares	
Total Net Area:	132,000 hectares	

* The aggregate value of 43,500 hectares for these four areas is accurate. The breakdown between them is estimated.

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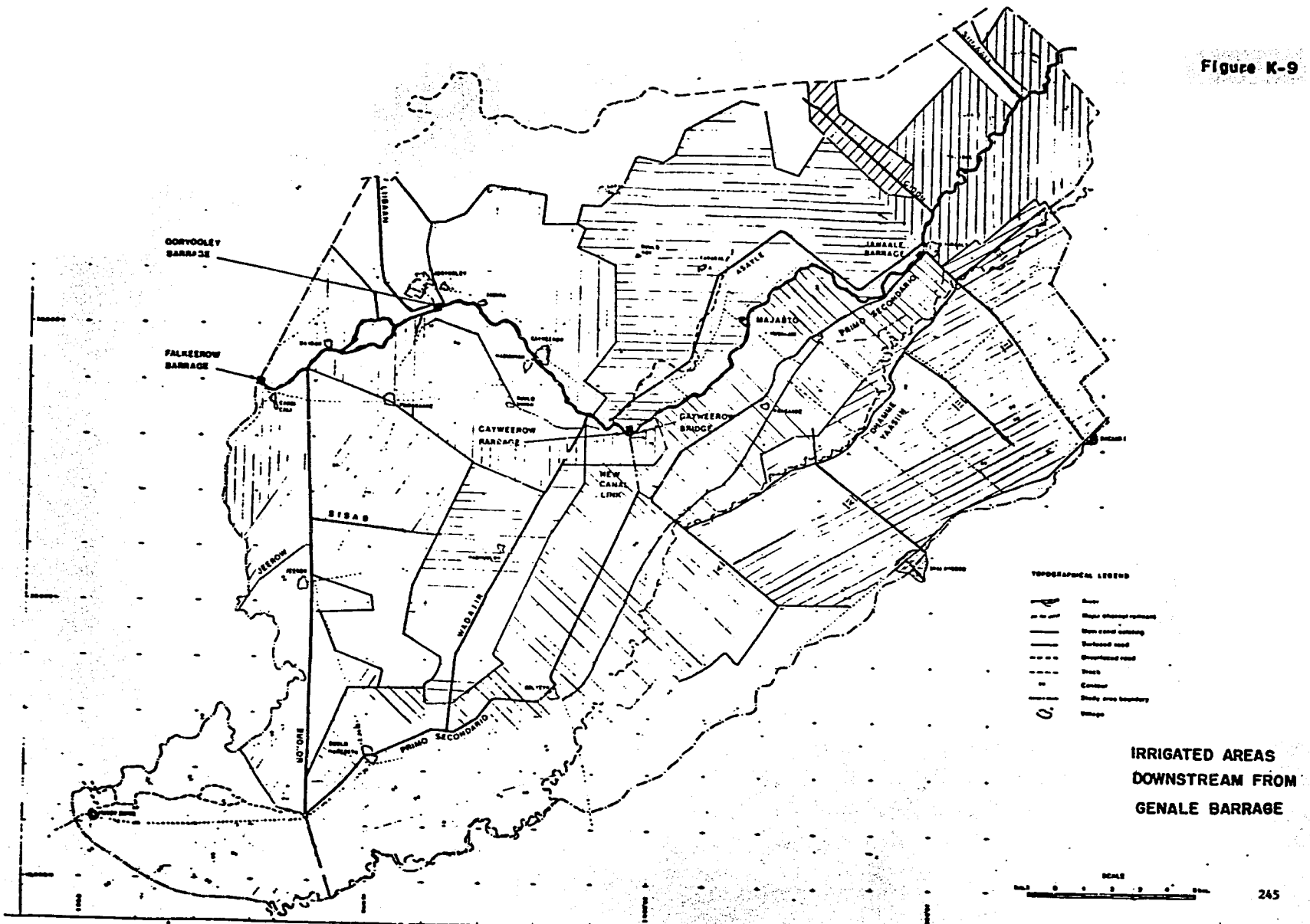
Figure K-9



IRRIGATED AREAS DOWNSTREAM FROM GENALE BARRAGE

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Storage of the diverted flood waters in a new off-stream reservoir near the end of the flood relief channel was being considered by the DLWR at the advice of their consultants, but there is now a question as to the feasibility of such a scheme because of the unfavorable topography.

During the one-year operation of the Duduble Project, about 40 centimeters of sediment deposited in the flood relief channel -- a considerable quantity amounting to about 100,000 m3. Sediment accumulated also in front of the diversion control headworks. These operational problems need to be addressed. In particular, it is important to determine whether the flood channel will soon reach a regime equilibrium, or whether extensive and costly excavation will need to be carried out annually in order to keep it operative. In any event, the project must be provided with adequate maintenance means. Operating instructions were given to the MOA by the project's constructors, including theoretical curves to be used to manipulate the sluice gates. These curves should be verified and, if necessary supplemented, by actual calibration in the field. Also, guidelines for maintenance requirements and implementation should be prepared.

1.4.2 The Jowhar Off-stream Storage Project (JOSP). This project has been used over the last four years to store Der season floods for low flow augmentation during the December-February dry season. A number of areas downstream from the Sabuun barrage depend on high river levels for gravity diversion to their service canals, and in order to preserve these interests the DLWR has restricted the diversions to the JOSP, thus limiting the effectiveness of the scheme. Solution of this problem either by providing one or more pumping stations or by constructing an uncontrolled, low weir across the river to raise the water level should be developed, in order to maximize use of the scheme.

Sediment deposition has also taken place at various locations in the JOSP, and this needs to be monitored and corrected by taking measures (such as installing a gated structure at the end of the outlet channel) as well as maintaining an adequate desilting program. The designers of the project prepared for the DLWR a comprehensive O&M manual with a schedule of personnel and equipment that should be followed.

The reservoir is very shallow (0-2 meters) and losses by evaporation and percolation are considerable. It is reported that out of a useful storage volume of 200 MCM, only 90 MCM can actually be delivered to the river during the December-February dry season, about 30 MCM in each month.

Consideration was given to raising the level of the off-stream storage reservoir in order to increase the project's low flow augmentation capability, but preference seems to be given to the prospect of a storage reservoir at Duduble.

However, raising the peripheral dike around the Jowhar reservoir by only 1 meter would appear to be capable of providing an additional volume of about 200,000 MCM. The evaporation would not be increased and the percolation would increase only slightly. This option should be given consideration at the same time as measures for maintaining the downstream requirements. It should be noted, however, that the accuracy of topographic maps that led to these estimates would need to be verified by more detailed field investigations.

1.4.3. The Balad Barrage. Completed in 1980, the Balad barrage can raise the river level by some 6.2 meters for regulation purposes. During the flood seasons, the gates are manipulated to maintain the upstream water level at about elevation 95.6 meters for diversion through a gated head regulator to canals irrigating about 200 hectares. During the dry season, the gates are kept open to prevent gravity diversions, and to permit downstream flow of all the river discharge. Some small parcels planted in perennials are irrigated by pumping directly from the river into the irrigation main canal.

The project was constructed as part of an agro-industrial complex carried out by the Ministry of Industry, including a textile factory and planned to include cotton cultivation. The irrigated land was since parcelled out to small farmers who grow principally maize and sesame, much of it on 1-hectare plots.

The initial reach of the main canal was designed to promote settlement of silt carried in suspension by the Shebelli river water. Finer material is carried into the smaller order canals, where much of it is deposited. The main canal needs to be excavated periodically (i.e. twice each year) in order to restore its sediment-excluding function. Shortage of funds has prevented the Project's administration from implementing the desilting operation this year. Other water courses and farm ditches are maintained by the farmers, as they are elsewhere in the Shebelli basin.

1.4.1 The Genale-Gayweerow-Qorioley-Falkeerow Barrages. As shown by Table K-1, a total of about 67,500 hectares are commanded from these four barrages, or approximately half of the area irrigated from the Shebelli River. The Genale Barrage alone commands 24,000 hectares by way of the Primo Secondario and Dhamme Yassin canals, and also regulates the flow-through of water controlled at the downstream barrages. As such, the Genale Barrage is a key control structure in the Shebelli River irrigation system. The present impossibility of operating most of the gates at Genale, as well as the head regulators on the Primo Secondario and the Dhamme Yassin canals, severely impairs water control and management of the system. In practice, the water surface elevation remains at or slightly above the spillway crest level, and the open head regulators permit the supply of large amounts of water into the two main canals. Flow

through takes place over the spillways, discharging toward the downstream area only what is not diverted to the Primo Secondario and the Dhamme Yassin.

The only constraint limiting this inequitable distribution is imposed by the inability of many of the canals to receive their design discharge because of siltation.

To a lesser degree, the same situation prevails at Qorioley and Falkeerow.

Fortunately, the Genale Barrage was designed and constructed with ungated spillway weirs that have been able to discharge flood flows even when the sluice gates and low level outlet gates were inoperative. However, every wet season the water level upstream from the barrage encroaches on the freeboard and almost reaches the bridge underdeck. Should one of the spillway bays become obstructed by floating logs and debris, the barrage could be overtopped and consequently destroyed. It is, therefore, imperative that the gates be repaired or replaced in order to restore the barrage's discharge capacity as soon as possible.

On the distribution systems, practically all the regulators and turnout structures are out of service, making it impossible to measure and distribute the water in a rational manner.

Most of the canals -- from primary to the farm ditches -- fill up with deposited sediment yearly, but the farmers have joined up with the district offices of the DLWR in a yearly maintenance program to excavate sediment deposits from the canals during the December-February dry season. The department provides excavators, bulldozers and operators, and the farmers procure fuel and oil as well as motivation payments for equipment operators to desilt the main and secondary canals. The farmers themselves maintain the water courses (tertiary canals) and the farm ditches through labor contributions proportionate to their length of frontage along the canal. Portions of the canal system which are not served under existing uneven water distribution conditions are not maintained.

Under the sponsorship of the ADB, rehabilitation of some 2500 hectares is currently underway, to be served from the new Gayweerow barrage. It is designated as Qorioley Project, Phase 1. Starting in 1987, service to this area will depend on the adequacy of releases from the Genale Barrage, and will influence the service to the areas served by the Qorioley and Falkeerow barrages.

Obviously, the rehabilitation of the three barrages on this reach of the Shebelli River and provisions for their conjunctive operation are necessary if the distribution of water to the irrigated areas is to take place beneficially.

1.4.5 The Kurtenwaare Barrage. Completed recently, this control structure is proposed to be placed under the jurisdiction of the DLWR. Being the last control structure on the Shebelli River, its ability to distribute to its command area adequate quantities of water will require coordination with the operators of the upstream control structures and their agreement on a fair method of apportionment.

1.4.6 Operation during extreme dry season. The Ministry of Agriculture decides on a rotation of water use among the various command areas. Typically, during the January-April 1986 dry season, water abstraction from the river was permitted only for human and animal consumption and for irrigation of perennials and vegetables, to the exclusion of other field crops such as maize and sesame, as follows:

- reach from Hawaadley to Afgoi:	2 days/week
- " " Afgoi to Genale	2 days/week
- " " Genale to Kurtenwaare:	3 days/week

During that dry season, releases from the Jowhar reservoir for low flow augmentation were maintained at the monthly rate of about 30 MCM.

upper lower pool
May help?

Many of the banana growers have wells or tubewells on their property, from which they pump supplemental water required during the dry season.

2.1 The Shalambood Target Area

The TAMS feasibility study of the rehabilitation of the Shalambood Area and reconstruction of the Faraxaane Area provided the basis for the selection of Shalambood perimeter as the target area of the Shebelli Water Management Project. The Genale Barrage, described in the preceding pages, regulates the flow of the Shebelli for this area. An off-take structure, close to the left bank (looking downstream) abutment of the barrage, conveys water into the Primo Secondario canal and the Dhamme Yassin canal.

The latter serves an area of 5,280 hectares gross through the branch canals, Second Secondario, Third Secondario and Fourth Secondario. The TAMS study of the Shalambood area found a net irrigable hectarage of 4,148. However, when the perimeter was put into operation, the Yassin Canal also delivered water to the Fifth Secondario (to the southwest) and to the sixth Secondario (to the northeast). In addition, a narrow strip was irrigated directly by the Yassin Canal along a reach on its right bank. AID's expanded definition includes these areas as the Shalambood target area, totalling 10,200 hectares (gross), or 8,000 net irrigable hectares.

It is recommended that the actual physical rehabilitation of the target area, comprising main and branch canals and drains, operation and maintenance tracks, interlinking roads, distribution and field canals and drains, and their related structures (water control and delivery, crossings, bridges, etc) be implemented progressively over the 10 year life of the project. During SWMP1, the entire perimeter will benefit from rehabilitation of the Genale barrage; approximately 5,280 hectares (gross) from the proposed Dhamme Yassin rehabilitation, and approximately 2000 hectares (gross) by rehabilitation of the Fourth Secondario. The design to be undertaken in SWMP1, however, will embrace the total target area. This design will take into account clarification of public/private split in responsibility for tertiary/quarternary canals' upgrading and maintenance which will emerge from SWMP's basinwide water management technical assistance component. SWMP2 investments will be designed to stimulate farmers' own investments in canals below the secondary level.

2.2 Present Conditions and Main Problems

The conditions prevailing in the Shalambood perimeter have been described in detail in the various studies devoted to the area, particularly MMP, LI, and TAMS, so no long description is given here. They may be summarized as:

- Supplemental irrigation rather than controlled. During the Gu Season, one could even name it "flood recession irrigation", while in the Der season, it appears more like a rainfed agriculture supported by one or a few water applications, as available from the river;

- Irrigation of perennial crops, estimated to represent 10 percent of the total area, is complemented by groundwater pumped from wells;

- Irrigation efficiencies are estimated to be very low; the studies put forward figures ranging from 10 to 25 percent, based mostly on computation and estimates rather than actual observation;

- Low efficiency is blamed on account of poor or nil night irrigation, what brings to light two topics to incorporate in the adaptative research program, field efficiency et night irrigation, and one knilly in design, night storage facilities. In any case, provisions for local storage, be it to store night water for day time delivery or extend irrigation periods beyond the end of river flows, should be considered;

Operation of the system is carried out with some efficiency, but could be largely improved both by rehabilitation of the systems and special training and equipment of the teams in charge;

- Maintenance of the system is poor, but carried out from farm to distributory canals by the users. Branch canals and the Yassin itself were previously maintained by the GSDR; it seems that deficiency of public administration has been taken over, in part, by the users themselves through their traditional associations. They raise funds and paid for the fuel of the graders and excavators. Due to the high sediment content of the river waters, desiltation is a burden in maintaining the canals;

- Maintenance has been limited to cleaning, desilting and deweeding of the earth canals; for apparently a long period, neither concrete nor metal work has been repaired.

- Shalambood perimeter has no drainage system; due to the present "irrigation" practice, this absence has resulted in limited damage, mainly through water logging. SOme patches of apparently abandoned land,

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The existing road and track network has to be improved, both in terms of construction of new roads and the improvement of existing ones, so as to obtain a well developed, all weather network for canal and drainage maintenance and repair as well as for input supply and output marketing.

The key problems of salinity, sedimentation and surface drainage are discussed in more detail in the following sections.

2.3 Salinity Problems

This section considers successively: 1) river water salinity and quality; 2) groundwater salinity; 3) current soil salinity; 4) soil salinity under future irrigation; and 5) soil salinity levels in relation to crop production.

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2.3.1 River Water Salinity and Quality. Electrical conductivity (EC) figures are available for the Shebelli River since 1965. The mean Afgoi EC figures in microohms/cm are as follows (MMP report):

Jan	Feb	Mar	Apr	May	June	Jly	Aug	Sep	Oct	Nov	Dec
965	1,183	952	922	1,186	960	805	543	421	445	817	845

If allowance is made for the two days it takes river water to flow from Afgoi to Genale, it is found that recorded levels at Genale are very close to the Afgoi figures, but marginally higher. It has been stated that there is a water salinity peak at the beginning of the Gu season. An analysis by the Design Team of available records shows, however, that:

- The peak occurs only in years when river water is very low for two or more months prior to the Gu flood;

- Between 1965 and 1976, only 4 years out of 12 had a peak of over 2000 microohms/cm.

If the Jowhar water storage reservoir is effective in eliminating very low pre-Gu river flows, the peak now found in some years should disappear.

The overall water quality is conventionally obtained by plotting the salinity hazard (as EC) against the sodium hazard (sodium absorption ratio). Analyses of 120 samples in the MMP report show that the river water:

- has a very low sodium (alkali) hazard; and
- has a mostly moderate (2/3 cases) but sometimes high (1/3 cases) salinity hazard.

2.3.2 Groundwater Salinity and Quality. Groundwater, used mainly on perennial crops in the dry months when river water is unavailable, has a higher salinity than river water and must be used with caution.

The MMP report includes a map of groundwater salinity in the study area in the 1970's (Annex II, Fig. 9.1). In the Shalambood target area, groundwater underlying the northwestern areas near the river, the Primo Secondario and the Dhamme Yassin canals had ECs of 2.0 - 2.5 microohms/cm, rising to 3.0 in the southeastern areas near Shalambood town. These figures suggest that recharge of the groundwater from the river and main canals lowers groundwater salinity nearer to these sources. Overall groundwater use/recharge rates for the 67,400 hectares of the MMP study area are given as about 17 million cubic meters/40-50 million cubic meters. Any increase in use would alter this ratio and might lead to a modification of groundwater salinity, so this would need to be monitored carefully.

find + Cure

The recharge of groundwater is postulated to occur preferentially through a few "leaky spots" rather than via a widespread general downward percolation through the soil. The latter type of movement is severely restricted by the very low hydraulic conductivity of the subsoil clays, though hydraulic conductivities appear patchy: MMP figures vary between 0.05 and 0.4 m/d. Recharge via general downward percolation (as distinct from localised seepage due to the "leaky spots") occurs only when moisture at depth is close to saturation levels, so as to provide a direct hydraulic connection between root zone and groundwater. Zones with soil moisture much below saturation would stop moisture movement due to high matric suctions. The MMP report considers a feasible limit for downward percolation of this type to be 10% of gross irrigation application.

(c) Soil Salinity now

Salinity values of surface soils (0-50 cm) are generally low to negligible. Exchangeable sodium levels are very low at all soil depths.

The currently low soil salinity values could be increased if too much saline irrigation water were applied without adequate drainage. The harmful effects of high salinity are due to the raising of the salt content (salt here referring to all salts and not just sodium chloride). By decreasing the osmotic suction between plant solution and soil solution, high salinity impedes soil water uptake by plants; it may also involve toxicity effects from individual ions in the soil solution.

The MMP report analysed soil saturation paste electrical conductivities (ECe) from four soil horizons (0-50, 50-100, 100-150 and 150-250 cm) and found approximate ECe values for 80% cumulative probabilities of 2.0, 3.1, 4.8, and 5.2 respectively. The mean ECe values for all sites (1346 samples) in the MMP study area are as follows:

Depth in meters	Number of Samples	Average ECe	Standard error
0 - 0.5	600	2.0	0.06
0.5 - 1.0	593	2.9	0.12
1.0 - 1.5	64	4.1	0.95
1.5 - 2.5	46	4.5	0.57
2.5 - 3.5	43	4.8	0.33

These results indicate:

- low surface values, and
- a tendency to increase with depth.

The latter appears to be due to downward leaching of soluble salts and thus to indicate some water movement in these heav soils.

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In terms of salinity hazard, based on salinity values for the upper 100 centimeters of the profile, as set out in the following table, 91 percent of the 611 sites examined had a salinity hazard which was negligible (class 1) or low (class 2).

Class	Salinity hazard	Upper class limit	Number of sites	% of sites
I	Negligible	2.4	221	36.2
II	Low	4.9	333	54.5
III	Moderate	7.4	41	6.7
IV	High	9.9	13	2.1
V	Very high	over 9.9	3	0.5
			611	1000

In terms of Soil Solution Composition, the principal cation found in the salt solution of selected profiles was found to be calcium, and the principal anion, sulphate, but in the more saline soils sodium and chlorine become increasingly important.

The high proportion of calcium and the low sodium content of the project area soils should ensure, it is thought, that leaching of these soils, if needed, would not present serious problems. Sodium causes clay dispersion, reducing permeability, whereas calcium has an opposite effect, causing clays to flocculate, i.e., to adhere to each other to form flocs or small aggregates. Some gypsum (calcium sulphate) appears to be present in most horizons of most soils.

The TAMS 1986 1:10,000 land suitability map of the Shalambood project area (Drawing 7.2) puts most of the area into classes III pd and III pds. The 's' symbol, affixed to about 2/3 of the area mapped, indicates a salinity hazard. In this case the salinity hazard is defined as "subsoil salinities greater than 4 mohms/cm". 'Subsoil' is not defined but the description of Saruda series in the text suggests it refers to soil "below about 80 cm". The Design Team comment on this map is that:

> the threshold of 4 mohms/cm adopted is the limit between USDA classes 0 (salt free, 0-4 mohms/cm) and 1 (slightly saline, 4-8 mohms/cm), so that even subsoils with up to twice the 4 mohm/cm conductivity lomit adopted are still only in the slightly saline class;
>
> it appears that few if any actual conductivity measurements were taken, and no conductivity analyses are included in the published report. Thus the subsoil values reflected in the use of the 's' mapping symbol appear to be inferred, probably on the basis of the MMP data discussed above, and no new factual information on salinity is provided by the TAMS report;

- values for upper horizons in which roots are generally confined are in any case low;

- while it is prudent to draw advance attention to even slight salinities thought to occur at depth, the TAMS land suitability map is possibly over-cautious and based merely on inference. For these reasons, the map may give an exaggerated impression of salinity hazards to the casual reader not able or prepared to assess the available information critically for him/herself.

2.3.4 Soil Salinity in the Future. Salinity under irrigation can be maintained at present low levels, or reduced, only if total water (irrigation water plus rainfall) is in excess of crop requirements, thus allowing some downward movement of water to leach salts down the profile.

Leaching depends on: (1) what fraction of the water moves downward; (2) the electrical conductivity (EC) of that water; (3) the EC of the soil saturation extract (ECe), and (4) a factor (f) representing leaching efficiency i.e., the relative ability of leaching water to remove soluble salts.

The degree to which leaching is practicable in the heavy soils of the Shebelli and Juba Valleys has been the subject of much discussion and argument. One school of thought (see the Bureau of Reclamation/Ministry of Juba Valley Development February 1986 Interim Report) postulates that a system of soil cracks in the deeper soil layers would facilitate water movement and through-leaching of the cracked horizons. These cracks would occur, however, only after dry periods allowing deep soil drying and would close rapidly once the soil was well wetted. Leaching might be mostly on crack and ped faces and have little effect on ped interiors. It seems likely that in order to have significant leaching over a longer period and a more satisfactory leaching efficiency of the water involved, there must be a hydraulic connection between the upper soil profile (the root zone) and the deep subsoil after the cracks have closed. Since water movement, in the absence of cracks and macropores, moves only slowly, if at all, at less than saturation levels, this implies that the connecting zone must be saturated, or nearly so.

The saturated zone through which leaching water could move is probably not present under traditional subsistence irrigated agriculture, except possibly for short periods in the Gu season or after exceptionally deep basin flooding. But it is thought to be present more often under perennially irrigated crops (mainly bananas at present) and may occur more often in future under annual crops if improved irrigation methods which add a leaching fraction to the calculated crop water requirement are employed.

Once downward soil water movement occurs, it is thought that the leaching efficiency of this water ("f" in the second paragraph of this section) will be high. Because of low hydraulic conductivities due to the near absence of macropores, causing water to move mainly through micropores, leaching water will move quite slowly but will, it is argued, be relatively efficient for much the same reasons. The fact that the soil structure disappears on wetting, and the clays expand, eliminates possible preferred water pathways between structural units, resulting in more of the soil being exposed to water movement effects. The good content of calcium, which keeps clays flocculated, and the low content of sodium, which has the opposite effect, should ensure that present permeability rates will remain.

The fact that salinity levels are currently low in the upper 100 centimeters of almost all target area soils but increase with depth to higher levels suggests that the irrigation carried out over the last 60 years, though described as sporadic and inefficient, has resulted in enough leaching of the upper horizons to keep them at an acceptably low level of salinity. Improved irrigation methods resulting in increased leaching would, it appears, keep levels low -- provided that the water used is mainly river water and the proportion of the more saline groundwater is kept small.

A theoretical salt equilibrium level can be calculated, using assumed parameters as set out above in order to arrive at a balance between salt brought in and salt leached out. The MMP report, assuming average EC levels of 0.75, 2.5 and 1.1 microohms/cm for river water, for groundwater and for an 80/20 mixture of the two respectively, calculates corresponding ECe (soil saturation paste extract) equilibrium figures of 3.2, 10.7 and 4.7 mohms/centimeters. These figures, which should be compared with the crop tolerances given in the following section, suggest that groundwater can be used in amounts up to about 20 percent of total irrigation water.

Soil salinity levels can also be adversely affected if the water table, containing salts, were to rise sufficiently to allow salty water to rise by capillary attraction into the plant root zone. For this reason, water tables need to be monitored, though it appears that only in the immediate vicinity of the river are they now high.

2.3.5 Soil Salinity in Relation to Crop Production. Since salinity tolerances vary considerably among crops, the general salinity hazard classes, given in section 2.3.3 above, have to be considered in relation to the specific crops envisaged. Table K-2 gives generally accepted soil salinity levels which result in yield reductions for the crops listed of 10 percent, 25 percent, 50 percent, and 100 percent. The table indicates that cotton and rice are relatively tolerant of salinity, whereas maize and grapefruit are considered relatively sensitive.

Bananas, not included in the table, are only moderately sensitive to those forms of salinity not involving sodium, but are very sensitive to the sodium-ion. It is therefore necessary to consider more carefully the nature of the salinity involved. Analyses of ion species in soils of the area suggest that an acceptable sodium level for bananas would be found in soils with ECe values less than 4.5 mohms/cm.

Table K-2: Effect of Soil Salinity Levels on Yields of Selected Crops*

Crop	Yield reduction of			
	10%	25%	50%	100%
Cotton	9.6	13.0	17.0	27.0
Groundnuts	3.5	4.1	4.9	6.5
Rice	3.8	5.1	7.2	11.5
Maize	2.5	3.8	5.9	10.0
Grapefruit	2.4	3.4	4.9	8.0

* Soil salinity levels, in terms of the electrical conductivity of a saturated paste extract (ECe,mohm/cm), necessary to depress yields of the crops listed by 10, 25, 50 and 100 percent.

The above table needs to be interpreted in the light of the fact that:

- Soil salinity tolerances are perforce very generalized for the crop as a whole, but individual varieties and cultivars may be found with much higher tolerances than those indicated; and

- In the project area, observed rooting for all annual crops is normally confined to the 0-50 centimeter horizon even for crops with deeper rooting habits in less compact soils, so that upper profile salinity levels, generally lower than those at depth, are of primary importance.

In terms of the crop salinity tolerances suggested in the table, the mean values of the 0-50 and 50-100 centimeter soil horizons of 2-0 and 2.9 given in section 2.3.3 above indicate that even the relatively salt-sensitive crops, maize and grapefruit, can currently be grown on most sites with less than a 10% yield reduction.

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2.4 Surface Drainage

2.4.1 Soil Factors Influencing Surface Drainage in the Target Area. Surface drainage refers to the removal of surface water from the field. Inadequate surface drainage can result in waterlogging of the surface horizons and reduced crop growth or death, due to lack of oxygen in the root zone. A common cause of localised poor surface drainage in the Shalambood target area, giving rise to waterlogged patches and poor plant growth, is poor levelling of irrigated fields resulting in depressions and low spots. Irrigated water applied to the fields and left to soak in (basin irrigation) is deeper in these depressions, which may remain too wet to cultivate after the rest of the field or basin has dried out sufficiently to give a moisture content suitable for tillage. This phenomenon would not occur on permeable, well drained soils with good surface water acceptance properties in which water infiltrates rapidly and then moves down the profile. In the dominantly heavy clays of the Shalambood target area developed in the older, more compact alluvium, in contrast, both surface infiltration rates and subsoil permeability are very slow once the surface cracks have closed, resulting in waterlogged patches if levelling is inadequate and surface drainage is not provided for.

When farmers level fields or basins in Shalambood, a very slight gradient should be left to induce excess surface water to move slowly to field ditches. In the ADB project, immediately inland from the target area and on similar soils, gradients of 1 in 2000 (0.5 per 1000) are aimed at, increasing to 1 per 1000 in less flat areas. In current target area irrigation practice, however, at least on the smaller holdings with small fields and basins, farmers are said to apply water in the field to various depths, depending partly when they want to cultivate, and then wait for it to soak in. The water is held in place by bunds, there is no surface drainage and there are no field ditches. Water put into the field or basin sits there until infiltration and evaporation cause it to disappear. In the case of heavy applications involving standing water for considerable periods, more water might be lost by evaporation than enters the soil by infiltration. The Design Team was told that farmers might flood the field to depths of 3-5 cm, or, less often, to anything up to 30-50 cm, and inspected a field of mixed watermelons and cherry tomatoes in which standing water was said to have persisted for 3 months after a Der season flood before cultivation was begun some 80 days previous to the visit. This possibly unusual case effectively postponed the Der crop to late in the dry season, allowing a much later harvest than usual. Banana irrigation on the larger estates, in contrast, usually involves furrow irrigation and the more frequent application of smaller quantities of water which normally infiltrate in a day or two.

Surface infiltration rates, discussed further in the next section, are very rapid during a short initial period when soil cracks are still open, but then fall rapidly to very low rates indeed once soil wetting and swelling has caused the cracks to close.

A heavy rainfall or an irrigation application occurring when the cracks are well developed and both wide and deep at the end of the dry season will result at first in rapid water movement down the cracks (typically 1-2 meters deep) and in substantial amounts of water entering the subsoil before swelling of the soil closes the cracks.

Moistening a dry, cracked soil causes a spectacular decline of the initially high infiltration and percolation rates through two related mechanisms:

- the blocky structure of both the surface mulch and the soil below it, clearly seen in the dry soil, is nevertheless an ephemeral pseudo-structure caused essentially by a three dimensional system of shrinkage cracks produced on drying but lost again when the soil is moistened. Organic matter levelsin the soil are low, and churning and heaving have spread what little organic matter there is over a considerable depth of soil rather than allowing it to accumulate in a thin topsoil. The typical topsoil crumb structures due to organic matter binding, which are typical of most soils, do not occur in the vertisols of the target area. The blocky pseudo-structure, lacking any real binding forces once the soil is moistened, disappears as the soil is wetted. The structure of the surface mulch in particular disintegrates and the soil slakes.

- moistening of the dry soil causes an expansion of the soil as water molecules enter the expanding lattice structures of the montmorillonitic clays and cause them to swell. Expansion pressures rapidly close the ephemeral cracks and macropores between structural units. The expanded wet soil then virtually lacks macropores and most of the total porosity is constituted by micropores through which water movement is very slow even under saturated conditions.

2.4.2 Measured Infiltration Rates in the Target Area. Hill infiltrometers 100 millimeters wide, sunk 50 centimeters into the soil, reached rates of intake for Saruda and Golweyn series reached near zero after 6 hours. According to the TAMS soil survey, Saruda and Golweyn series occupy 83 percent of the Shalambood target area. Water intake in non-cracking situations (i.e. after previous rain or irrigation had closed the cracks)

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was 75-85 millimeters in 8 hours but then fell to near zero levels. In a dry cracked soil, in contrast, intake can be 300 millimeters and more in 5 hours.

Figure K-10 (MMP report, Annex 1, Section D3, Figure D.5) gives cumulative intakes for Saruda and Golweyn series in a non cracking situation. They show initially high intake rates for the first two hours, during which about 50 millimeters of water enters the soil, but much lower rates during the next 5 hours, during which only a further 20-25 centimeters is added. At this point the curve is fairly flat, suggesting that further infiltration is very slow indeed. For Saruda series, total infiltration times (MMP report) were calculated of 5.5 hours for 70 millimeters, but 11.0 hours for 80 millimeters and 31 hours for 120 millimeters.

2.4.3 Surface Drainage Recommendations for the Target Area. The Design Team supports the general recommendation for a series of quaternary (lateral) drains, tertiary (collector) drains, secondary (branch) drains and primary (main) drains put forward in the TAMS report. During Phase 1, parameters will be set for the design of Phase 2, to specify which elements will be constructed by farmers (after training), and which ones will be constructed by AID-funded contractors under Phase 2. It is likely, however, that tertiary drains will need to be constructed by farmers. Calculations in this report were based on the one year in ten maximum rainfall storm of 120 mm in 24 hours anticipated, and a resultant runoff rate of 7 l/s/ha. The team suggests, however, that the engineering design for the perimeter give further consideration to:

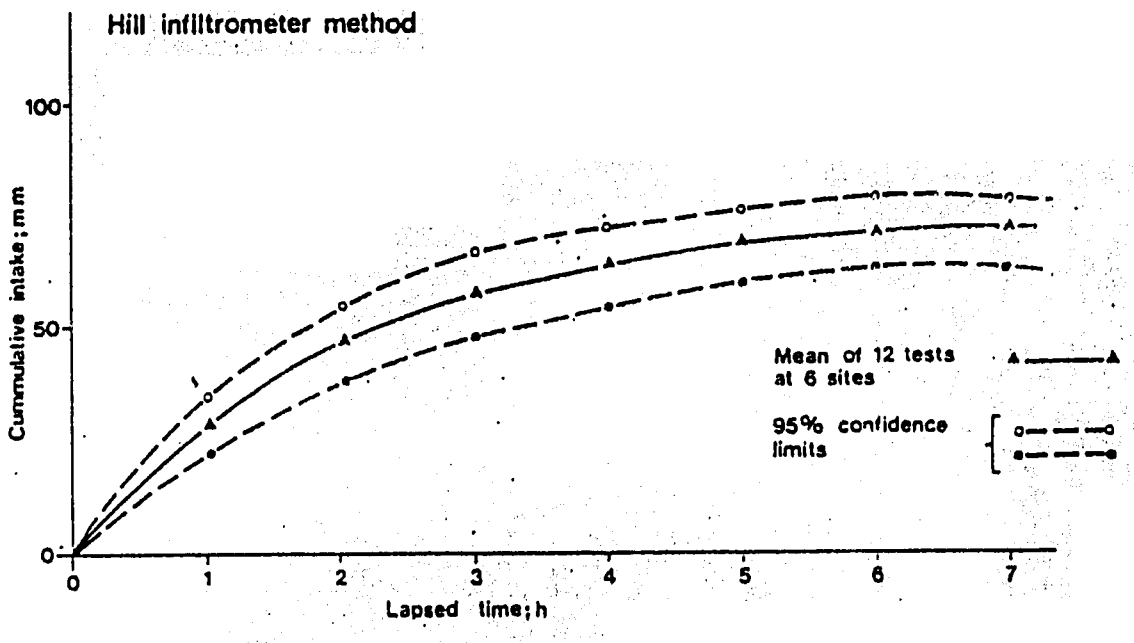
- The adequacy of the proposed 20 centimeter depth of farm drains;
- Whether it is desirable and practical to recycle drainage water by putting it back into the Shebelli, rather than disposing of it in the Shalambood sand dunes as recommended at present, if the water is not to be used for a protected irrigation area to the south of the project area.

2.5 Subsurface Drainage

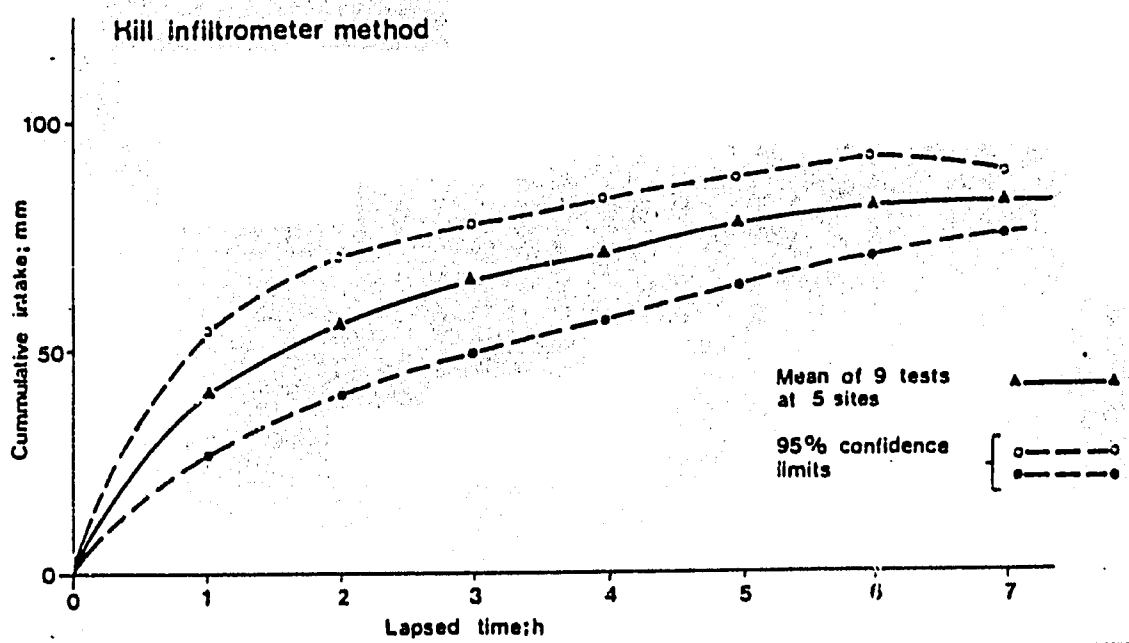
2.5.1 Soil Factors Influencing Subsurface Drainage Subsurface drainage of the heavy clay soils of the Shalambood target area is made difficult by the very low hydraulic conductivities of soils of the area. Earlier consultants' reports (MMP and TAMS) used measured hydraulic conductivities to calculate possible subsurface drainage requirements and layouts but the close spacing needed for such systems makes them very costly.

Figure K-10

SARUDA SERIES



GOLWEYN SERIES



274x

For subsurface drainage to be effective, water has to more laterally through the soil to the drains. Water movement to drains is controlled mainly by horizontal and to a lesser extent by vertical hydraulic conductivities. The hydraulic conductivity of a soil refers to the movement of water in the soil under saturated conditions, i.e. when all soil pores are full of water.

The MMP study measured horizontal hydraulic conductivities at 22 sites: of three methods tried out, the pumping out of water from a 125 mm auger hole method was found the most reliable. Clay textured alluvium, such as is found in almost all of the Shalambood target area, was found to have a mean hydraulic conductivity of 0.23 meters per day (23 cm a day) with a standard error of 0.04, and a range of 0.10-0.54. There was a trend for conductivities to decrease with depth in the depth range of 1-4 meters in which tests were conducted. In addition, double ring infiltrometers were used at soil depths of 0.5 and 1.5 meters to determine terminal infiltration rates as an indication of horizontal hydraulic conductivities at these depths. The very few tests of this type indicated hydraulic conductivity rates for old alluvial clays in the low range 0.04-0.12 meters per day.

Additional soil hydraulic conductivity measurements were made during the TAMS investigations in 1986, but only on 9 sites on examples of Saruda and Golweyn series located in the Faraxaane and banana drainage investigation areas. The nine measurements made, using an 8 centimeter auger hole, suggested very low hydraulic conductivities in the ranges 0.01-0.02 and 0.2-0.3 meters per day for Saruda and Golweyn series respectively.

The amount of factual information available on hydraulic conductivities is therefore very limited indeed. Even though fairly consistent, this information does not constitute a data base sufficient to recommend a subsurface drainage layout with confidence. Despite this lack of information, both the MMP and TAMS reports suggested possible subsurface schemes. The TAMS report envisaged corrugated drain tubing spaced at 12-20 meters and recommended the 20 meter spacing. The MMP report, assuming hydraulic conductivities in the range 0.05-04 meters per day envisaged spacings of 61 meters. Despite these disparities, both teams concluded that subsurface drainage appears unlikely to be cost effective in the areas studied.

2.5.2 Recommendations Regarding Subsurface Drainage

Subsurface drainage, if installed, would involve very close spacing and would be:

- of doubtful efficiency because of low subsoil hydraulic conductivities;
- too expensive in relation to the land-use envisaged.

It is recommended that no provision be made for subsoil drainage but that water tables be monitored by the installation of piezometers.

2.6 Sediment Problems

Large quantities of sediment are carried by the Shebelli river, except at low water levels, and are deposited in irrigation channels of all sizes, resulting in the constant need to dig them out.

Sediment concentrations in the Shebelli river at Majabto, 9.4 km downstream from the Genale barrage, were found in 1977 to be in the range 2-7000 ppm between July and November. Figures appear to have risen since 1977 due to overgrazing, leading to increased water run-off, sheet erosion and soil removal in the upper catchment area of the river in Ethiopia. Figures in earlier reports thus need to be updated, and sediment loads constantly monitored.

Visual examination by the Design Team of deposited material dug out of canals and discarded alongside them showed that:

- The sediment (loosely referred to sometimes as "silt") is generally heavy textured, being in most places predominantly clay, compact and with a hard consistency when dry;

- Nevertheless some textural variation was found within short distances, resulting in occasional minor areas of loam or even of very fine sand;

- The silt is $CaCO_3$ rich, with occasional calcium carbonate nodules.

Sediment is dug out from the major canals by large machines (excavators) based at Genale. Water users' groups supply the fuel and pay the driver a "motivation payment" to dig out the canal sections next to their members' land. An excavator was estimated to use about 150 liters of diesel a day to dig an average of 250 meters of main canal. The ADB project's resident engineer estimates the total cost of sediment removal at $ 1.25 a cubic meter.

The smaller irrigation channels down to field level are laboriously dug out by hand, usually twice a year, again by users' groups. The dug out material is abandoned adjacent to the channel.

regulate bed?

The suspended load of the moving irrigation water, conventionally referred to as silt, appears to consist mainly

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of clay-size particles. Clay-size particles are defined as having an equivalent diameter of less than 2 microns (0.002 mm). "Equivalent diameter" refers to settling velocities: a particle with an equivalent diameter of 2 microns has the same settling velocity as a spherical particle of that diameter. In practice kaolinitic clays have equivalent diameters mostly in the range of 0.0-1.0 micron, but the much smaller and less regularly shaped flakes that appear to be dominant in the Shebelli River sediment have much smaller equivalent diameters, normally mainly less than 0.1-0.2 micron. The importance of this in the present context is that the settling velocities of individual clay particles are very long indeed. Put another way, it means that they would be moved along in suspension even by very slowly moving water, and would not fall to the bottom unless the water stands still for some time.

If this is so, why is sediment deposited even in main canals in which water is generally moving, instead of being taken as far as the farmers' fields, and left to settle there slowly in the non-moving water of the basins? If sediment reached farmers' fields, it would fertilize the soil instead of blocking water channels.

Part of the answer lies in the calcium content of the Shebelli irrigation water and the fact that calcium causes clay particles to flocculate. Flocculation results from the fact that calcium-saturated clay flakes are attracted to each other and come together to form little packets or "flocs" which then fall and settle relatively rapidly even in moving water. The clogging of channels of all sizes appears to be due to this phenomenon. This suggests, in turn, that sedimentation basins placed between the river intake and the main canal would be effective in trapping a large part of the suspended load and thus in reducing the rate at which waterways are silted up.

The sediment is not currently being used. If it reached the fields it would have a beneficial effect, effectively importing nutrients from outside the area. This effect kept the Nile alluvium productive for thousands of years until the Aswan dam trapped the annual sediment load, preventing it from moving downstream to farmers' fields.

2.7 Irrigation Requirements and Water Availability

The data available from previous studies were used to prepare Table K-3 where the year is considered from April to March with, in turn, the Gu, Haggai, Der and Jilal seasons.

The figures in each line on a monthly basis are:

- Line 1) Rainfall, in millimeters;

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- Line 2) Effective rainfall in millimeters as calculated by the USDA Soil Conservation Service. It is noted that the concept of "effective rainfall" applies differently to rainfed or irrigated cropping; due to the low levels of rainfall, the figures used in the studies are acceptable for preliminary estimates; but they should be refined during SWMP research investigations;

- Line 3) Potential evapotranspiration Penmann formulae, for the customary reference grass crop, in millimeters;

- Line 4) Perennial crops' (banana plantation and orchards) plant requirements (consumption use), in millimeters;

- Line 5) Annual crop requirements, in millimeters, according to TAMS' recommended cropping patterns;

- Line 6) Weighted plant water requirements, in millimeters, using the same weighting as TAMS (10 percent perennials and 90 percent annuals);

- Line 7) Same as line 6, but expressed in m^3/s for the total net 8,021 hectares;

- Line 8) Mean monthly discharge at Awdheegle, in m^3/s, after reconstruction of the data missing from MMP and LI; they averaged the data covering the period January 1951 - December 1984. The Awdheegle station accounts for the Shebelli River discharges entering the middle and lower river valley reaches, where approximately 81,000 hectares net are irrigable;

- Line 9) 75 percent frequency minimum mean monthly discharges, in m^3/s. These figures come from a statistical evaluation of the data; they correspond to a discharge exceeded 3 years out of 4 at Awdheegle. The usual remark applies, which is that a 75 percent excedence year is not exactly made of 12, 75 percent individual months; generally, the reconstructed 75 percent year is a little pessimistic, and its actual occurrence should be closer to 80 percent;

- Line 10) Head works requirements, in m3/s, for 8,021 net hectares, accounting for an efficiency coefficient of .45. This efficiency was proposed by TAMS as the target efficiency; it will not be achieved before completion of physical rehabilitation of the irrigation infrastructure,

including drainage and road systems, and will remain dependent on dissemination of improved agricultural and water management technologies;

Line 11) Line 10) divided by Line 9) expressed as a percentage. The monthly figures represent the proportion of water resources available at Awdheegle that the target area would require to achieve the cropping pattern and target efficiency proposed by TAMS. The figures demonstrate that the target area would require 12.5 percent or less of the Awdheegle discharge for much of the year, with requirements increasing into Haggai and reaching over 90 percent in January and February;

Lines 12 and 13) These lines repeat line 10 and 11 computations, but under the assumption that perennials are irrigated with groundwater pumped from December to March. The annual crops still require 40 to 70 percent of Awdheegle resources, except in March when their requirement is nil.

Table K-3 should be regarded with caution; river water losses between Awdheegle and Genale are not considered, nor are return flows from upstream perimeters. The basic TAMS' assumptions, as suggested in the line-by-line comments, are tentative at best.

The table does not consider either discharges released (or releasable) from the Jowhar off-stream reservoir (100 MCM, possibly able to be increased to 200 MCM if the embankment is raised by 1 meter). These releases, occurring at the end of the Der season, could increase available discharge by 20 to 40 m^3/s during 1 to 3 months, and relieve the water constraint on most of the downstream perimeters, including Shalambood.

In spite of these caveats, Table K-3 does outline the imbalance between Gu-Haggai requirements, largely met by the river flows, and Der-Jilal requirements, when only a fraction of irrigable land could be watered. It is strongly recommended that the cropping pattern prepared by TAMS be carefully reviewed by the SWMP adaptive research team during Phase 1 investigations. Following is one particular practice which needs study, and about which little is known in terms of timing and duration. SWMP-supported studies and research will more clearly define the need for following.

Groundwater availability in the Lower Shebelli basin was estimated in terms of yearly recharge to be 50 to 70 MCM, while annual abstractions were about 17.6 MCM. In the Shalambood target area, with 10 percent of the total net hectarage devoted to perennials, the volume needed by perennials during the shortage period, December to March, is 6.86 MCM or 5.5 MCM net (plant level requirements).

Table K-3: Rainfall, Water Availability and Requirements

	A	M	J	J	A	S	O	N	D	J	F	M	Y
	GU			HAGGAI				DER			JILAL		
1) Mean Rainfall, mm	80.60	76.00	76.70	54.80	52.10	17.80	32.30	52.30	22.70	1.20	0.10	3.40	470.00
2) Ef. Rfll, 75%. mm	29.30	26.20	34.80	31.40	151.80	0.20	3.00	22.00	2.20	0.00	0.00	0.00	164.90
3) ETO, mm	167.10	159.00	140.70	143.50	153.30	168.60	162.80	140.70	154.70	127.40	167.40	192.80	1924.10
4) Net Irr. Req. (1), mm (perennials)	137.80	132.80	105.90	112.10	139.50	168.40	159.80	118.70	152.50	171.40	167.40	192.80	1759.10
5) Net Irr. Req. (1), mm (annual crops)	0.00	7.40	32.70	67.90	53.60	14.00	26.30	58.10	109.80	61.40	1.50	0.00	432.70
6) Net Irr Req. (1), mm (10% perennial/90% annual)	14.50	20.90	42.00	25.90	67.30	30.90	41.70	62.40	119.80	76.00	19.00	20.30	593.20
7) Field Net Irr. Req. m3/s	0.45	0.63	1.30	2.27	1.96	0.96	1.25	2.09	3.59	2.28	0.63	0.61	1.51
8) Mean month disch. at Awdheegle m3/s	27.50	62.00	44.70	33.10	6.37	75.40	72.90	58.70	31.30	12.40	7.40	14.70	42.10
9).75% month discharge, Awdheegle m3/s	8.06	44.80	26.50	18.00	39.70	69.90	65.90	43.10	15.90	5.54	1.45	3.36	28.60
10) Headwks Req. 8021 ha net m3/s	1.00	1.40	2.89	5.04	4.36	2.13	2.78	4.64	7.98	5.07	1.40	1.36	3.56
11) (10), (9) in %	12.40	3.10	10.90	28.00	11.00	3.00	4.20	10.80	50.20	91.50	96.60	40.50	12.50
12) Headwks Req. for ha 7219 net annuals									6.58	3.69	1.00	0.00	
13) (12)/(9) in 5									41.40	66.50	68.60	0.00	

2.8 Physical System Rehabilitation

The SWMP Design Team has thoroughly reviewed the TAMS engineering design. While valuable, it must be noted that SWMP will cover an area much larger than that reviewed by TAMS. In addition, the SWMP Design Team strongly recommends two design concepts not found in TAMS:

- A canal system made of earth and clay-lined canals, instead of the concrete-lined ones as proposed by TAMS designers; and

- Specific desilting facilities.

Other comments and recommendations as regards final design are of minor importance. Table K-3 shows, in line 10, that the maximum head works discharge is 7.98 m^3/s, or 0.995 l/s/ha. Allowing for a 25 percent increase in design capacity brings the 8021 hectare net area headworks requirement up to 1.24 l/s/ha or 9.95 m^3/s, say 10 m^3/s. This discharge is to be broken down among the main canal reaches, branch canals, etc.

The Genale Barrage rehabilitation program proposed by TAMS is generally acceptable; this comment however, assumes to a preliminary geotechnics and materials exploration of the foundation and structural concrete conditions of the existing structure.

The Phase 1 engineering design will require that concrete samples of the barrage be taken and analyzed in the lab. Visual inspection of rebar is recommended to check the degree of rusting and adherence with mortar. More sampling boreholes are required to determine the foundation conditions; they could be drilled along a line 3 - 5 meters away from the barrage's downstream face, across the apron. Some disturbed and undisturbed samples will need to be taken to the lab. The depth of the boreholes should be at least 5 meters, and could increase up to 10 meters if and when required.

If such an investigation is positive, the rehabilitation program can generally follow the TAMS design, i.e. refurbishing the structure and replacing the gates and pipes. If the results of the investigation reveal major structural deficiencies, a decision will need to be made as to the extent -- and cost -- of more extensive rehabilitation or reconstruction required.

The siltation problem is a major issue in the rehabilitation of Shalambood irrigation system; on the one hand, the sediments currently entering the canals range from fine sands to colloidal clays, and a standard desilting

structure would be expensive and would require a vast area. On the other hand, apart from fine sands, most of the silts and clays abstracted from the river should be carried through the irrigation canals and allowed to settle in the farm plots.

TAMS proposed that this issue be addressed by using lined canals from primaries to the field with slopes allowing velocities higher than .5 m/s; they evaluated the canal cost increase as 37 percent higher than unlined ones. The Design Team believes the actual extra cost could be higher, mainly due to the foundation conditions (swelling clays along most of the canal tracks), which could require that the thin concrete-lined canals proposed by TAMS, become big self-standing, reinforced-concrete canals, with special foundation arrangements.

This applies to main and branch canals and to even more of the distribution system; actually, the Team believes the irrigation system (and symmetrical drainage system as well) should not go farther than the farm gates, for farms exceeding 25 hectares in area, or for groups of small farms of 15 - 25 hectares in total. Beyond the farm gates, field canals' layout, construction, and maintenance should be left totally in the hands of the farmers, with assistance and advice from SWMP, when needed and requested.

Siltation problems are being addressed in the rehabilitation of the Asaile Canal perimeter, currently under implementation. The use of a long, wide and shallow-sloped earth canal was recommended and is being constructed. The selected slope and section should allow the sand and coarse fraction of silt to be deposited, while finer sediments are carried on to the fields. Length of the desilting channel should allow enough time for the sediment grains to lose momentum and fall down on the bed, and the canal carrying capacity should be checked against the range of expected discharges. A few solutions appear feasible at this early stage for desilting facilities:

a) The feeder reach of the Yassin Canal from the river off-take to the turnout structures to the Second through Sixth Secondario branch canals could be modified. The length could be about 1000 m, with a trapezoidal cross section, bed width 10 m, depth 4 m, banks 1.5/1 and the longitudinal slope $4.2\ 10^{-5}$ (42 mm/km). This would achieve a mean velocity of .2 m/s, sufficient to get rid of the coarser sediments.

   The upstream inlet structure should have vertical concrete walls (baffles), dividing the entering flow over the whole cross section.

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b) As an alternative to the previous solution, the desilting feed canal could be split into 2 or 3 parallel channels of the same slope and length, each section being reduced accordingly.

c) Another solution would be to take advantage of the flatness of the Shalambood perimeter area; the head portion of each branch canal, which follows a roughly horizontal natural ground line, would be oversized and its slope kept to a minimum so as to achieve a similar velocity pattern and result in coarser sediment deposition. The advantage of this approach would be to link the canal desilting operations to more limited groups of farmers and users' associations, making them more aware of the direct correlation between desiltation and water availability.

The design of the sections and slopes should proceed from considering not only the peak discharge flow conditions (maximum velocity in the range .6 - .7 m/s), but also reduced discharge conditions, when water is scarce and scarcity is divided among the canals (minimum .25 - .30 m/s). Velocities below 0.5 m/sec may encourage breeding of water borne disease vectors like schistosomiasis snails, thus desiltation designs will need to be assessed in light of disease problems, and necessary mitigation will need to be provided.

The main comment about the proposed drainage system is that it should, if possible, arrange for the return flow from irrigation losses to be reinjected into the Shebelli River. It is obvious that projected efficiencies will take some time to be achieved; in the interim, more water will be taken off the river and only partly utilized in the perimeter.

With the use of more accurate and larger scale maps which SWMP will fund for design purposes, the lay-out of the main drain should be reviewed and alternative tracks summarily studied; similarly, the outfall drain reach, carrying return flows from the perimeter back to the main stem, should be considered, at least at the preliminary design stage.

In developing a few longitudinal profiles for the main and outfall drains, the location of the lifting station should be considered and optimized.

The pumping capacity of the station should be composed of 5 or 6 identical pump units; while storm flows may occur very soon after completion of the work, initial very low efficiencies will induce higher return flows, while demonstration of improved irrigation and water management practices, and system maintenance is carried out under the SWMP research component.

3.2 Buildings.

The following buildings will be constructed during year 1 of SWMP 1:

- 4 three-bedroom "westernized" residences in Afgoi (sites to be determined, each at 238 m^2, for the CARS long term research advisors;

- 1 four-bedroom "westernized" Guest House with office space in Afgoi (site to be determined) totalling 316 m^2 for short-term research consultants; and

- 1 four-bedroom "westernized" Guest House with office space in Genale (ETC Genale compound, site to be determined, totalling 316 m^2 for researchers and other TA and counterparts while in the Genale-Shalambood area).

Tables K-4 and K-5 that follow summarize cost estimates which are part of preliminary bid packages developed for these houses during PP design. The bid packages were separately submitted to USAID/Somalia. The layouts for each type of house follow as Figures K-11 and K-12. The designs will be finalized by an IQC A&E consultant shortly after the Project Agreement is signed (see section 5.2 of the PP). Construction will be undertaken by an American firm through a Direct AID contract, with supervision by USAID/Somalia's Engineering Office. The residences will be complete prior to the arrival of the long-term TA team in mid-1988.

The proposed IQC A&E consultant will also review GSDR plans for upgrading CARS office and laboratory facilities. Figure K-13 provides a proposed schematic site plan for CARS, taking into account refurbishing of existing structures and assuming that the residences (No. 21, 1-4) and Guest House (No. 20) will be located there. GSDR funding is provided under the adaptive irrigated agricultural research component of SWMP for the refurbishing and construction of the following:

- 800 m^2 of new laboratories and offices, estimated at U.S. $ 215/m^2 or U.S. $ 172,000 in Somali shilling equivalents;

- 600 m^2 of new warehouse and seed storage space, at the same unit cost, for a total of U.S. $ 129,000 in Somali shilling equivalents.

The A&E Consultant will more precisely define needs, determine what the ADB and IBRD are covering under AFMET 2, and adjust this GSDR contribution accordingly.

GSDR funding is also proposed for the upgrading of the CARS & irrigation system during year 3 of the project, with use of Somali A&E and construction contractors assumed.

A draft scope of work for Phase 1 engineering design which includes consideration of the above is found in Annex O.

3. SUPPORTING INFRASTRUCTURE

3.1 Roads.

Almost all transport corridors of significance to the Shalambood area are being upgraded over the next few years. The 87 kilometer main highway from Afgoi to Golweyn is being upgraded to 7 meter asphalt status. The private Italian contractor Nadia di Gruppo will undertake supervision on behalf of Somalfruit. The work is financed by Somalfruit, from the GSDR's percentage share of banana revenues ($70 per ton). Detailed design of this work was completed in early 1986 under EEC financing by Consulint SPAL of Rome. The design also includes 3 spurs: Buffow-Genale, Shalambood-Merka, and Bivio Kaptanlas-Genale. It is not clear if Somalfruit will upgrade these spurs to asphalt status as well.

In addition, some other activities of significance are:

- ONAT has recently completed resurfacing (gravel/coral limestone) of the Buffow-Genale road;

- The Ministry of Works is constructing a 25 kilometer road from Alafrito to Qorioley (So.Sh. 61 million);

EEC is financing $2 million ECU's worth of road maintenace materials and equipment for the Afgoi-Gelib road; and

EEC is also financing construction of new bridges at Qorioley, Mojabto and Bariray.

This work in total should assure adequate transport in and out of the Shalambood target area.

Only roads/tracks for maintenance of Dhamme Yassin (and its feeder reach) and the Fourth Secondario will be upgraded during Phase 1. All other road/track upgrading needed will be considered for Phase 2 funding during Phase 2 PP (or PP amendment) preparation.

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COST ESTIMATE FOR USAID FAMILY HOUSE AFGOI

Description	So.Sh.	US $
1. Foundation Excavation: M^3 120 x 200 Sh.	24,000	192
2. Backfill & Termite Treatment: M^3 260 x 700 Sh.	182,000	1,456
3. Stone Foundation: M^3 105 x 3,150 Sh.	330,750	2,646
4. Substructure: M^3 95 x 18,500 Sh.	1,757,500	14,060
5. Superstructure: M^3 50 x 22,500 Sh.	1,125,000	9,000
6. Block Wall: M^2 520 x 968 Sh.	503,360	4,027
7. Aluminium Windows & Doors: Windows M^2 32 x 17,500 = 560,000; Doors M^2 2.7 x 18,500 = 49,950	609,950	4,880
8. Internal Doors with steel frame: Pieces 10 x 21,500	215,000	1,720
9. Tiles and Ceramic: M^2 300 x 1,860 Sh.	558,000	4,464
10. Toilet sets: 2 x 65,000	130,000	1,040
11. Finishing works, Electricity Plumbing, Painting and Septic tank	950,000	7,600
	6,385,560	51,085
12. Mobilization & Demobilization 10%	638,556	5,108.50
TOTALS	7,024,116	56,193.50

Payment requirements:

a) 50% Somali Shilling Sh.Sh. 3,512,058
b) 50% United States Dollar USD $ 28,096

Rate 1 USD = 125 Shillings

COST ESTIMATE FOR USAID GUEST HOUSE

Description	So.Sh.	US $
1. Foundation Excavation: M^3 145 x 200 Sh.	29,000	232
2. Backfill & Termite Treatment: M^3 350 x 700 Sh.	245,000	1,960
3. Stone Foundation: M^3 145 x 3,150 Sh.	456,750	3,654
4. Substructure: M^3 135 x 18,950 Sh.	2,558,250	20,466
5. Superstructure: M^3 87 x 23,500 Sh.	2,044,500	16,356
6. Block Wall: M^2 670 x 968 Sh.	648,560	5,188
7. Aluminium Windows & Doors:		
Windows M^2 38 x 17,500	665,000	5,320
Doors M^2 5.5 x 21,500	118,250	946
8. Internal Doors with steel frame Pieces 15 x 21,500	322,500	2,580
9. Tiles and Ceramic: M^2 510 x 1,860 Sh.	948,600	7,589
10. Toilet sets: 5 x 65,000	325,000	2,600
11. Finishing works, Electricity Plumbing, Painting and Septic tank	1,425,000	11,400
	9,786,410	78,291
12. Mobilization & Demobilization 10%	978,641	7,829.40
TOTALS	10,765,051	86,120.40

Payment requirements:

a) 50% Somali Shilling	Sh.Sh.	5,382,526
b) 50% United States Dollar	USD $	43,060

Rate 1 USD = 125 Shillings

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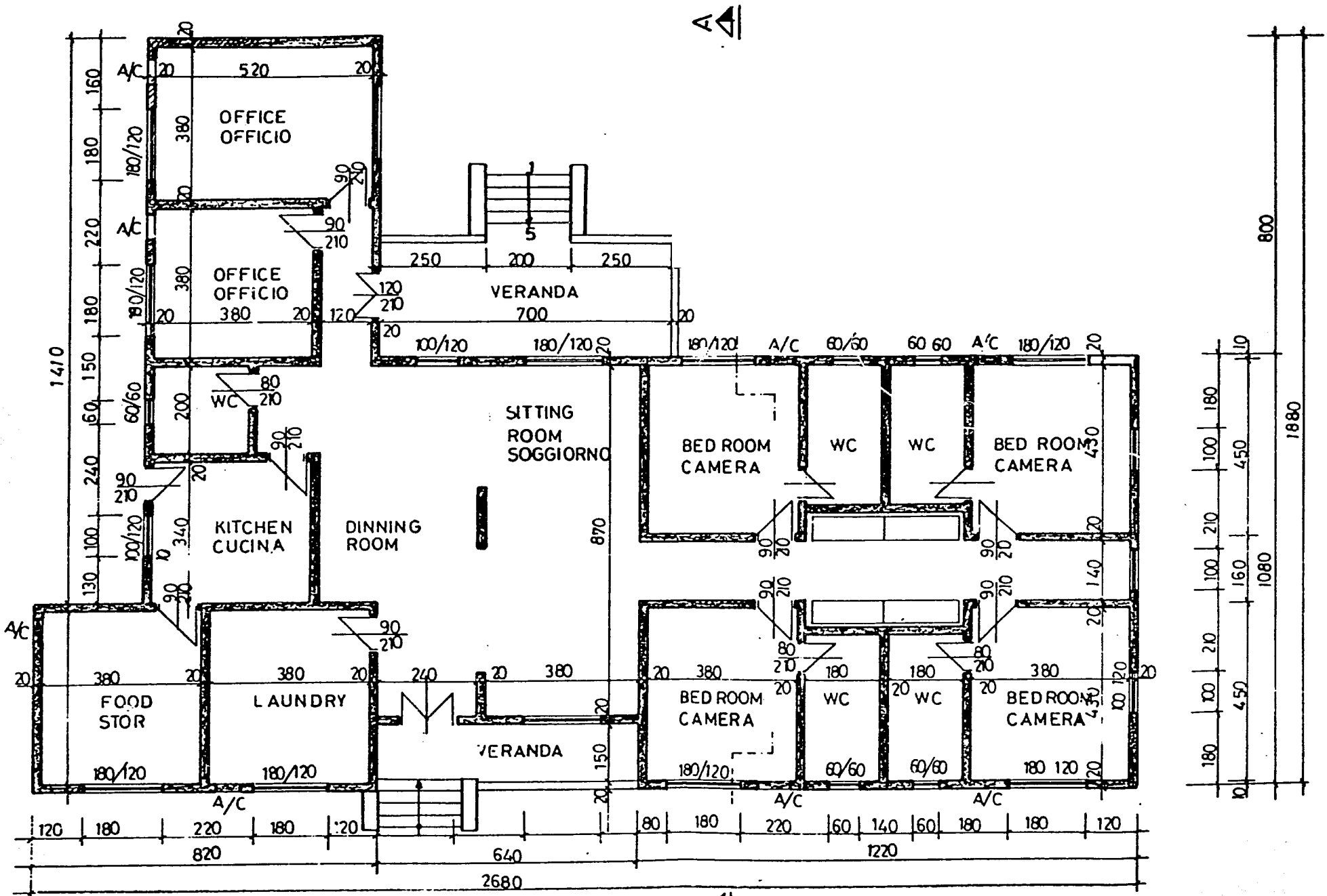
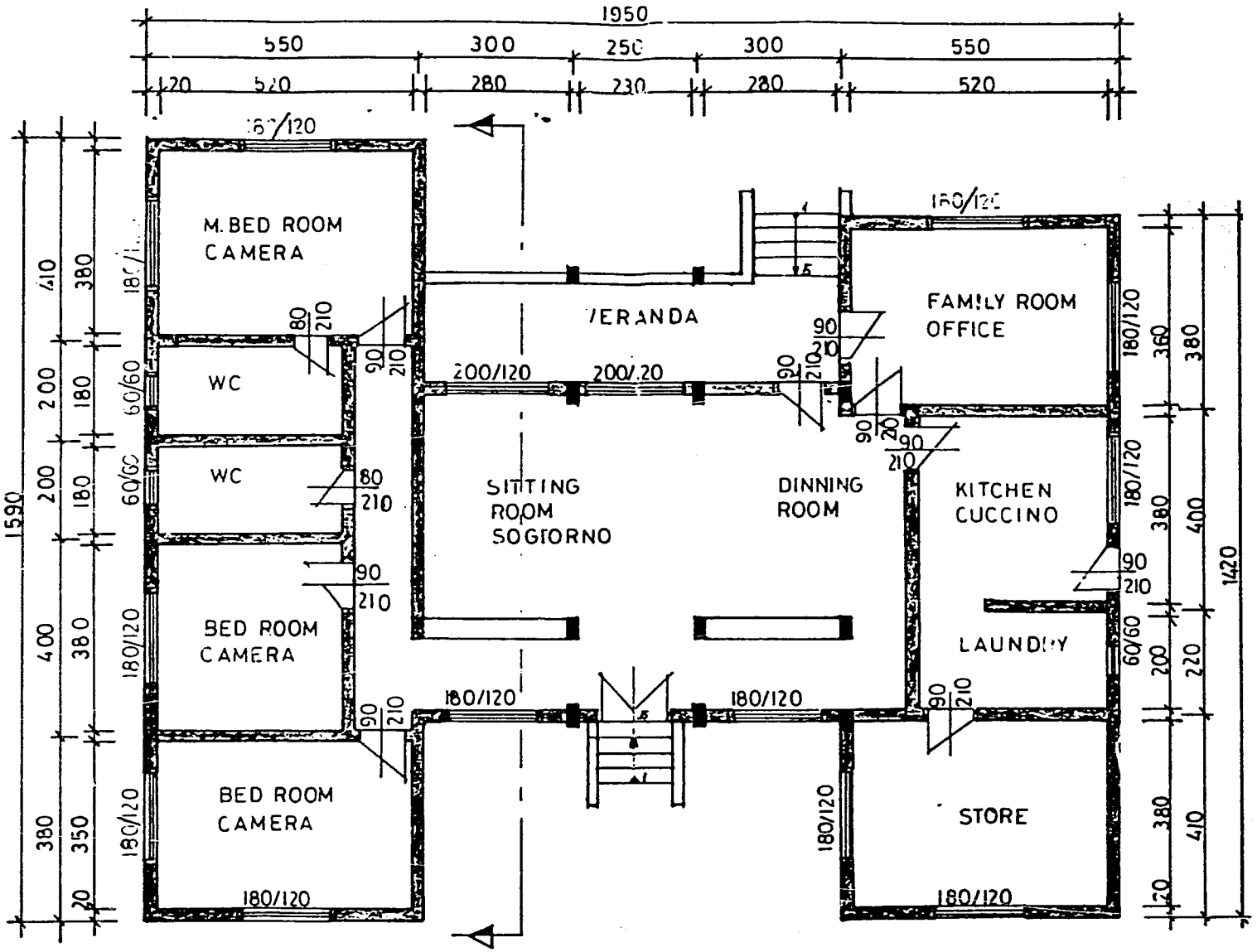
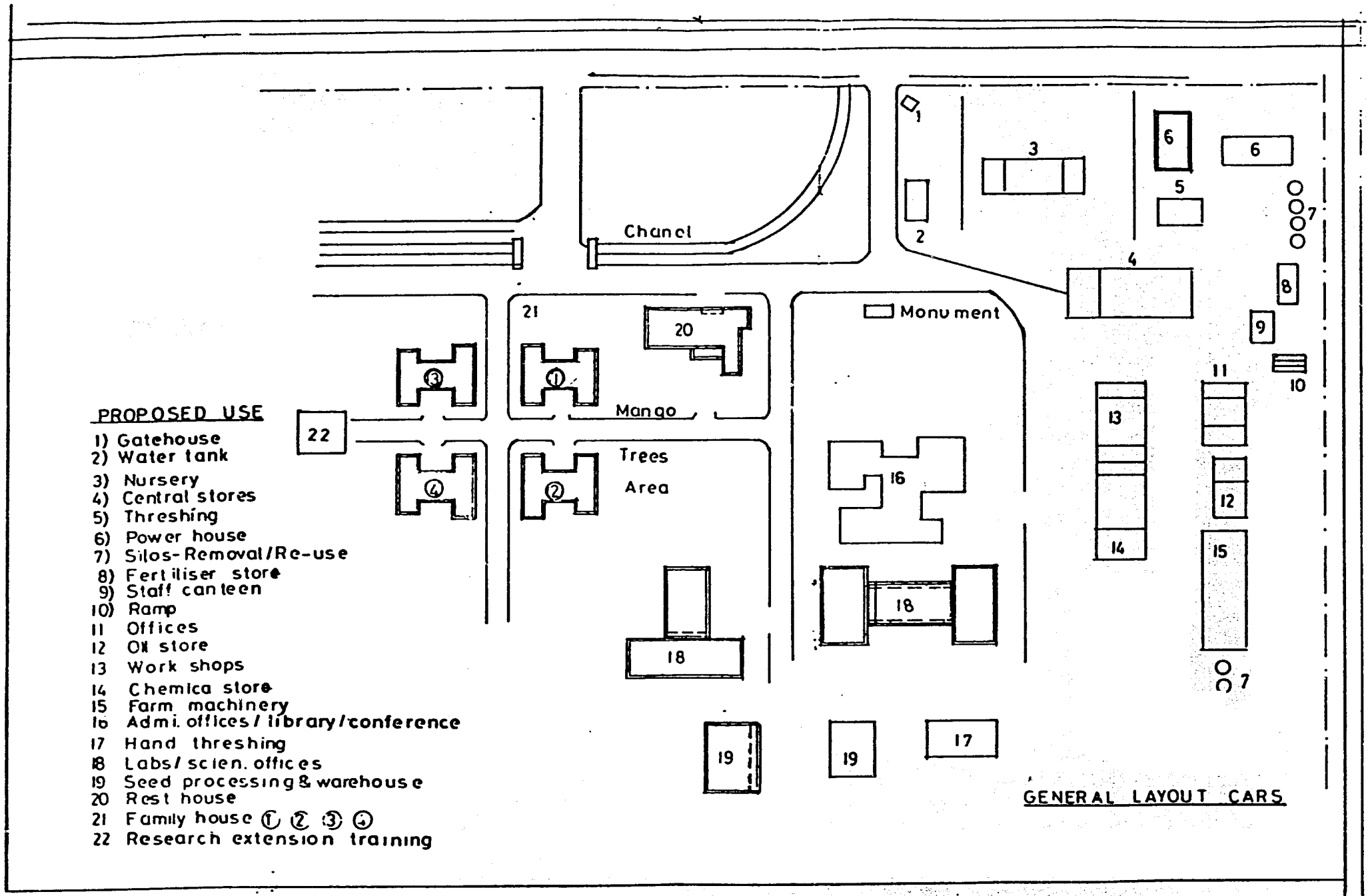


GROUND FLOOR SC. 1:100



PLAN GROUND FLOOR SC. 1 100


Chanel
Monument
Mango
Trees
Area
PROPOSED USE
1) Gatehouse
2) Water tank
3) Nursery
4) Central stores
5) Threshing
6) Power house
7) Silos-Removal/Re-use
8) Fertiliser store
9) Staff canteen
10) Ramp
11 Offices
12 Oil store
13 Work shops
14 Chemica store
15 Farm machinery
16 Admi. offices/ library/conference
17 Hand threshing
18 Labs/ scien. offices
19 Seed processing & warehouse
20 Rest house
21 Family house ① ② ③ ④
22 Research extension training
GENERAL LAYOUT CARS

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4. LOCAL PRIVATE SECTOR INPUTS FOR SWMP ENGINEERING

Rehabilitation and subsequent maintenance of the irrigation system will require many inputs which the private sector will supply, mostly through local production, but supplemented with imports. Available or local private sector capabilities are discussed below.

4.1 Design, Drafting and Engineering Consulting Services

These services combine Somali and some foreign country engineering and planning experience with valuable national knowledge about: input availability quality, problems, alternate procurement sources and procedures, labor and material costs, management, local laws, and facilitation of contacts with the GSDR and private sector entrepreneurs. It is assumed that American firms bidding on the direct AID engineering design and civil works rehabilitation contracts may wish to sub-contract with such firms.

4.2 Heavy Equipment and Civil Works Services

Several firms who could be subcontractors to American prime contractors exist and have extensive experience with constructing canals, roads, slide gates and other major civil works. The ADB irrigation project, to be completed in 1988, is using a local firm for these services. Many of these firms have European partners and are familiar with western methods.

4.3 Raw Material Supplies

Sand, gravel, rebar, and possibly cement can come from local sources. Care must be taken so that sand with high salt levels (fresh sea sand) is not used. Rebar will probably need to be imported. A feasibility study has been done for a cement plant to be located in southern Somalia near the proposed dam site at Bardhere on the Juba river. Local materials, limestone, clays, and shales, are available and clinker for the Berbera plant can be processed into bagged cement. The Phase 1 engineering design contractor will determine availability and quality, particularly of cement.

4.4 Slide Gates and Water Pumps

Construction of several slide gate designs has been undertaken by ONAT, the National Foundry, and at least two private sector firms which have machining, foundry and fabricating capabilities. Examples of private sector products are found at the Qorioley and Falkeerow barrages. There will, however, need to be a determination of whether sufficient capabilities exist locally to produce suitable quality gates for barrages, head works and the six branch canals. Local capabilities for producing secondary and tertiary canal gates can be upgraded to acceptable standards. All gates will be the responsibility of prime construction contractor who may wish to subcontract with local firms as needed. It is assumed that gates for the Genale barrage will need to be imported.

Water pumps for pumping stations and wells are mostly imported. Special attention must be given to designs which are simple to use, maintain, and repair locally. Small pumps, if needed, could be made locally.

4.5 Motors

Rebuilding and repairing of diesel, petroleum and electric motors can be done by many specialized motor repair shops mostly located in Mogadishu. Spare parts and proper tools are sometimes limited. New motors of varying capacity may need to be imported. Any imports should be familiar to local repair and maintenance staff and should have easily available spare parts.

4.6 Wells

Establishing new wells and rehabilitating existing wells in the target area can be undertaken if water table level, and water quantity, and quality are acceptable and if supplementary irrigation is needed. It is expected wells will be financed primarily by large private farmers. About 13 private drilling rigs (including Somalfruit) are available in Somalia, but many of them are old and need repair. It does seem possible that functional rigs could produce 8 production wells per year. A complete analysis and recommendations for more private sector involvement in well drilling rehabilitation, maintenance and operation was prescribed in an AID-funded 1986 report by Louis Berger International, Inc., prepared under AID's Comprehensive Groundwater Development Project.

4.7 Transport of Materials and Equipment and Housing Construction.

Several local contractors are available who have experience with development projects and appear to be well staffed and equipped to meet the project's needs.

4.8 Aerial Surveys and Analysis

An expatriate firm with local facilities and staff to produce black and white photos at 1:6000 and 1:12000 is available in Mogadishu.

4.9 Piping and Other Plastic Products

There are three firms in Somalia producing a wide variety of polyvinyl chloride products such as tanks, water pipes from 10 to 30 cms, and hoses. These inputs will be available to contractors.

4.10 Communication and Computer System Repairs

Local firms experienced in repair of two-way radio equipment and personal computers (IBM and Wang) with total capacity of up to 16 megabytes are located in Mogadishu. Availability of spare parts and ability to make major repairs could be limited. Nairobi would be the most logical alternate backup repair source. Several PCs will be used for management of the project and for engineering works; standardization should be considered by AID and the GSDR.

4.11 Maintenance

Water users' groups, small firms, and private individuals in Shalambood, Genale and Mogadishu are presently providing most maintenance and repairs, and will continue to be available for such services. AID direct contracts will be used for major engineering functions such as canal desilting. Maintenance of roads, slide gates, pumps , motors, and water gauges could gradually be turned over to local private contractors once relevant training, equipment, and management capabilities are established and canal system users' fees are in place to pay for maintenance.

Table K-6 provides a partial list of private sector firms, contacted by or suggested to the design team, who could possibly provide required inputs.

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Table K-6: Examples of Somali Private Sector Engineering Input Goods and Services

Private Sector Firm	Design/Drafting. Consulting	Heavy Equip Civil Works	Raw Materials	Slide Gates	Pumps	Motors: Electric Diesel, Petrol	Well Drilling, Maintenance	Aerial Surveys	Plastic Pipe etc.	Communication Computer Repair
Juba Enterprises		x					x			
Fratelli Murri Co.		x	x				x			
Somali Drilling Co.		x					x			
Horn of Africa Drilling		x					x			
National Drilling			x				x			
Horn Contractors		x								
National Engineering & Construction Co.		x								
Buralhess Construction Co. Ltd	x	x								
Kampihl		x								
Warfa Construction Enterprise	x									
National Foundry				x	x					
ONAT				x						
Gurah Co. Ltd.	x									
Juba Trading Co.			x							
Arab Essa			x							
Agro Service (So) LTD					x					
SCANTEC										x
TUBEX									x	
Somali GRP Products									x	
Somali Prefab									x	
Murry Watson Aerial Photo Services										
Hossada Farameddar Bambumder (Shalambood)				x						
Dogga Company				x						

ANNEX L

FINANCIAL AND ECONOMIC ANALYSIS

ANNEX L: FINANCIAL AND ECONOMIC ANALYSIS

1. PRODUCTION

1.1. Project Implementation.

It is assumed that project implementation will accelerate gradually. Since the design of the civil works will take place during year one followed by construction in subsequent years, it will be year five before a greater availability of irrigation water reaches all farms within the target area. It will then be a further five years before all farms within the project fully utilize the input packages of fertilizer, seed, pesticide and extension services developed by SWMFl research to maximize their production. So, it will be ten years after the commencement of any work on the irrigation system before the full potential output is reached or, should the project proceed on schedule, 1990 before there is any output increase, and the year 2000 before output is maximized.

1.2 Crops.

Large yield increases can be realized for all crops with the exception of bananas which are already achieving good yields. These increases are starting from a very low base of inputs, improved farming techniques and the more intensive cultivation of existing agricultural land by the farmers. Although the number of farms remains constant, 35 percent more land within the boundaries of existing farms will be cultivated and the cropping intensity will increase from less than one to 1.5.

1.2.2 Yields.

Low present crop yields are the consequence of two major factors which the project proposes to address. The first of these is the non-availability of water at critical stages of plant growth, the second is the poor farming practices of farmers, though the small farmers with less than five hectares of land are cropping their land at a 1.0 intensity rate in comparison to larger farmers whose cropping intensity is only 0.6. Together these shortcomings result in yields as low as 0.75 tons of maize per hectare on small farms, 0.25 tons of sesame, and so on. For the purpose of this analysis the projected yields calculated by TAMS for Shalambood will be used in order to examine the impact of the project on output and income within the target area. These yields are shown in Table L-1. All of the projected yields are lower than those attained on experimental plots in the area and lower than those attained in other projects in Africa. As such they can be seen as relatively

conservative projections. No new crops are incorporated into the analysis with all increases coming from improvements in existing crops. However, research is likely to identify some new crops that can be produced profitably in the project area such as vegetables and oilseeds. Although the increase in yield resulting from the project is large, the yields are not in any sense particularly high, especially bearing in mind the fact that it is irrigated land that is being farmed. Actual yield increases in many cases may well be above those projected, but for the purpose of this analysis we will err on the side of caution.

1.2.3 Output.

Output increases for the project area are shown in Table L-2. Maize production increases from a present total of 3,922 tons to 13,378 tons. Sesame increases from 486 tons to 5,091 tons, a very substantial increase resulting from improved water delivery in the Der, the sesame growing season. The improved Der season water delivery will come from SWMP's basinwide technical assistance to improve the management of the Jowhar reservoir and other water allocation and management systems. Legumes also increase substantially from only 116 tons at present to 2,318 tons at full development. In this case, it is the introduction of crop rotation, not practised at present, that leads to this increase, with legumes being an important rotation crop which will be promoted through SWMP research and extension activities. The production of vegetables also increases from the present 3,004 tons to 7,919 tons with all of the increase coming from the use of improved seed and the use of fertilizers and pesticides. Watermelon and other fruit will increase from a present production of 632 tons to 6,628 tons at full development in year ten of the project.

1.2.4 Bananas.

At present, bananas are grown in large farms within the target area. They receive all of the water they need supplemented by well water between the Der and Gu seasons for optimum production conditions and an input package provided by Somalfruit. This project will not fund banana research but will rather promote the use of water saving practices to enhance the Der season water availability for smallholder production of cereals, oilseeds and vegetables.

2. FINANCIAL ANALYSIS.

2.1. Financial Prices.

If the project is ultimately to be viable, it should operate without the need for a continuous subsidy for the farmer. For the purpose of the financial analysis, prices for output are market determined prices, as are all input prices which are calculated free of subsidy. Given the absence of a true market determined price for some inputs, within Somalia prices have, in some cases, been calculated based upon known c.i.f. prices. A list of the prices used in the analysis is provided in Table L-3.

2.2. Farm Budget Models.

Four farm budget models have been constructed for the analysis of the impact of the project on farm incomes. They cover the range of farm sizes, from model one which is a farm budget for a one hectare farm, through model two which is five hectares to model three, a fifty-five hectare farm and model four which is a large farm of two hundred hectares. As bananas show no increase in yield or production as a result of the project no farm budget for a banana plantation has been included.

2.2.1. Model One. (Table L-4)

Existing yields and incomes are shown in the first column of figures. The existing, or 'without project', situation is that the production of the one hectare farm is SoSh 26,000 in value with SoSh 7,000 of that consisting of on farm consumption. Year three in the model is the first year in which improved water delivery arrives to the farm. It is then year six before production is maximized. In year six the value of output has increased to SoSh 85,000, a more than three fold increase. Even after we allow for the increased cost of inputs, the net benefits have increased from an output value of SoSh 21,000 without the project to SoSh 69,000 with the project to give an incremental net benefit of SoSh 48,000.

2.2.2. Model Two. (Table L-5)

The five hectare farm budget model also shows a large incremental increase in income with net benefits increasing from SoSh 147,000 to SoSh 438,000, once again a threefold increase.

TABLE 8: PROJECTED EXPENDITURES BY COMPONENT BY INPUT, LOP TOTALS
(U.S.$ 1,000 @ So.Sh. 90=U.S.$ 1.00)

DATE	PERSONNEL		TRAINING		COMMODITIES		CONSTRUCTION		OTHER		CONT & INFLATIO		SUB-TOTALS		TOTALS
LINE ITEM	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	AID	GSDR	U.S.$
Shebelli River Management	3756.8	1469.2	0.0	50.0	1437.5	1060.0	0.0	1175.0	1360.0	2024.0	709.6	701.6	7263.9	6479.7	13743.6
Adaptive Irrigated Agr. Research	2979.4	849.3	0.0	37.3	1657.7	593.6	201.4	1042.8	0.0	1880.8	526.3	512.4	5364.8	4916.1	10280.9
Shalambood Rehab.	0.0	0.0	0.0	0.0	0.0	0.0	6890.6	1528.8	0.0	0.0	0.0	0.0	6890.6	1528.8	8419.4
Project Coordinati & Support	1282.0	286.1	1119.5	228.1	181.0	0.0	0.0	0.0	79.0	50.0	419.2	90.9	3080.7	655.1	3735.7
TOTALS	8018.2	2604.5	1119.5	315.4	3276.2	1653.6	7092.0	3746.6	1439.0	3954.8	1655.0	1304.8	22600.0	13579.7	36179.7

2.2.3. Models Three and Four. (Tables L-6 and L-7)

Increases in net benefits from large farms are greater than those for smaller farms with the fifty-five hectare farm increasing its net benefits from SoSh 419,000 to SoSh 3,842,000, a nine fold increase while we get a ten fold increase in net benefits for the two hundred hectare farm. The primary reason for the larger increases are because currently the farms in these two categories have a cropping intensity of only 0.6 while the smaller farms are now achieving a cropping intensity of 1.0. It is assumed that the cropping intensity for all farms will increase to 1.5 as a result of this project.

3. COST RECOVERY.

Water charges set at a level sufficient to cover at least the maintenance and administrative costs associated with the continued provision of irrigation water within the Shalambood Target area are not only desirable but essential for the continuing viability of the project beyond the project funding stage. If these recurrent costs are not recoverable from the water users, it is inevitable that future reliance on Government Budget allocations could not only impose an undue burden on that budget but also jeopardize the continued maintenance and management of the irrigation system. Beyond any financial considerations there is an important economic reason for levying a water charge on the irrigated areas of the project. Somalia is a semi-arid country, limited availability of water being the major constraint to agricultural expansion. While the project will improve the efficiency of irrigation in the Shalambood area, it will not however, make water plentiful. Indeed there is no provision for markedly increasing the storage of water. Shalambood is part of the Shebelli irrigation area, most of which may eventually be rehabilitated. There is a trade off. The more water used within any one of the projects within the area, the less is available for all other areas. Ultimately, a choice will need to be made between a smaller area using water more intensively or a larger area using water less intensively. In short, we are talking about the careful rationing of Somalia's scarcest resource. There are a number of ways that this rationing could be carried out. The simplest and most effective method is through the price system.

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3.1. The Price System.

By levying water charges, irrigation water becomes a cost like every other cost in the farm production process, rather than the free good it is at present. As a cost, the rational farmer will weigh its use in the same way that he will that of fertilizer or pesticide and, based upon the expected value of his output, decide how much he will use. Given the variety of crops that the farmer in this area is able to grow, he will have a range of choice over a number of crops that are more or less water intensive in their requirements. At this stage it would be premature to try to determine what the water charge should be. It is possible that the water charge could be structured to reflect the relative scarcity of water throughout the year with a lower charge in the Gu season when water is plentiful; equity considerations might argue for differential charges for small and large farmers; the critical thing will be to set a charge that is sufficient to ensure the efficient maintenance of the irrigation facilities on an ongoing basis.

3.2. Ability to Pay.

A reasonable question would be whether the small farmer would be able to pay a water charge sufficient to cover his share of the overall cost. If we go back to table 3.1 we see that the small, one hectare farmer, after all costs, is gaining an incremental net benefit of SoSh 40,000 at full development (approximately). A charge of SoSh 6,000 per hectare per year to cover the recurrent costs of the Shalambood Irrigation District would still leave this farmer much better off as a result of the project and would certainly leave him with sufficient income to ensure his active participation in striving for increased production. For the larger farms a water charge would be easily met from increases in income.

4. ECONOMIC ANALYSIS.

4.1. Shadow Exchange Rate (SER).

There are, as of February 1987, three exchange rates in Somalia. The official exchange rate which is set at approximately SoSh 90/U.S. $, two free market rates which are fluctuating around the range of 140 to SoSh 150 to the dollar and the auction rate for forty-five day dollars which is around SoSh 125/US $. A free market for all SoSh would produce a rate somewhere between the two extremes of 90 and 150. It would certainly be above 90, probably well above, but would just as clearly be below the 150 rate which is determined

by a very limited supply of, and demand for, that portion of the F/X account that is traded freely. For the purpose of this analysis a shadow exchange rate of SoSh 130/U.S. $ will be adopted.

4.2. Shadow Prices.

Based upon the above SER, a set of shadow prices for farm inputs and outputs is shown in Table L-3.

4.3. Shadow Wage Rate.

A number of studies have asserted that there is an insufficient supply of labor within the Shalambood area. This assertion appears to be based upon the observation that wage rates rise during times of peak demand - planting and harvest. Given that labor would be expected to have an upward sloping supply curve in all but the most extreme of circumstances, an increasing wage rate at times of increased demand can not be seen as evidence of a labor shortage. Interviews within the target area with the major employers, the banana growers, indicate no apparent shortage of labor with a plentiful supply available year round at a wage rate of SoSh 100 per day. This contrasts with reported rates as high as SoSh 350 per day, paid for short periods by farmers during harvest. A further indicator of little real labor shortage is the working population within the area. This is estimated to be around 10,000. Allowing for 255 work days per year this gives us a total of 2.5 million working days. Present crop culture is probably using no more than 750,000 to 1 million of these days year round. There can be little doubt there is unemployment and underemployment within the area, and that the use of a shadow wage rate in the economic analysis is justified. A SWR representing the opportunity cost of labor would seem to be set by the present wages on banana plantations of SoSh 100 a day and this is the rate that will be used.

4.4. Project Costs.

4.4.1. Civil Works.

The costs of civil works within the project, calculated in shadow prices are given in Table L-8 labelled as "Rehabilitation". These costs commence with mapping and field investigations in the first year with an eventual eight year budget period until the completion of construction in year eight.

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4.4.2. Recurrent Costs.

Operation and maintenance costs of the irrigation works is also given in Table L-9 marked Shalambood Irrigation District Maintenance. Costs included here are all maintenance, replacement and operating costs for the irrigation and drainage within the project area.

4.4.2. On-farm Costs.

The costs incurred by farmers start to increase as soon as they utilize the input package of seeds, fertilizer and pesticides developed by the SWMP research component. We assume a gradual adoption of the package with total on-farm costs building up to year five. This is shown in Table L-9.

4.5. Project Benefits.

Incremental production and incremental benefits for the project are shown in Table L-8. In normal circumstances, the situation 'without project' would consist of a linear projection of present average yields from which incremental output could be measured. Given the rapidly deteriorating condition of the existing irrigation system, a linear projection would not reasonably represent future yields without the project. What we would observe in the Shalambood area, should the project not go ahead, would be a progressively reduced area of irrigated land with small farms being the first to be affected because of physical location and access to available water. Within twenty years it is probable that the total irrigated area in Shalambood could be reduced by some fifty percent. At this level, with the available water going to the large farms, the area would probably stabilize. The vast majority of the small farmers would then be dependent upon rainfed agriculture. For this reason the 'without project' conditions in Table L-2 show falling production. The overall effect of this assumption on the project benefits is not large, but it does serve to underline the very rapid worsening of the situation faced by small farmers should the deterioration of the irrigation facilities continue. In the benefits table, where year 1 is the first year of civil works we have no benefits occurring until year 3 in the form of increasing farm output and then building up until year ten when output is at a maximum. The actual value of benefits, because of the declining output in the 'without project' condition, continue to rise slightly even after year ten.

4.6. Benefit-Cost Analysis.

The project cash flow is given in Table L-9. As can be seen the project breaks-even during year 14 and subsequently produces SoSh 9.7 billion by year thirty. The internal rate of return (IRR) at 13.4 percent, which while probably close to the opportunity cost of capital, puts this project into the acceptable category.

The projects sensitivity to various cost and benefit assumptions are presented in Table L-10. The reader will note that the project is not very sensitive to a 20 percent increase in rehabilitation costs. It is more sensitive to incremental production delayed by one year or an assumed 20 percent increase in on-farm costs but both still yield an IRR of about 10 percent. However, the project is very sensitive to a decline in benefits. If benefits are assumed to be 20 percent less than expected the IRR declines to six percent.

4.7. Foreign Exchange Implication.

The high dollar cost of the civil works will not impact upon the Somali budget since it will be met from donor funds. There is a continuing F/X cost of the project, however, in the form of imported farm inputs. These include fertilizer, pesticide and fuel costs for tractor plowing. All told these costs will amount to some SoSh 83 million per year, approximately $925,000 at current exchange rates. To balance these input costs are F/X savings as a result of import substitution and F/X earnings from the continued export of banana and an increase in the export of watermelon and vegetables. A conservative figure for the value for these exports would be on the order of SoSh 260 million per annum ($2.9 million) at full production, generating more than sufficient F/X to cover the increased input cost. The import substitution saving comes from the reduction in grain and edible oils imports resulting from the increased output of the project and are worth some SoSh 498 million - $5.5 million. Overall there is a net F/X benefit of some $6.9 million approximately.

5. MARKETING

The Shalambood target area has good market access being located off the main North to South highway that runs down aw far as Kismayo in the south and serves to link the target area with the markets of Mogadishu in the north. Sixteen kilometers of this road adjoins the target area. A second asphalt road runs from the target area to the town of Merka.

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5.1. Maize.

Maize is one of the staples of the Somali diet. The marketing of maize was, from the time of the revolution until 1984, controlled by the Agricultural Development Corporation (ADC). The marketing strategy of ADC for much of this period appears to have been one of maintaining a stable nominal price for consumers. This had the effect of reducing the real price for both the consumer and the farmer which predictably led to falling production. A Presidential Circular in January 1984 removed the monopolistic powers that ADC had exercised over the grain markets and in 1985, for the first time in many years, there was a free market for both the buyers and sellers of maize. This led to a very rapid increase in prices for the farmers and increased production. Private markets appear to be operating with a fair degree of efficiency, although the farmers suffer from a lack of good on-farm storage which means that they tend to sell at harvest time when the price is lowest. No problems are anticipated in the marketing of the increased output. The Somali domestic market looks well able to absorb the projected maize increases with the country still some way off from achieving self-sufficiency in grain. The only area that may possibly be of some cause for concern is that of leakage of PL 480 grain onto the Somali market outside of the refugee areas. This can have a potentially depressing effect on grain prices and needs to be monitored carefully in a multi-donor context.

5.2. Stover.

An important by-product of maize production in the project area is stover in the form of maize stalks. There is a healthy demand for fodder of all types from both the semi-nomadic herdsmen who bring their cattle into the area during the Jilal (dry) season and from the settled farmers within the area who keep cattle. The maize stalks are sold in bundles at a price of SoSh 0.5 per maize stalk. Output of stalks should double as a result of the project but no problems selling at this price are anticipated. In this regard, it is worth noting that in past years, when maize prices were controlled by ADC, the return to the farmer from the sale of stover was sometimes greater than the return from the sale of the grain.

5.3. Sesame.

Sesame is grown for processing into edible oil. In terms of marketing, sesame presents a similar picture to maize with the ADC being the monopsony buyer until 1984. As with maize, this resulted in low farm gate prices and a static level of production. Prices

and marketing are now decontrolled. In recent years imports of vegetable oils have been running at around 30,000 tons a year. The increase in production in the project will substitute for some part of these imports. In view of the fact that sesame is the preferred oil for most Somali consumers, no problems are anticipated with regard to the marketing of increased output attributable to SWMP's introduction of technical packages to increase yields.

5.4. Legumes.

These are not an important item in the Somali diet but consumption has increased in the past ten years. Imports of legumes have risen over the past few years and the increased output from the project will substitute for some of these imports.

5.5. Vegetables and Fruits.

There are three widely marketed vegetables in Somaia: tomatoes, onions and potatoes. Within the target area, tomatoes are the predominant vegetable crop although peppers and onions are also grown. Marketing is in the hands of small traders at highly variable prices determined by the demand and the supply of the product. Increased volatility is introduced by the lack of any cold storage. The project will markedly increase the output of vegetables and fruit. Prior to SWMP research which would facilitate this increase, there needs to be a demand study with a view to determining the ability of Mogadishu and other markets to absorb the increased output. A potential market for some of the output is the cannery at Afgoi and this market needs to be explored.

5.6. Bananas.

At present, bananas are the second largest export from Somalia with exportation to the Gulf States and Italy and is in the hands of the joint GSDR/private sector Somalfruit. At present the export potential for Somali bananas looks good with any increased output from the project being easily absorbed. However, any significant increase in the planting of perennial crops could possibly involve a "land grab" from smallholders in the target area and also compete for scarce Der season water supplies with small farmers on the project site as well as downstream. SWMP will not do any work with bananas. If anything, any expansion of the area planted to bananas will be discouraged.

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Table L-1: Per Hectare Yield Assumptions

	Maize	Sesame	Legumes	Vegetables	Fruit	Stover Stalks (No.)
	(----------Kilograms---------)					
One Ha. Farm						
Without Project	750	250	200	6,000	6,000	25,000
With Project	2,000	750	600	15,000	11,000	40,000
Five Ha. Farm						
Without Project	1,000	300	250	6,000	6,000	25,000
With Project	3,000	900	800	17,000	14,000	40,000
Fifty Ha. Farm						
Without Project	1,200	300	300	7,000	6,500	25,000
With Project	3,200	1,000	900	18,000	16,000	40,000
Farms 100 Ha. Plus						
Without Project	1,000	270	270	6,000	6,000	25,000
With Project	2,800	800	800	15,000	13,000	40,000

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1) Mainly cowpeas
2) Mainly tomatoes
3) Mainly watermelon

Table L-2: Project Incremental Production 1/

	Year 0-2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Maize (tons)																			
With Project 2/	3,922	4,318	6,555	8,238	10,136	11,610	12,735	13,198	13,362	13,364	13,366	13,368	13,370	13,372	13,374	13,375	13,376	13,377	13,378
Without Project 3/	3,922	3,906	3,944	3,780	3,728	3,692	3,656	3,622	3,598	3,572	3,548	3,524	3,500	3,478	3,460	3,444	3,430	3,420	3,408
Incremental Output	0	412	2,611	4,458	6,408	7,918	9,079	9,576	9,764	9,792	9,818	9,844	9,870	9,894	9,914	9,931	9,946	9,957	9,970
Sesame (tons)																			
With Project	486	732	1,987	2,888	3,765	4,338	4,809	5,004	5,089	5,090	5,090	5,090	5,090	5,090	5,090	5,091	5,091	5,091	5,091
Without Project	486	484	478	472	468	464	462	460	456	454	450	448	446	444	444	440	440	438	438
Incremental Output	0	238	1,509	2,416	3,297	3,874	4,347	4,544	4,633	4,636	4,640	4,642	4,644	4,646	4,646	4,651	4,651	4,653	4,653
Legumes (tons)																			
With Project	116	235	866	1,324	1,754	2,010	2,205	2,283	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318
Without Project	116	114	114	112	112	112	110	110	110	110	110	110	108	108	108	108	108	108	108
Incremental Output	0	121	752	1,212	1,642	1,898	2,095	2,173	2,208	2,208	2,208	2,208	2,210	2,210	2,210	2,210	2,210	2,210	2,210
Vegetables (tons)																			
With Project	3,004	3,249	4,547	5,504	6,396	7,074	7,596	7,813	7,900	7,903	7,905	7,908	7,910	7,913	7,914	7,916	7,917	7,918	7,919
Without Project	3,004	2,976	2,912	2,840	2,784	2,744	2,704	2,670	2,640	2,610	2,580	2,550	2,520	2,494	2,476	2,458	2,442	2,428	2,414
Incremental Output	0	273	1,635	2,664	3,612	4,330	4,892	5,143	5,260	5,293	5,325	5,358	5,390	5,419	5,438	5,458	5,475	5,490	5,505
Watermelon (tons)																			
With Project	632	1,031	3,122	4,369	5,617	6,066	6,428	6,558	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628
Without Project	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
Incremental Output	0	399	2,490	3,737	4,985	5,434	5,796	5,926	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996
Bananas (tons)																			
With Project	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Without Project	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Incremental Output	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stover (by value 1000 SoSh)																			
With Project	53,480	62,998	79,926	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000	95,000
Without Project	53,480	53,480	53,480	53,480	53,480	53,480	55,280	55,280	53,480	53,480	53,480	53,480	53,480	53,480	53,480	53,480	53,480	53,480	53,480
Incremental Output	0	9,518	26,446	41,520	41,520	41,520	39,720	39,720	41,520	41,520	41,520	41,520	41,520	41,520	41,520	41,520	41,520	41,520	41,520

1) Based upon an eventual irrigated cropped area of 8,000 hectares.

2) No increase in output until year three of project. Output is then maximized in year 10, but incremental production continues to increase slightly as without project conditions show falling output.

3) Present production in years 0-2, but declining over time due to the progressive deterioration of the irrigation system.

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Table L-2: Project Incremental Production 1/

	Year 0-2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Maize (tons)																			
With Project 2/	3,922	4,318	6,555	8,238	10,136	11,610	12,735	13,198	13,362	13,364	13,366	13,368	13,370	13,372	13,374	13,375	13,376	13,377	13,378
Without Project 3/	3,922	3,906	3,944	3,780	3,728	3,692	3,656	3,622	3,598	3,572	3,548	3,524	3,500	3,478	3,460	3,444	3,430	3,420	3,406
Incremental Output	0	412	2,611	4,458	6,408	7,918	9,079	9,576	9,764	9,792	9,818	9,844	9,870	9,894	9,914	9,931	9,946	9,957	9,970
Sesame (tons)																			
With Project	486	732	1,987	2,888	3,765	4,338	4,809	5,004	5,089	5,090	5,090	5,090	5,090	5,090	5,090	5,091	5,091	5,091	5,091
Without Project	486	484	478	472	468	464	462	460	456	454	450	448	446	444	444	440	440	438	438
Incremental Output	0	238	1,509	2,416	3,297	3,874	4,347	4,544	4,633	4,636	4,640	4,642	4,644	4,646	4,646	4,651	4,651	4,653	4,653
Legumes (tons)																			
With Project	116	235	866	1,324	1,754	2,010	2,205	2,283	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318
Without Project	116	114	114	112	112	112	110	110	110	110	110	110	108	108	108	108	108	108	108
Incremental Output	0	121	752	1,212	1,642	1,898	2,095	2,173	2,208	2,208	2,208	2,208	2,210	2,210	2,210	2,210	2,210	2,210	2,210
Vegetables (tons)																			
With Project	3,004	3,249	4,547	5,504	6,396	7,074	7,596	7,813	7,900	7,903	7,905	7,908	7,910	7,913	7,914	7,916	7,917	7,918	7,919
Without Project	3,004	2,976	2,912	2,840	2,784	2,744	2,704	2,670	2,640	2,610	2,580	2,550	2,520	2,494	2,476	2,458	2,442	2,428	2,414
Incremental Output	0	273	1,635	2,664	3,612	4,330	4,892	5,143	5,260	5,293	5,325	5,358	5,390	5,419	5,438	5,458	5,475	5,490	5,505
Watermelon (tons)																			
With Project	632	1,031	3,122	4,369	5,617	6,066	6,428	6,558	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628
Without Project	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
Incremental Output	0	399	2,490	3,737	4,985	5,434	5,796	5,926	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996	5,996

Table L-3: Input-Output Price Assumptions

	Unit	Unit Price: Financial Analysis	Unit Price: Economic Analysis
		(-----So. Sh.-----)	
Inputs			
Fertilizer			
Urea	M.T.	26,754	37,380
NPK	M.T.	21,488	29,940
DAP	M.T.	31,204	43,665
Pesticides(ave.)	Liter	400	577
Labor	Day	150	100
Tractor Plowing	Hour	1,220	1,760
Output			
Maize	M.T.	17,335	24,000
Sesame	M.T.	72,674	117,000
Legumes	M.T.	33,716	54,700
Vegetables	M.T.	30,000	30,000
Watermelon	M.T.	10,000	21,000
Stover	Stalk	0.5	0.5

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Table L-4: Farm Level Financial Analysis of Farm Unit Model 1 Without Water Charges
(1000 SoSh)

	Without Project	1	2	3	4	5	6
Main Production							
Maize	9.00	9.00	12.00	14.00	16.00	18.00	20.00
Sesame	1.88	1.88	13.50	18.00	19.50	21.00	22.50
Legumes	1.00	1.00	4.50	6.00	6.75	7.50	9.00
Vegetables	7.50	7.50	11.25	15.00	16.25	17.50	18.75
Watermelon	0.00	0.00	4.00	4.50	5.00	5.25	5.50
Stover	7.50	7.50	10.00	10.00	10.00	10.00	10.00
Total	26.88	26.88	55.25	67.50	73.50	79.25	85.75
Less on Farm Consumption	6.34	6.34	9.55	10.70	11.55	12.40	13.25
Total Cash Sales	20.54	20.54	45.70	56.80	61.95	66.85	72.50
Operating Costs (2/)							
Maize							
Seed Bed Preparation	3.15	4.11	4.11	4.11	4.11	4.11	4.11
Inputs	0.27	1.82	1.82	1.82	1.82	1.82	1.82
Other Costs	0.36	0.30	0.30	0.30	0.30	0.30	0.30
Total Maize Operating Costs	3.78	6.23	6.23	6.23	6.23	6.23	6.23
Sesame							
Seed Bed Preparation	0.73	4.39	4.39	4.39	4.39	4.39	4.39
Inputs	0.09	0.81	0.81	0.81	0.81	0.81	0.81
Other Costs	0.07	0.27	0.27	0.27	0.27	0.27	0.27
Total Sesame Operating Costs	0.89	5.47	5.47	5.47	5.47	5.47	5.47
Legumes							
Seed Bed Preparation	0.50	1.54	1.54	1.54	1.54	1.54	1.54
Inputs	0.09	1.42	1.42	1.42	1.42	1.42	1.42
Other Costs	0.05	0.14	0.14	0.14	0.14	0.14	0.14
Total Legumes Operating Costs	0.64	3.10	3.10	3.10	3.10	3.10	3.10

Table L-4: Farm Level Financial Analysis of Farm Unit Model 1 Without Water Charges
(1000 SoSh)

	Without Project	1	2	3	4	5	6
Main Production							
Maize	9.00	9.00	12.00	14.00	16.00	18.00	20.00
Sesame	1.88	1.88	13.50	18.00	19.50	21.00	22.50
Legumes	1.00	1.00	4.50	6.00	6.75	7.50	9.00
Vegetables	7.50	7.50	11.25	15.00	16.25	17.50	18.75
Watermelon	0.00	0.00	4.00	4.50	5.00	5.25	5.50
Stover	7.50	7.50	10.00	10.00	10.00	10.00	10.00
Total	26.88	26.88	55.25	67.50	73.50	79.25	85.75
Less on Farm Consumption	6.34	6.34	9.55	10.70	11.55	12.40	13.25
Total Cash Sales	20.54	20.54	45.70	56.80	61.95	66.85	72.50
Operating Costs (2/)							
Maize							
Seed Bed Preparation	3.15	4.11	4.11	4.11	4.11	4.11	4.11
Inputs	0.27	1.82	1.82	1.82	1.82	1.82	1.82
Other Costs	0.36	0.30	0.30	0.30	0.30	0.30	0.30
Total Maize Operating Costs	3.78	6.23	6.23	6.23	6.23	6.23	6.23
Sesame							
Seed Bed Preparation	0.73	4.39	4.39	4.39	4.39	4.39	4.39
Inputs	0.09	0.81	0.81	0.81	0.81	0.81	0.81
Other Costs	0.07	0.27	0.27	0.27	0.27	0.27	0.27
Total Sesame Operating Costs	0.89	5.47	5.47	5.47	5.47	5.47	5.47
Legumes							
Seed Bed Preparation	0.50	1.54	1.54	1.54	1.54	1.54	1.54
Inputs	0.09	1.42	1.42	1.42	1.42	1.42	1.42
Other Costs	0.05	0.14	0.14	0.14	0.14	0.14	0.14
Total Legumes Operating Costs	0.64	3.10	3.10	3.10	3.10	3.10	3.10

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Table L-4: Farm Level Financial Analysis of Farm Unit Model 1 Without Water Charges
(1000 SoSh)

	Without Project	1	2	3	4	5	6
Vegetables							
Seed Bed Preparation	0.24	0.37	0.37	0.37	0.37	0.37	0.37
Inputs	0.06	0.29	0.29	0.29	0.29	0.29	0.29
Other Costs	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total Vegetables Operating Costs	0.32	0.68	0.68	0.68	0.68	0.68	0.68
Watermelon							
Seed Bed Preparation	0.00	0.37	0.37	0.37	0.37	0.37	0.37
Inputs	0.00	0.27	0.27	0.27	0.27	0.27	0.27
Other Costs	0.00	0.02	0.02	0.02	0.02	0.02	0.02
Total Watermelon Operating Costs	0.00	0.64	0.64	0.64	0.64	0.64	0.64
Total Oper. Costs w/o Water Charge	5.63	16.13	16.13	16.13	16.13	16.13	16.13
Farm Family Net Benefit	21.25	10.76	39.13	51.38	57.38	63.13	69.63
Farm Family Benefit w/o Project	21.25	21.25	21.25	21.25	21.25	21.25	21.25
Incremental Farm Family Net Benefit	0.00	-10.49	17.88	30.13	36.13	41.88	48.38
Financing Required							
Short Term Loans (4/)	0.00	10.49	0.00	0.00	0.00	0.00	0.00
Debt Service	0.00	0.00	12.80	0.00	0.00	0.00	0.00
Net Farm Benefit After Financing	0.00	0.00	5.08	30.13	36.13	41.88	48.38

1/ Increased costs of production are incurred in Year 1, with benefits first accruing in Year 2
2/ Labor costs under this model are counted as 'free' as all labor is assumed to be of the farm family
3/ Comprises tractor costs for plowing, harrowing, etc
4/ Interest rate assumed at 22%
5/ Costs and benefits are assumed to remain constant at all levels

Table L-5: Farm Level Financial Analysis of Farm Unit Model 2 Without Water Charges
(1000 SoSh)

	Without Project	1	2	3	4	5	6
Main Production							
Maize	62.00	62.00	80.00	100.00	120.00	140.00	150.00
Sesame	13.50	13.50	75.00	90.00	105.00	120.00	135.00
Legumes	0.00	0.00	37.50	45.00	52.50	56.25	60.00
Vegetables	75.00	75.00	62.50	75.00	87.50	100.00	106.35
Watermelon	0.00	0.00	22.50	27.50	30.00	31.25	35.00
Stover	38.75	38.75	50.00	50.00	50.00	50.00	50.00
Total	189.25	189.25	327.50	387.50	445.00	497.50	536.25
Less on Farm Consumption	38.55	38.55	55.50	64.00	72.50	81.00	86.00
Total Cash Sales	150.70	150.70	272.00	323.50	372.50	416.50	450.25
Operating Costs (2/)							
Maize							
Seed Bed Preparation	24.24	21.43	21.43	21.43	21.43	21.43	21.43
Inputs	5.58	11.84	11.84	11.84	11.84	11.84	11.84
Other Costs	1.86	1.50	1.50	1.50	1.50	1.50	1.50
Total Maize Operating Costs	31.68	34.76	34.76	34.76	34.76	34.76	34.76
Sesame							
Seed Bed Preparation	4.39	21.96	21.96	21.96	21.96	21.96	21.96
Inputs	1.45	6.77	6.77	6.77	6.77	6.77	6.77
Other Costs	0.41	1.35	1.35	1.35	1.35	1.35	1.35
Total Sesame Operating Costs	6.25	30.08	30.08	30.08	30.08	30.08	30.08
Legumes							
Seed Bed Preparation	0.00	13.33	13.33	13.33	13.33	13.33	13.33
Inputs	0.00	9.68	9.68	9.68	9.68	9.68	9.68
Other Costs	0.00	0.68	0.68	0.68	0.68	0.68	0.68
Total Legumes Operating Costs	0.00	23.69	23.69	23.69	23.69	23.69	23.69

Table L-5: Farm Level Financial Analysis of Farm Unit Model 2 Without Water Charges
(1000 SoSh)

	Without Project	1	2	3	4	5	6
Vegetables							
Seed Bed Preparation	2.44	2.14	2.14	2.14	2.14	2.14	2.14
Inputs	1.30	2.71	2.71	2.71	2.71	2.71	2.71
Other Costs	0.15	0.08	0.08	0.08	0.08	0.08	0.08
Total Vegetables Operating Costs	3.89	4.92	4.92	4.92	4.92	4.92	4.92
Watermelon							
Seed Bed Preparation	0.00	2.14	2.14	2.14	2.14	2.14	2.14
Inputs	0.00	2.71	2.71	2.71	2.71	2.71	2.71
Other Costs	0.00	0.08	0.08	0.08	0.08	0.08	0.02
Total Watermelon Operating Costs	0.00	3.95	3.95	3.95	3.95	3.95	3.95
Total Oper. Costs w/o Water Charge	41.82	97.39	97.39	97.39	97.39	97.39	97.39
Farm Family Net Benefit	147.43	91.86	230.11	290.11	347.61	400.11	438.86
Farm Family Benefit w/o Project	147.43	147.43	147.43	147.43	147.43	147.43	147.43
Incremental Farm Family Net Benefit	0.00	-55.57	82.68	142.68	200.18	252.68	291.43
Financing Required							
Short Term Loans (4/)	0.00	55.57	0.00	0.00	0.00	0.00	0.00
Debt Service	0.00	0.00	67.80	0.00	0.00	0.00	0.00
Net Farm Benefit After Financing	0.00	0.00	14.88	142.68	200.18	252.68	291.43

1/ Increased costs of production are incurred in Year 1,with benefits first accruing in Year 2
2/ Labor costs under this model are counted as free' as all labor is assumed to be of the farm family
3/ Comprises tractor costs for plowing, harrowing, etc
4/ Interest rate assumed at 22%
5/ Costs and benefits are assumed to remain constant at all levels

Table L-6: Farm Level Financial Analysis of Farm Unit Model 3 Without Water Charges
(1000 SoSh)

	Without Project	1.00	2.00	3.00	4.00	5.00	6.00
Main Production							
Maize	381.60	381.60	990.00	1210.00	1540.00	1650.00	1760.00
Sesame	174.00	174.00	807.50	1155.00	1320.00	1485.00	1650.00
Legumes	37.50	37.50	453.75	536.25	618.75	701.25	742.50
Vegetables	315.00	315.00	825.00	962.50	1100.00	1168.75	1237.50
Watermelon	78.00	78.00	275.00	330.00	385.00	412.50	440.00
Stover	198.75	198.75	550.00	550.00	550.00	550.00	550.00
Total	1184.85	1184.85	4001.25	4743.75	5513.75	5967.50	6380.00
Less on Farm Consumption	127.43	127.43	389.95	432.30	475.20	500.50	525.80
Total Cash Sales	1057.42	1057.42	3611.30	4311.45	5038.55	5467.00	5854.20
Operating Costs (2/)							
Maize							
Seed Bed Preparation	125.93	376.75	376.75	376.75	376.75	376.75	376.75
Inputs	32.28	226.99	226.99	226.99	226.99	226.99	226.99
Hired Labor	236.12	326.70	326.70	326.70	326.70	326.70	326.70
Other Costs	9.54	16.50	16.50	16.50	16.50	16.50	16.50
Total Maize Operating Costs	403.86	946.94	946.94	946.94	946.94	946.94	946.94
Sesame							
Seed Bed Preparation	56.61	322.08	322.08	322.08	322.08	322.08	322.08
Inputs	14.85	180.35	180.35	180.35	180.35	180.35	180.35
Hired Labor	143.55	397.49	397.49	397.49	397.49	397.49	397.49
Other Costs	5.22	14.85	14.85	14.85	14.85	14.85	14.85
Total Sesame Operating Costs	220.23	914.76	914.76	914.76	914.76	914.76	914.76
Legumes							
Seed Bed Preparation	12.58	168.47	168.47	168.47	168.47	168.47	168.47
Inputs	4.20	138.44	138.44	138.44	138.44	138.44	138.44
Hired Labor	25.58	119.79	119.79	119.79	119.79	119.79	119.79
Other Costs	1.13	7.43	7.43	7.43	7.43	7.43	7.43
Total Legumes Operating Costs	43.48	434.12	434.12	434.12	434.12	434.12	434.12

Table L-6: Farm Level Financial Analysis of Farm Unit Model 3 Without Water Charges
(1000 SoSh)

	Without Project	1.00	2.00	3.00	4.00	5.00	6.00
Vegetables							
Seed Bed Preparation	8.78	23.49	23.49	23.49	23.49	23.49	23.49
Inputs	5.67	35.65	35.65	35.65	35.65	35.65	35.65
Hired Labor	52.87	88.94	88.94	88.94	88.94	88.94	88.94
Other Costs	0.54	0.83	0.83	0.83	0.83	0.83	0.83
Total Vegetables Operating Costs	67.86	148.89	148.89	148.89	148.89	148.89	148.89
Watermelon							
Seed Bed Preparation	8.78	23.49	23.49	23.49	23.49	23.49	23.49
Inputs	4.78	32.83	32.83	32.83	32.83	32.83	32.83
Hired Labor	15.64	35.85	35.85	35.85	35.85	35.85	35.85
Other Costs	0.36	0.83	0.83	0.83	0.83	0.83	0.83
Total Watermelon Operating Costs	29.56	92.99	92.99	92.99	92.99	92.99	92.99
Total Oper. Costs w/o Water Charge	764.98	2537.69	2537.69	2537.69	2537.69	2537.69	2537.69
Farm Family Net Benefit	419.87	-1352.84	1463.56	2206.06	2976.06	3429.81	3842.31
Farm Family Benefit w/o Project	419.87	419.87	419.87	419.87	419.87	419.87	419.87
Incremental Farm Family Net Benefit	0.00	-1772.71	1043.69	1786.19	2556.19	3009.94	3422.44
Financing Required							
Loans (2/)	0.00	1772.71	0.00	0.00	0.00	0.00	0.00
Debt Service	0.00	0.00	753.00	1524.20	611.67	0.00	0.00
Net Farm Benefit After Financing	0.00	0.00	290.69	262.09	1944.52	3009.94	3422.44

1/ Increased costs of production are incurred in Year 1,with benefits first accruing in Year 2
2/ Interest rate assumed at 22%
3/ Costs and benefits are assumed to remain constant at all levels

Table L-7: Farm Level Financial Analysis of Farm Unit Model 4 Without Water Charges

	Without Project	1.00	2.00	3.00	4.00	5.00	6.00
Main Production							
Maize	1156.00	1156.00	3400.00	4000.00	4600.00	5200.00	5600.00
Sesame	567.00	567.00	2400.00	3000.00	3600.00	4200.00	4800.00
Legumes	124.20	124.00	1200.00	1650.00	1950.00	2250.00	2400.00
Vegetables	990.00	990.00	3000.00	3000.00	3250.00	3500.00	3750.00
Watermelon	264.00	264.00	900.00	1100.00	1200.00	1250.00	1300.00
Stover	722.50	722.50	2000.00	2000.00	2000.00	2000.00	2000.00
Total	3823.70	3823.70	12900.00	14750.00	16600.00	18400.00	19850.00
Less on Farm Consumption	358.14	358.14	1018.00	1060.00	1102.00	1144.00	1176.00
Total Cash Sales	3465.56	3465.56	11882.00	13690.00	15498.00	17256.00	18674.00
Operating Costs (27)							
Maize							
Seed Bed Preparation	457.78	1370.00	1370.00	1370.00	1370.00	1370.00	1370.00
Inputs	117.33	825.40	825.40	825.40	825.40	825.40	825.40
Hired Labor	858.33	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00
Other Costs	34.68	60.00	60.00	60.00	60.00	60.00	60.00
Total Maize Operating Costs	1468.12	3443.40	3443.40	3443.40	3443.40	3443.40	3443.40
Sesame							
Seed Bed Preparation	204.96	1171.20	1171.20	1171.20	1171.20	1171.20	1171.20
Inputs	53.76	655.80	655.80	655.80	655.80	655.80	655.80
Hired Labor	519.75	1445.40	1445.40	1445.40	1445.40	1445.40	1445.40
Other Costs	18.90	54.00	54.00	54.00	54.00	54.00	54.00
Total Sesame Operating Costs	797.37	3326.40	3326.40	3326.40	3326.40	3326.40	3326.40
Legumes							
Seed Bed Preparation	46.28	612.60	612.60	612.60	612.60	612.60	612.60
Inputs	15.46	503.40	503.40	503.40	503.40	503.40	503.40
Hired Labor	94.12	435.60	435.60	435.60	435.60	435.60	435.60
Other Costs	4.14	27.00	27.00	27.00	27.00	27.00	27.00
Total Legumes Operating Costs	159.99	1578.60	1578.60	1578.60	1578.60	1578.60	1578.60

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Table L-7: Farm Level Financial Analysis of Farm Unit Model 4 Without Water Charges

	Without Project	1.00	2.00	3.00	4.00	5.00	6.00
Vegetables							
Seed Bed Preparation	32.21	85.40	85.40	85.40	85.40	85.40	85.40
Inputs	20.79	129.63	129.63	129.63	129.63	129.63	129.63
Hired Labor	193.84	323.40	323.40	323.40	323.40	323.40	323.40
Other Costs	1.98	3.00	3.00	3.00	3.00	3.00	3.00
Total Vegetables Operating Costs	248.82	541.43	541.43	541.43	541.43	541.43	541.43
Watermelon							
Seed Bed Preparation	32.21	85.40	85.40	85.40	85.40	85.40	85.40
Inputs	17.51	119.39	119.39	119.39	119.39	119.39	119.39
Hired Labor	57.35	130.35	130.35	130.35	130.35	130.35	130.35
Other Costs	1.32	3.00	3.00	3.00	3.00	3.00	3.00
Total Watermelon Operating Costs	108.39	338.14	338.14	338.14	338.14	338.14	338.14
Total Oper. Costs w/o Water Charge	2782.69	9227.97	9227.97	9227.97	9227.97	9227.97	9227.97
Farm Family Net Benefit	1041.01	-5404.27	3672.03	5522.02	7372.02	9172.02	10622.03
Farm Family Benefit w/o Project	1041.01	1041.01	1041.01	1041.01	1041.01	1041.01	1041.01
Incremental Farm Family Net Benefit	0.00	-6445.28	2631.02	4481.01	6331.02	8131.02	9581.02
Financing Required							
Loans (2/)	0.00	6445.28	0.00	0.00	0.00	0.00	0.00
Debt Service	0.00	0.00	176.18	2832.18	4606.18	5769.99	0.00
Net Farm Benefit After Financing	0.00	0.00	2454.84	1648.84	1724.84	2361.03	9581.02

1/ Increased costs of production are incurred in Year 1, with benefits first accruing in Year 2
2/ Interest rate assumed at 22%
3/ Costs and benefits are assumed to remain constant at all levels

Table L - 8
Project Incremental Benefits

Year	Maize Production	Maize Value (So.Sh.)	Sesame Production	Sesame Value (So.Sh.)	Legume Production	Legume Value (So.Sh.)	Vegetable Production	Vegetable Value (So.Sh.)	Watermell Production	Watermell Value (So.Sh.)	Stover Value (So.Sh.)	Total Value (So.Sh.)
	(M.T.)	(Million)	(M.T.)	(Million)	(M.T.)	(Million)	(M.T.)	(Million)	(M.T.)	(Million)	(Million)	(Million)
3	412	9.9	238	27.8	121	6.6	273	8.2	399	8.4	10.3	71.2
4	2,611	62.7	1,509	176.6	752	41.1	1,635	49.1	2,490	52.3	28.7	410.4
5	4,458	107.0	2,416	282.7	1,212	66.3	2,664	79.9	3,737	78.5	45.0	659.4
6	6,408	153.8	3,297	385.7	1,642	89.8	3,612	108.4	4,985	104.7	45.0	887.4
7	7,918	190.0	3,874	453.3	1,898	103.8	4,330	129.9	5,434	114.1	45.0	1,036.1
8	9,079	217.9	4,347	508.6	2,095	114.6	4,892	146.8	5,796	121.7	45.0	1,154.6
9	9,576	229.8	4,544	531.6	2,173	118.9	5,143	154.3	5,926	124.4	45.0	1,204.1
10	9,764	234.3	4,633	542.1	2,208	120.8	5,260	157.8	5,996	125.9	45.0	1,225.9
11	9,792	235.0	4,636	542.4	2,208	120.8	5,293	158.8	5,996	125.9	45.0	1,227.9
12	9,818	235.6	4,640	542.9	2,208	120.8	5,325	159.8	5,996	125.9	45.0	1,230.0
13	9,844	236.3	4,642	543.1	2,208	120.8	5,358	160.7	5,996	125.9	45.0	1,231.8
14	9,870	236.9	4,644	543.3	2,210	120.9	5,390	161.7	5,996	125.9	45.0	1,233.7
15	9,894	237.5	4,646	543.6	2,210	120.9	5,419	162.6	5,996	125.9	45.0	1,235.4
16	9,914	237.9	4,646	543.6	2,210	120.9	5,438	163.1	5,996	125.9	45.0	1,236.5
17	9,931	238.3	4,651	544.2	2,210	120.9	5,458	163.7	5,996	125.9	45.0	1,238.1
18	9,946	238.7	4,651	544.2	2,210	120.9	5,475	164.3	5,996	125.9	45.0	1,238.9
19	9,957	239.0	4,653	544.4	2,210	120.9	5,490	164.7	5,996	125.9	45.0	1,239.9
20-30	9,970	239.3	4,653	544.4	2,210	120.9	5,505	165.2	5,996	125.9	45.0	1,240.6

Table L - 9

Shebelli Water Management Project: Costs And Benefits
(So.Sh. 1,000,000)

Year	Rehab Costs	Cord & Supp	Research & Exten Costs	Riv Bsn Mgmt Co	Shal Ir Dist O&M	On Farm Costs	Total Costs	Benefit (Reve)	Cash Flow	Accum C.F.
1	0.0	1.8	26.4	39.8	0.0	0.0	68.0	0.0	(68.0)	(68.0)
2	135.7	15.6	84.8	83.8	0.0	0.0	319.9	0.0	(319.9)	(387.9)
3	280.5	17.6	43.4	81.4	0.0	0.0	422.9	0.0	(422.9)	(810.8)
4	470.9	22.0	51.4	77.0	25.0	13.1	659.4	71.2	(588.2)	(1,399.0)
5	207.5	19.4	33.0	42.4	27.8	370.2	700.3	410.4	(289.9)	(1,688.9)
6	0.0	20.4	27.6	33.0	32.0	528.4	641.4	659.4	18.0	(1,670.9)
7	130.0	18.2	41.6	54.6	37.6	584.3	866.3	887.4	21.1	(1,649.8)
8	260.0	18.2	41.6	54.6	40.0	584.3	998.7	1,036.1	37.4	(1,612.4)
9	520.0	18.2	41.6	54.6	42.3	584.3	1,261.0	1,154.6	(106.4)	(1,718.8)
10	260.0	18.2	41.6	54.6	44.6	584.3	1,003.3	1,204.1	200.8	(1,518.0)
11	130.0	18.2	41.6	54.6	44.6	584.3	873.3	1,225.9	352.6	(1,165.4)
12	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,227.9	562.6	(602.8)
13	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,230.0	564.7	(38.1)
14	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,231.8	566.5	528.4
15	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,233.7	568.4	1,096.8
16	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,235.4	570.1	1,666.9
17	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,236.5	571.2	2,238.1
18	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,238.1	572.8	2,810.9
19	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,238.9	573.6	3,384.5
20	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,239.9	574.6	3,959.1
21	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	4,534.4
22	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	5,109.7
23	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	5,685.0
24	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	6,260.3
25	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	6,835.6
26	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	7,410.9
27	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	7,986.2
28	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	8,561.5
29	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	9,136.8
30	0.0	0.0	0.0	36.4	44.6	584.3	665.3	1,240.6	575.3	9,712.1
Total	2,394.6	187.8	474.6	1,322.0	1,141.3	14,934.9	20,455.2	30,167.3	9,712.1	
IRR	0.1341									

Table L-10: Sensitivity Analysis

	IRR (Percent)
1. Basic solution 1/	13.4
2. Rehabilitation costs 20% greater	11.8
3. Incremental production Delayed one year	9.9
4. Incremental benefits 90% of expectation 2/	9.9
5. Incremental on-farm costs 20% greater	9.7
6. Incremental benefits 80% of expectation 2/	6.0

1/ Twenty percent of basin-wide costs (project coordination and support costs, research and extension costs and river basin management costs) are allocated to the Shalambood 8,000 hectares.

2/ The reduction in incremental benefits could be due to lower yields than expected or a lower than expected value of the incremental output or any combination thereof.

ANNEX M

SOCIAL SOUNDNESS

ANNEX M: SOCIAL SOUNDNESS

1. PROJECT STRUCTURE AND OVERALL CONTEXT

The proposed project will focus work on three major components:

1) Strengthening the GSDR capability for centralized Shebelli River management and administration;

2) Strengthening supportive adaptive irrigated agricultural and software research; and

3) Improving the intensity and efficiency of irrigated agriculture in the Shalambood target area.

It has been noted elsewhere that the first two components of the proposed project are broader in scope than the last and are meant to have direct and indirect benefits to national level policies as well as to local farmers. Efforts in the Shalambood area ought to result in a grassroots-oriented learning process with applicability to water management and irrigation efforts both near to the target area and elsewhere in Somalia. These first two components have a wider applicability than the third. The main impact area of the first component is the entire Shebelli river within Somalia, an area which in 1985 had a population of 2,085,000 or 32 percent of the entire population of Somalia. The primary target of the second component is an area which comprises the target area of the proposed irrigation system rehabilitation, along with two nearby irrigation project areas: Faraxaane and Qorioley. The main target of the third component and therefore of all three components together are the people living in the Shalambood irrigation area. The analysis will therefore focus on this group, but will make reference to social elements which might apply to the other components throughout the discussion.

The people of the Shalambcod area are part of a larger agro-pastoral system in the interiverine area of Southern Somalia. This region, which occupies 200,000 square kilometers between the Juba and Shebelli Rivers, involves subsistence traditionally derived from permanent dryland as well as irrigated agriculture, in addition to the pastoral elements found elsewhere in Somalia. Shalambood is an area served by a canal system built by the Italians during the colonial period of Somalia's history; the canals provide a relative abundance of water which permits people to live in

sedentary villages and farm several crops during the year. In comparison, nearby farmers have to use rainfed agricultural techniques which can only support a lower population density. It should be pointed out, however, that Shalambood has been under settled cultivation for hundreds of years. Resident farmers are joined by nomads during the dry months when water is unavailable in other regions.

2. SOCIO-CULTURAL FEASIBILITY

2.1 The Social Setting in the Target Area

Irrigated agriculture and the cooperative institutions associated with it have a long history in the Shalambood area. Oral traditions exist which indicate that irrigation was present in the area as far back as the sixteenth century. Leaders of the dominant groups in the lower Shebelli settled large numbers of slaves of diverse origins in the region, from the mid-19th century onward, to encourage the production of agricultural surpluses on the land by establishing private plantations of up to forty hectares. It was only from 1908 onward that the Italians began expropriating land in the south for concessionary purposes to help defray the costs of colonial administration. Thus irrigation and the institutions associated with irrigated agriculture (see Section 2.3 below) predate the colonial period in Somalia.

In the colonial period, the Italians acquired the best riverine land for the large-scale production of bananas and sugar. The Italians began their irrigation system with the Genale Barrage, started in 1926, when the rest of the system was completed by 1935-36. According to McGowen et. al., "At that time the area bounded by the upstream edge of the project zone...was divided into 63 aziendas or plantations, almost all owned by Italian entrepreneurs or commercial firms." (McGowen, Richard; Johnston, Larry; Waldstein, Alfred et. al. "Irrigation Water Lifting in the Shebelli Water Management Project", Associates in Rural Development, Inc., USAID, September, 1986).

Once the Italians began to leave, their aziendas reverted to the Somalis who remained in the area. The location of one's land, and much of one's social identity, is still defined in terms of the azienda on which one's plot exists. Several types of farms began to evolve over time, as the land of the Italians was divided up in various ways.

Based on a January 1987 team survey, the Land Tenure Center classifies five such farm types in the Shalambood area. These are listed in Table M-1. Figures M-1 and M-2 show the distribution of these holdings throughout the target area. It should be noted that under the present conditions found in the irrigation system, the small farm holdings are located in the driest area of the Shalambood target area, the area farthest from the main water flow on the Dhamme Yassin Canal. Likewise, the large farm entities (plantations or large private farms, state farms, and large special interest cooperatives) are all located closest to the water source. This means that any water improvement will first flow through large farms before reaching the small farm holders.

Table M-1: Farm Types in the Shalambood Region

Independent Smallholders (who individually hold and cultivate the land).....(46.4%)

Smallholder Agricultural Cooperatives (made up of individual landholders, but often with group registration where smallholder assistance may be available but sometimes to only a few farmers on a priority basis*.....(13.7%)

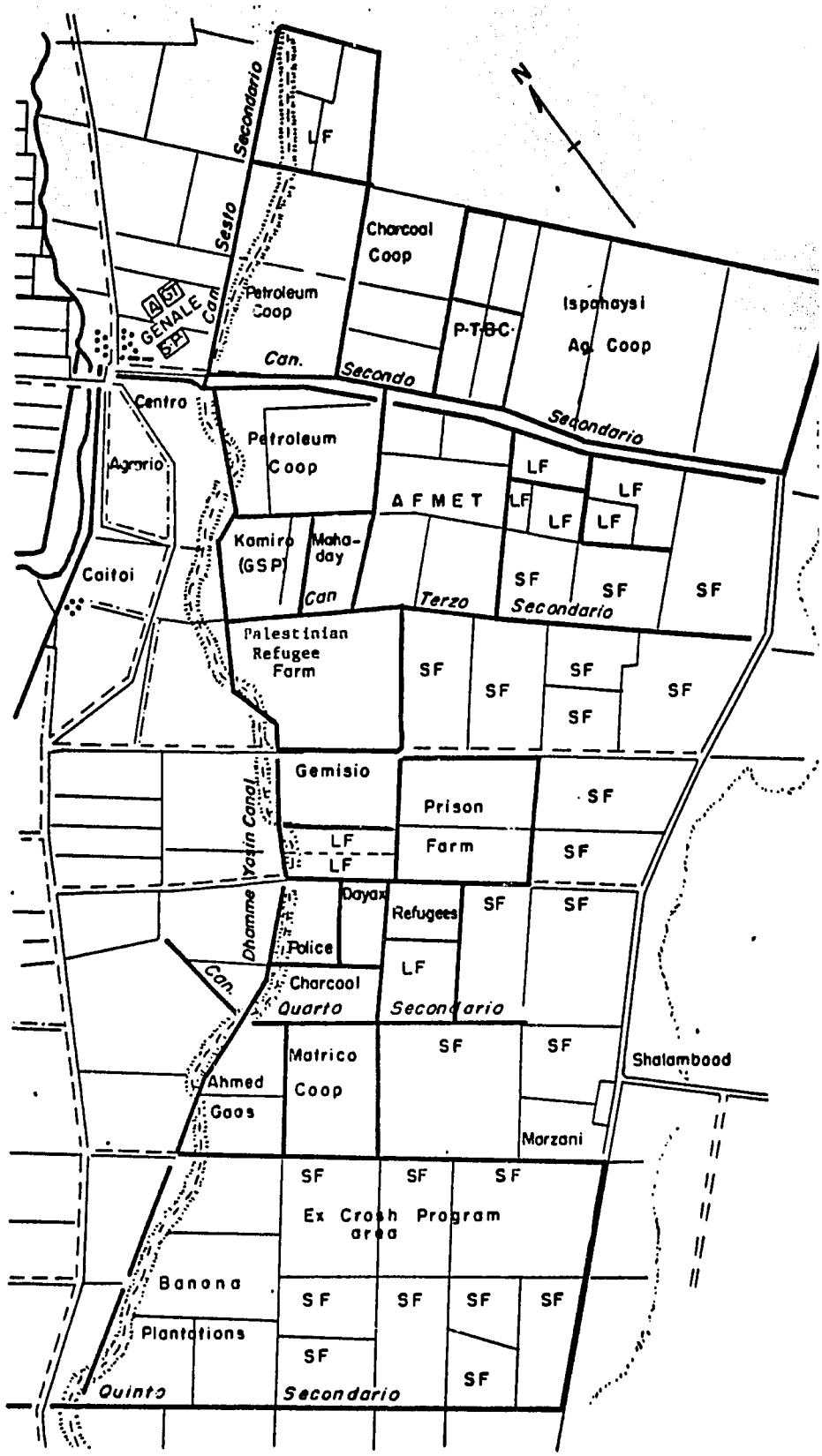
Large Cooperatives (owned by a small number of large investors and administered by the National Union of Cooperatives*.....(14.0%)

State Farms*.....(10.2%)

Large Private Farms (which include some owned by remaining Italians as well as Somali owners.....(15.2%)

* McGowen et al. point out that these institutions were Italian-owned aziendas taken over by Somali institutions, which are now in various stages of devolution of ownership and management by large Somali investors and/or the smallholder labor force which occupies them.

Source: Land Tenure Center Report, 1987



LF = Large Farm
SF = Small Farm

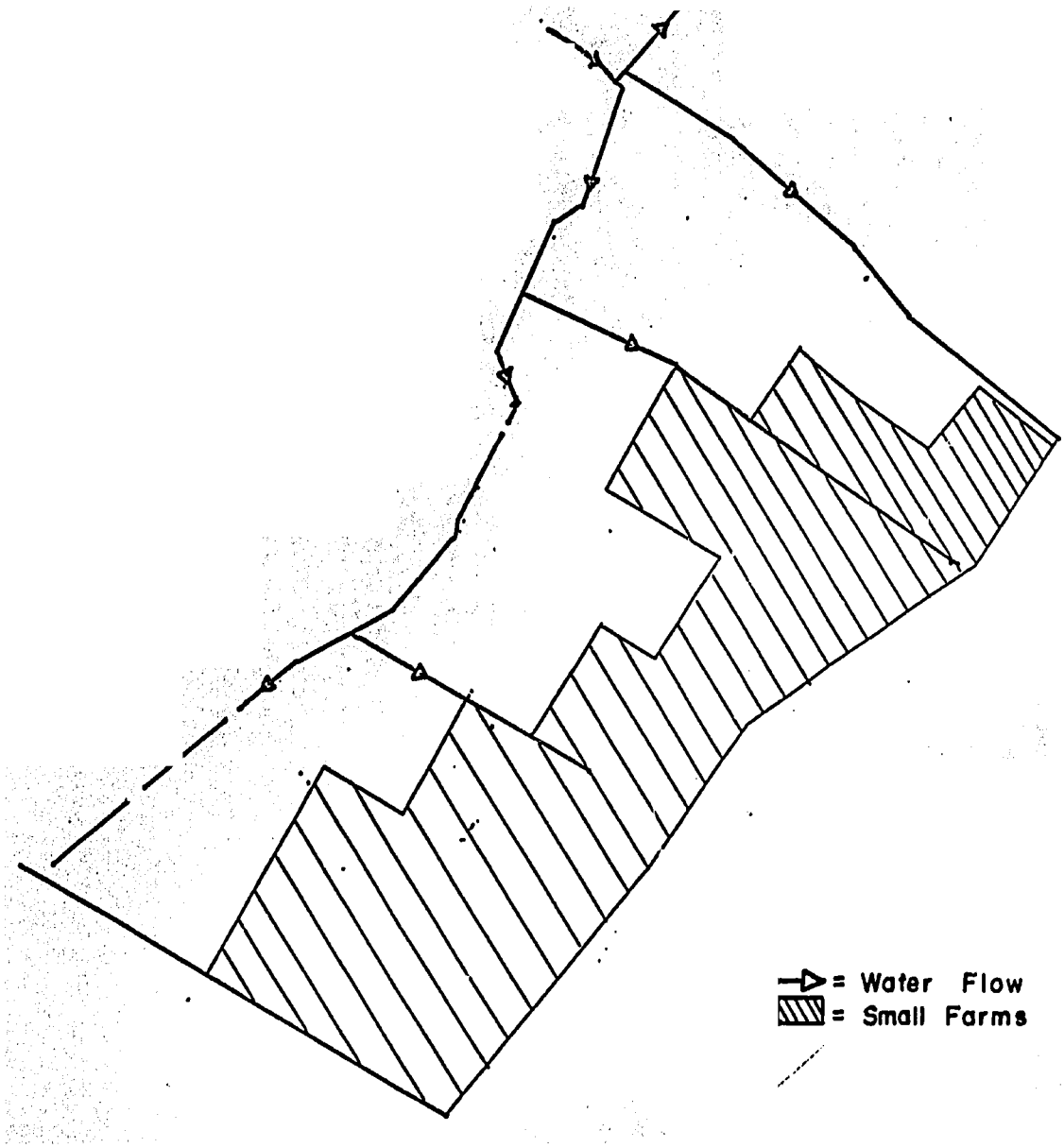
Figure O-1

FARM SIZE DISTRIBUTION
IN SHALAMBOOD TARGET AREA

327/x

Figure M-2

SMALL FARM LOCATION IN
SHALAMBOOD TARGET AREA



The term cooperative is confusing in the context of the Shalambood area. Shalambood smallholder cooperatives fall within the bounds of what could be termed multipurpose cooperatives, with group land registration and some degree of cooperative supply of inputs, at least on paper. The larger so-called cooperatives, on the other hand, have few, if any, of these cooperative features. These large entities are the holdings of small limited privileged investor groups, who are not subject to national ceilings on holding size, have no time limits on land leases, and receive government support for land development by obtaining the designation of "cooperative" for their holdings. It should be pointed out, however, that these entities cannot be thought of as cooperatives in any normal sense of the word. These large "cooperatives", as far as could be ascertained, are linked at the national level with the National Union of Cooperatives. This Union appears, in some cases, to have acted as a receiver for such holdings after some apparently failed. Table M-2 below lists the large farm entities to be found on Figure M-1.

Table M-2: Selected Large Farm Entities in the Shalambood Target Area

Large Privileged Investor "Cooperatives" (affiliated with National Union of Cooperatives)

1. Petroleum Cooperative
2. Charcoal Cooperative
3. Public Transport and Building Cooperative (PTBC)

Multipurpose Agricultural Cooperatives (also affiliated with National Union of Cooperatives)

1. Matrico
2. Dayax
3. Ispahaysi

Other special purpose farms (incomplete list-purpose and management system unknown or uncertain):

1. AFMET Farm- for experimentation and training
2. Prison Farm
3. Police Farm

Large Private Holdings

1. Gemisio (banana Plantation
2. PLO Farm
3. Ahmed Gaas
4. Mahaday

The Land Tenure Center will be sending a graduate student to do a further year's work on land tenure issues in the Shalambood area under funding from the Privatization and Policy Initiatives Project of USAID. It is expected that study will clear up some of the confusion about these large land-holding entities, as well as shedding light on other land tenure issues in the Shalambood as well.

The Land Tenure Center calculates that 66.3 percent of the land of the target area is cultivated on a smallholder basis. This includes land cultivated by independent smallholders, those in smallholder agricultural cooperatives, and some holdings of farm laborers, since large commercial farms in the target area commonly give about a half-hectare of land to their farm laborers to cultivate for their personal use (which accounts for 6.2 percent of the total 8,543 hectares surveyed). These smallholders are the primary target of this proposed project.

The 1986 Lahmeyer Report (Lahmeyer International, "Shebelle Water Strategy Study", 1986) sets the population density of the Lower Shebelli Region at 28/sq.km.

It should be pointed out that, since record-keeping at both the national and local levels is fragmentary in Somalia, numerous contradictions and gaps exist in the existing data base, so we have relied on estimates based on landholding data and average household size.

The TAMS Report's (1986) housecount of permanent settlements in the Shalambood area yielded an estimate of 25,360, but their estimate includes the population of the town of Shalambood, some of which is not part of the farming population. The exact relationship of this part of the population to the project target area is not clear to the author. Since a farmer's fields are often in a different location than his or her home or settlement area, it is hard to feel confident in correlating the populations of the two. For this reason, one cannot simply use the TAMS figure to predict the actual number of potential project participants. Similarly, the project area has changed since the TAMS research was carried out, with the present project area being much larger than it was when the TAMS research was carried out. The present larger area potentially draws population from Genale, another large settlement in the area, in addition to the towns reflected in the TAMS report. This too produces unknown effects.

Table M-3: Shalambood Study Area Settlements and Gross Order of Magnitude Estimates of Households and Resident Population

SETTLEMENT (1)	HOUSEHOLDS	POPULATION (2)
Abikow	30	200
Ahmed Garre	10	70
Baraale	12	80
Bulo Dhurow	70	480
Doondheere	100	680
Gemesio	40	270
Kamiro	13	90
Laba Garas	70	480
Lando	20	140
Manfredini (3)		
Shalambood (4)	3300	22440
Shouferi	26	180
Tisinar	36	250
Total	3727	25360

(1) Settlement here means permanent settlement; some of these are not officially recognized as villages.

(2) Survey results show average household size in Shalambood study area is 6.8 persons. Numbers have been rounded off.

(3) The refugee village of Manfredini has not been included in the settlement count. There are currently 270 refugees cultivating 0.25 ha of land each, some of who presumably live in this village with their families.

(4) Source: Ministry of National Planning, 1982 Labor Force Survey. Figures have been adjusted to allow for a 3% annual growth rate.

Source: TAMS Report, 1986.

Instead of trying to correlate settlement area population with farming areas, we have derived our estimate of the target area population by multiplying the estimated number of holdings times the average household size of 6.8 found in the TAMS survey. (Note: the Demographic Survey of the region done in 1980-1981 calculated that the average household size for Lower Shebelle as a whole was 4.4, but this figure seems excessively low). The density of holdings per unit of land area was kept constant, but the numbers of holdings increased to reflect the expansion in hectarage of the proposed enlarged project area. The landless rate has been estimated to be in excess of 25 percent, and so the final population estimate has been weighted to include this group. The result gives an estimated population of 27,440 people, of which approximately 20,580 are estimated to be landholders, and 6,860 estimated to be landless.

Table M-3 lists the major settlements in study area and estimates the number of households and population.

2.2 Land Tenure

Currently, land tenure relations in Somalia are governed by the Agricultural Land Law (Number 73) of 1975 and subsequent decrees, notably Law Number 23 of 1976. The Land Tenure Center report points out the following essential features of that law:

First, the law establishes State control over all the country's lands, with distribution, supervision and management of the land being the responsibility of the Secretary of Agriculture.

Second, access rights are on the basis of a 50 year lease for individuals or families. As has been noted, there is no time limit for land held by cooperatives or public agencies.

Third, the law says that lease rights are inheritable by close kin, although the definition of "close kin" under the law remains vague. According to the Land Tenure Center report, the Family Code rules are operative here. This code lays out in great detail who the rightful beneficiaries are, the shares due them and the procedures needed to settle the division of the estate. On the whole, the rules applied are almost the same as the traditional Islamic rules of inheritance. A notable exception is that while Islamic law grants half-shares to daughters and full shares to sons, Somali code makes no such sex-biased distinction.

Fourth, land ownership ceilings are specified for individuals and larger organizations (30 hectares irrigated, 50 hectares rainfed, and 100 hectares for banana

plantations, but there are no limitations on size for corporations or private organizations). Only one parcel may be registered per family, but the land office does not check to see if a family owns other parcels. Strict enforcement of this regulation could be an impediment to registration, since many families, even among small-holders, own multiple parcels. Special agencies or entities of which the government is part owner (such as Somalfruit, a prominent presence in Shalambood), are excluded from the provisions of the land law.

Fifth, the government may nationalize lands in excess of the limits, or repossess land registered by individuals who fail to honor the terms of their registration lease. Since land transfer through sale, sub-letting or rental does not appear to be legal, such acts can be held to be violations of the Land Law. Individuals involved in such relationships could lose their holding rights as a consequence of these acts. Land which is not cultivated over a successive two-year period may be repossessed for re-registration and assignment to others as well. Individuals may register lands that they are farming or may wish to farm. According to the Land Tenure Center report, "the large number of farms currently unregistered are in a legal netherland."

Finally, the land law establishes authority to tax land.

In spite of this law, however, tenure security is a major problem in Shalambood. The Land Tenure Center report points out that the problems of security and registration are not necessarily the same. Shalambood is an area which has been settled for a long time. Even though the incidence of land registration is low, the survey showed that boundary disputes are still relatively infrequent. Ownership disputes, while more frequent than boundary disputes, are still relatively uncommon according to the survey. With a rise in land values, which will most certainly be brought about by the proposed project, the incidence of ownership disputes will almost certainly rise as well.

Most disputes are solved in the villages themselves through the village councils, the satellite village councils (see Section 2.4 below) or through the farmers' committees. Only the more serious land disputes are solved in a more formal manner, largely through the Ministry of Agriculture, which in the Shalambood area is represented by the Genale Land and Water Office.

Although the Land Tenure Report notes that district and regional courts may become involved in land disputes, their involvement is being resisted by the MOA which feels that such disputes are administrative rather than judicial matters. Judicial involvement so far seems to have been limited to intra-family cases where inheritance is at issue,

not in inter-family disputes. Since the resolution of land disputes is seen as an administrative process, their solution entails mediation and negotiation as processes for resolution rather than adjudication. As Hoben points out, the resolution process, "involves the consideration of a broad range of substantive issues...not only traditional notions of equity but an assessment of the relative political influence of the interested parties." (Hoben, Allen, "Resource Tenure Issues in Somalia". Boston University African Studies Center, 1985).

The formal process of land dispute resolution involves a meeting conducted by the District Agriculture Officer, the District Commissioner, the police superintendant and the head of security. Several village elders are usually informally invited as well. Cultivators base their claims on "use" and evidence of registration (if any), rather than on any traditional claims. The case may be appealed upward to the regional and national levels if a satisfactory decision is not reached, but as appeals are not without cost, as Hoben points out, there is increasing pressure to effect a compromise.

The Land Tenure Center report notes that unregistered land is more often involved in disputes than registered land and even though the number of disputes in Shalambood remains low, as will be seen, farmers are beginning to perceive these disputes as being a problem.

Disputes also develop out of rental agreements, which are illegal. Disputes originate when the renter refuses to hand back the land when the rental agreement expires. There is an indication that refugees have become increasingly involved in these rental agreements since they have no right to the land they are renting and have few rights should they become involved in a formal dispute.

Finally, the Land Tenure Report cites a type of case where the Ministry of Agriculture assigns land to individuals. Two types of situations could evolve. The first is one where the regional MOA officer in Genale is requested to designate "unclaimed", that is unregistered, land for someone; the other is where the MOA in Mogadishu assigns an individual a specific plot. If either land has a previous occupant, a dispute may result and be resolved through the source-force methods described above. The farmers'fear of "land grab" which might result from the proposed rehabilitation project and the steps which might be taken to minimize this risk will be discussed in a subsequent section.

2.3 Local Level Water Management

In recent years, common residence, common religion, and common landholding have taken precedence over questions of origin and kinship. It is said that questions of origin and kinship have no effect on access to resources in the Shalambood area. If this is true, it is partly due to the system of cooperative water management which now exists in the area.

Some of the features of this cooperative water management system have their origins in the traditional society of the interriverine Somalis, where, as Hoben has pointed out, access to water "is shared by all families that contribute to their (ponds') construction and maintenance. A committee elected by these families establishes a code of rules regulating the use of a pond and its maintenance schedule."

Merryman and Merryman quoted in the 1986 Shebelli Design Guidance Report (Keller, Jack et al., "Design Guidance for Shebelli Water Management Project", Utah State University, USAID WSM Report 49, December, 1986.) point to local institutions in the Juba River area which manage water system upkeep and establish and enforce water rights.

McGowen et al. point out that plantation agriculture was declining in the 1960's. There was a drop in the Shebelli's water level and a tremendous rise in the cost of labor after independence. The European azienda owners began to depart, but their foremen continued to run the system as it was managed in the colonial times. The report points out that as it became evident that the Italian owners would not be returning, the foremen took plots for themselves and began to lease out the rest of the aziendas to those that were willing to pay. Agricultural production in smallholder aziendas began to be carried out by family units on these individual plots.

Although the McGowen et al. report attributes the impetus for formation of autonomous water groups to these post-colonial foremen, it is evident that the basis for this type of cooperation is found in pre-colonial sedentary groups. Shared responsibility for allocation and maintenance of water works and appointed committees to establish rules regulating the use of water resources and a schedule of maintenance are reported in early reports. It is likely, therefore, that some aspects of the origin of the present system of water management below the secondary level can be traced to pre-colonial Somali culture as well.

According to the McGowen et al. report, the traditional foremen lost their power on smallholder aziendas as a result of the Land Law of 1975. These traditional foremen were

335x

replaced by a water users' group and management by farmers' committee.

It has been pointed out elsewhere in this Project Paper that, in principle at least, the government is responsible for maintaining the secondary canals of the present irrigation system. McGowen et al. point out that although the government is responsible, in principle, in practice the maintenance of these canals necessitates the organization of a inter-azienda level water committee involving the heads of the azienda-level water-users' committees in the case of smallholder farms, as well as the representatives of the larger farms or cooperatives. One of these organizations is called the Committee of Farmers of Shalambood.

The Third Secondario's maintenance, for example, involves sharing of information and coordination between the heads of 16 aziendas, including those growing perennial crops (large plantations, etc.) and those growing annual crops (smallholders and agricultural cooperatives).

The report notes that when public consensus demands it, the leader of the inter-azienda committee goes to the leaders of each azienda committee to collect an assessment. The leader then goes to the MOA to arrange for machinery and labor for the Secondario to be cleaned. The Ministry lends the equipment at no charge, but the committee uses the money collected both to pay for fuel and as an incentive for equipment drivers.

The system sometimes encounters problems due to lack of available equipment from the government side. While the PP Design Team was in the field, one committee chairman asked an MOA representative who was with it at the time where he could get equipment now that he had collected money from the groups. He was not able to get a useful answer.

The management committee of the association determines when the cleaning of tertiary canals will be done. The committee informs the member families of how much labor each will have to supply as a function of the size of each family's holdings. People with large holdings are asked to supply more labor. Those with very small holdings usually are not asked to contribute.

According to McGowen et al., most aziendas are fed by three or four tertiaries. People are generally asked to clean the section of the canal that runs along their own parcels. It takes a gang of 15 to 20 workers using hand tools, working two days a week, about a month to clean the length of a tertiary within an azienda. Such heavy work is carried out by the men.

The azienda-level water committees also collect land taxes for the municipalities: So. Sh. 5 per hectare for rainfed land and So.Sh.10/ha for irrigated land. The azienda-level committee also attempts to resolve land and water disputes to avoid having to bring them to the MOA.

In short, the azienda-level committee therefore serves as: (1) a water management agency, (2) a fund collecting agency both for the government and for canal maintenance, and (3) a local-level mediation group in land and water disputes. The users' group allocates water as well within the azienda. The PP Design Team concurs with McGowen et al. in noting that kinship does not seem to play a critically determinant role in access to resources.

Although the azienda-level users' groups seem to have a strong grounding in the cultural traditions of the Somalis, as far as can be seen, and although they seem to have served their multiple functions quite well up to this point, it is still not clear to what extent they can be drawn upon to serve new, until now, untried functions such as their use as a possible organizational base for training, group credit or other functions in which local insitutions need to interface with the project.

One water users' group has formed on every smallholder owned azienda and cooperative in the target area, taking the name (sometimes the Italian name) of the azienda on which it is located, according to the author's discussions with Waldstein. The location of these smallholder aziendas are marked "SF" on Figure M-1 above. The smallholder cooperatives are Matrico, Dayax and Ispahaysi Cooperative farms. Each of these has a water users' group and is marked on Figure M-1 as well.

Interviews with farmers and management committee chairmen indicate a willingness on the part of the leadership of users' groups to try to operate these groups for new purposes, but there is a fear of overburdening these groups with too many new functions at one time. It is feared that too many additional burdens might adversely effect the organizations' ability to carry out their primary function of water management. It is felt that these committees are excellent local institutions through which to try, on a pilot basis at first, to channel local level innovations of the project to smallholder farmers in the target area. However, more research needs to be done into other local institutions such as village councils and self-help groups to provide other alternatives should water users' groups prove ineffective for handling project interventions outside the scope of water management.

2.4 Local Government

Brief mention needs to be made about the structure of village-level government in the Lower Shebelli. A district in Somalia may include from 5 to 40 Village Councils representing up to 250 satellite villages. The Councils have seven members and sometimes will include some of the chairmen of the satellite village councils. Satellite villages usually have a three member council, but it is likely, although not certain, that the azienda committee serves this function in the Shebelli. It has already been pointed out that the azienda committee collects land taxes for the Village Council. Members of the Village Council are nominated by the Party and are then elected by village residents. Claxton points out that these members are often selected from among the traditional council of elders, but this is not always the case (Claxton, Ann, "An Institutional Analysis of Local Government in the Somali Democratic Government", USAID: December, 1983).

The Councils discuss and handle any issue of concern to the people, including health, sanitation, water, land use, as well as personal and family disputes. Claxton also points out that needs and project ideas are channeled up from satellite villages to Village Councils to the district. Although few if any foreign donor assistance projects have operated through this channel, these councils must be explored as a possible catalyst in public mobilization for self-help.

The local government system also permits the formation of self-help organizations, which allow the collection of money under the so-called "Self-Help" Law for specific project purposes within local communities. Unfortunately, there was time neither to locate nor to translate this law. This law should be located and the self-help committee be more carefully researched in the early phases of the project, to better understand the purposes for which self-help organizations are created and the system under which they are managed, as a possible alternative for local level mobilization in case farmers' committees and water-users' groups prove to be incapable of supporting a broader range of project interventions.

2.5 Motivation

The potential positive effects on the production and income security of farmers of all types in the target area of the rehabilitation of the irrigation system are readily seen by all. Farmers interviewed noted that there is less water available to them each year, taking differences in rainfall into account, and they realize fully that the lower

water availibility is due largely to the deterioration of the canal system.

Farmers also note that lesser availability of water has led to increased inequities of distribution. Thirty-two percent of the farmers interviewed by the Land Tenure Center noted that both the timing and the amount of water received in the Gu season (the rainy season from April to June) were inadequate. Only 11 percent of the farms reported having no problems (unfortunately, no correlation was made between response to this question and farm size in the survey). In the Der season (the rainy season from October to December), 50 percent of the farmers reported inadequate timing and amounts of water available, and only 4 percent reported having no problems. Farmers' perceptions of drainage and salinisation problems were noted as well, to a lesser extent than expected, but there may well be problems that farmers have not yet perceived.

Another indication of the high motivation of farmers is the continuous functioning of the water users' groups both at the azienda and the inter-azienda levels. Keller et al. pointed out that the reason people continue to participate in these groups is a function of the high silt content of Shebelli River water. McGowen et al. point out that this continued cooperation indicates the importance of irrigated agriculture to farmers. Access to the irrigation works is far and away the most important economic resource at the disposal of the farmers in the target area.

An indication of the high motivation of farmers when faced with the potential rehabilitation of the system is demonstrated by their reaction to the notion of a water tax. Everyone has a right to water under Islamic law, but when asked to suggest ways that funds could be generated for upkeep and maintenance of the irrigation system once rehabilitation has been completed, Land Tenure Center found that 54 percent of the farmers surveyed were willing to pay higher land taxes for this purpose, 18 percent would be willing to pay higher water taxes, and 14 percent were willing to pay both higher land and water taxes. Thus 86 percent would contribute greater amounts to the tax base for irrigation operations and maintenance costs. In this case, farmers saw the water tax as a payment for the service, not for the water itself. All of this indicates that farmers are highly motivated to obtain the major benefits of the proposed project. The farmers will watch for improved maintenance once water service charges are begun, and would withdraw their support if such improved services cannot be delivered.

Increasing the motivation of small farmers to participate in the overall project might be facilitated by a series of smaller co-projects, structured to operate along with the major components already discussed above. These

small projects, which could be planned and carried out with the help of local institutions such as self-help groups, farmers' committees, and village councils could be designed with the advice of an appropriate ministry and funded with AID/GSDR local currency generations or could be implemented through a PVO. These could involve such projects as:

1) small irrigation works of a simple nature which could be funded and built on a local level;

2) potable water supply improvement at the village level;

3) a fuelwood and windbreak tree planting and nursery program with training for villagers;

4) local livestock waterpoint improvements to strengthen and maintain livestock waterpoints designed into the rehabilitation scheme;

5) planning seminars to generate local projects and village level planning, project discussions and other village-level meetings to discuss project-created problems and situations; and

6) training courses for village committees, water users' foremen, and farmers' committees to transfer accounting, credit, and other management support skills.

Each of these elements could be designed into the scheme to build support and participation among local people in the target area.

2.6 Critical Issues for the Project to Address

The success of the project will be judged by farmers in the target area, in the end, by its ability to deliver certain critical outputs. Farmers will expect the quality of canal maintenance to be greatly improved, particularly if the project envisions the regular collection of charges for water services. Farmers will also be watching to see that they get their share of the water. It has been shown that the small farmers are largely last in line for water delivery, after the plantations and large farm entities. The project will be judged a failure if none of the increased water supply reaches small farmers at the end of the line.

Certainly another major issue, from the point of view of farmers, is their fear of a "land grab" phenomenon. Farmers sometimes rank this problem above that of irrigation according to the Land Tenure Report. A key informant noted that he was aware of the irrigation rehabilitation project

and recognized that with improved water supply outsiders would be tempted to take advantage of the unregistered status of the land in the area. In their survey, Land Tenure found that only 44 percent of the farmers enjoyed some measure of tenure security. Land registration, therefore lies high on the farmers' agenda of needs. Farmers rightly feel that improved irrigation will do them no good if they lose their land.

There are several issues involved in a successful expansion of the registration process. Registration is a complicated, lengthy and expensive procedure. The problems of time and cost make it especially hard for small farmers to register their land. It was said that the entire land registration procedure costs a land holder So.Sh. 20-30,000 after transportation and gratuities are taken into account. Clearly registration of land is not for the poor smallholder.

Female-headed households have far fewer registered parcels than male-headed households and smaller parcels are seldom registered. Another problem is that the Land Law only allows a person to register one parcel, even though the Land Tenure Center Survey reports that 32.1 percent of those surveyed reported having more than one parcel.

A program of land registration on the aziendas needs to be carried out using greatly simplified procedures in advance of the rehabilitation work on the canal system to provide security for the small farmer. This registration should not be predicated on a cadastral survey, as such a survey would take a long time to organize and carry out, leaving danger for land to be taken in the meantime. A cadastral survey is also unnecessary as the presently functioning system of establishing relative boundaries through a sketch map seems to be functioning fairly well, as demonstrated by the relatively low number of boundary disputes found by the Land Tenure Center Survey of 1987.

Although the Shalambood target area has a wide range of interest groups--from large banana plantation owners to small farmers--if the land tenure security problem can be solved, the added water security to be provided by the planned rehabilitation could serve the mutual interests of all.

The project needs to address the problem of local participation. Among other things, basic knowledge of how local Village Councils and other village level institutions operate in the Lower Shebelli is still limited. Although the Councils themselves may not present any obstacle to the project, lack of knowledge as to their method of operating, and their own goals, might deprive the project of a potential ally for helping to generate program effects. Knowledge about this and other local institutions

might be particularly useful if the water users' groups prove ineffective in multi-functional pilot programs.

Local participation is basic to the problem of making effective recommendations for improved cultural practices and a necessary part of adaptive agricultural research. A knowledge of local institutions and their interrelationships is particularly important if AID decides to organize projects peripheral to the actual canal rehabilition, such as improvement of local potable and livestock water supply, fuelwood supply, and windbreaks. A clearer understanding of the network relationships between members of cooperatives, water users' groups, and Village Councils is clearly needed if effective local project training for Phase II planning is to take place.

Another issue which must be addressed by the project is the problems created by the high incidence of water-borne disease in the area, particularly schistosomiasis, the incidence of which is estimated by some to be between 80-90 percent among workers on banana plantations in the lower Shebelli. Other water-borne diseases are common as well: gastroenteritis, dysentery and typhoid. Malaria is widespread, as are tuberculosis and pneumonia. Anemia and kwashiorkor are also present, and with pneumonia, are among the leading causes of death. All of these diseases are highly debilitating, severely limiting the productivity of local labor. Water-borne disease will have to be addressed if improvement in human resources is to match improvements in agricultural infrastructure and technique.

The project must recognize the need for nomads to use the project area as a place for watering their animals in seasons when water is scarce on the range. Since many farmers have their own livestock under the care of nomads, and since sedentary farmers are themselves often related to nomad families or have family members engaged in livestock husbandry, the need to use the target area for livestock water will have to continue despite the damage livestock could inflict on canals. Rather than being an obstacle to the project itself, the need to accommodate livestock will require that water points be designed into the target area, as well as other features to minimize damage to canal works caused by the animals.

2.7 Minimum Participator Profiles

The three components of the proposed project focus on the independent smallholder on the aziendas within the Shalambood irrigation system. The minimum participant in this system is the plantation laborer who works on contract, either alone or with his or her family. Plantation laborers are given a daily wage for one or more household members to

take care of one jibal of land (25 meters by 25 meters, there are 16 jibals in a hectare). What makes them interesting to this project is that they are also given up to a half-hectare subsistence plot as part of their labor contract, which makes them effectively smallholders. Contracts, however, are reserved for workers in positions of trust (such as pump tenders and guards), or workers who are known to be needed throughout the year.

Shalambood also has a population of casual laborers, some of whom may be refugees, who have neither the protection of a labor contract nor the additional security of their own subsistence plot. Such casual laborers lack the funds to seek employment in other areas, and are thus trapped in a situation where they can only earn money when work is locally available. This population is malnourished and highly prone to disease. They represent the lowest stratum of Shalambood society.

Since the social line of demarcation between the small farmers and the landless, casual laborers is the subsistence land supplied as the result of a labor contract, the project needs to emphasize the need for all such casual laborers in Shalambood at least to be brought under the umbrella of the labor contract system as the minimum requirement for survival. Special extension packages would have to be developed to improve the subsistence levels of these smallholders under the project's irrigated research program.

The natural boundary of the rehabilitation component of the project makes it easy to estimate the number of people likely to be the primary beneficiaries of the project, but the heterogenous nature of the farming systems within the project area means there will be a number of unintended beneficiaries as well, notably the larger farming systems of the perennial growers, the state farms, and the large investor-owned cooperatives. The presence of increased water supply will undoubtably improve the situation for these farmer/investors as well as for the farmers in the target group, and will probably increase the amount of land under such perennial production. This might result in some of the small target farmers losing their land and joining the ranks of the landless or contract laborers. The allocation of water savings between expanding perennial crops versus annual food crops will be thorny to resolve, and could also have a negative impact on smallholders.

2.8 Communication Strategies

...e effective linguistic and religious unity of the people in Somalia and especially those living in the Shebelli seems to simplify the potential communication process for the proposed project. In the target area, innovation in agriculture is taking place all around the small farmers who are to be the primary target group. Tractors are in common use, and the rapid transformation of the plantation sector into an agribusiness economy is everywhere evident in the target area.

For the small farmer, however, the inequities are enormous. For the small farmer, basic inputs and machinery are difficult to obtain. That which is available is either inappropriate or insufficient. Although an FAO program in farmer credit and input supply was visited in nearby Qorioley, the quality control for supplied seed and

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Table M-4: Percentages of those Completing Various Education Levels in the Lower Shebelle Region 1980-1981

	Total	None	Koranic	Elem.	Inter.	Sec.	Univ.
Male	100	61	20	9	9	1	<1/2
Female	100	94	1	2	2	1	<1/2

Source: Report on the Demographic Survey of Banadir, Bay and Lower Shebelle Regions of Somalia, Central Statistical Department, Ministry of National Planning, 1981.

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fertilizer was shown to be low, overall, and key informants indicated that farmers were abandoning these pilot projects. Such loss of confidence in extension sources bodes ill at this point, and indicates that a good deal of remedial effort will be necessary to regain farmer confidence.

The level of literacy has been determined to be 36 percent total for Lower Shebelli by the Demographic Survey of 1981, with a 54 percent male literacy rate and a 19 percent female literacy rate. These figures seem to be overestimates, particularly if one compares it to the low-

level of education delivery in the region. The education figures for the Lower Shebelli are shown in Table M-4.

In the case of the small farmer of the target area, communication must be established on a face to face basis through a program of extension which is carefully programmed in advance. Reliance on written media, such as newsletters and pamphlets, should be minimized given the low level of literacy indicated.

The aziendas themselves provide a self-defined area for a program of demonstrations, while the water users' groups provide a basis for instruction in improved water management practices which need accompany the rehabilitation to maintain the system in high efficiency over the years. The extension program must encompass, in addition, a system of regular visits to laborers on banana plantations so that they might learn new farming techniques to apply on their own subsistence plots.

Women are de facto heads of many farming households in the Shalambood aziendas. This is partially related to the fact that only 74 percent of the people in Lower Shebelli live in the area in which they were born. There seems to be some degree of rural/urban migration in and out of the Shalambood area. If one looks at sex ratios in the area, for example, one notices that there is a sharp dip in males between the ages of 20 and 39. At 40 the ratio again returns fairly close to normal, given a higher male mortality rate. This sharp dip in the peak productive years is indicative of out-migration for labor (Ministry of National Planning, Central Statistical Department, "Report of the Demographic Survey of Banadir, Bay and Lower Shebelli Regions of Somalia", 1980-1981).

The Islamic custom of polygyny or marrying multiple wives may also account for some of these female-headed households. The Demographic Survey of 1980-81 states that 53 percent of males who have been married have been married more than once. Some of these are accounted for as polygynous marriages. On the other hand, 38 percent of previously married females have been married more than once as well. This indicates that some of the multiple marriages in the Lower Shebelli are the result of divorce. Since the author is not certain what the property rights of a divorced woman are in Somali society it is too early to estimate how many of the female-headed households are due to divorce.

Lewis and others have reported that polygynous Somali men in the Bay region often involve their wives in tasks in differing economic areas. One wife, for example, might stay and work the family farm. Another wife might become nomadic, caring for the family's camel herd. A third wife could be caring for the family cattle. To make things more confusing to outsiders, the tasks of each wife can vary from year to

households. The Demographic Survey of 1980-81 states that 53 percent of males who have been married have been married more than once. Some of these are accounted for as polygynous marriages. On the other hand, 38 percent of previously married females have been married more than once as well. This indicates that some of the multiple marriages in the Lower Shebelli are the result of divorce. Since the author is not certain what the property rights of a divorced woman are in Somali society it is too early to estimate how many of the female-headed households are due to divorce.

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Even though married women run their households and farms on a day-to-day basis when their husbands are absent living with another wife, formal farm management decisions are still vested in the husband. As a consequence women have little direct role in the water users'group management committees. Yet, when men are absent, women often have to take de facto control of the farms. An effective communication strategy requires taking women into account in spreading extension messages to the target area.

McGowen et al. point out that we still know little about the day-to-day role of women in the irrigation system itself, but it is likely that management potential is being under-utilized. Thus, unless a special effort is made from the beginning to involve women, female-headed households will miss out on training and other opportunities to be provided by the proposed project. This would slow down the development of a better life for many inhabitants of the region.

3. SPREAD EFFECTS: THE DIFFUSION OF INNOVATION

3.1 Leadership/Authority

Clearly, the foremen and the members of the water users' association committees are going to be key figures in motivating farmers to participate in project activities. Each azienda growing annual crops, as the McGowen et al. report points out, can be considered to be a water-users' association, although not named as such. Each association is governed by a farmers' committee. The head of the committee (who is also the chief executive officer of the association) is known as the foreman. Water distribution and the maintenance of the canals are his responsibility.

The farmers' committees are self-perpetuating bodies which renew their membership from the rank and file of association members. Although the number of individuals varies from place to place, members are selected from individuals that distinguish themselves by their leadership qualities and performance within the system.

Another layer of leadership comes with inter-azienda level committees, which draw together representatives from various aziendas to coordinate the maintenance of the secondary canals in the system.

A third level of leadership is provided by the Village Councils discussed in section 2.4 above. This leadership is nominated by the Party and elected by village residents. It is still not clear what, if any, is the relationship between the farmers' committees, the satellite village three-member councils, and the larger Village Councils or, likewise, the relationship between all of these groups and traditional village elders. Clearly project staff will have to gain a better understanding of the relationships between these groups if the project is to maximize performance on equity issues and impact on production. For the time being, however, little is known about how these leaders exercise their authority. It should be emphasized that although we know the most about the leadership of the water users' groups and their operations, we must not assume that these are the most important or effective leaders even at the local level. It may be important to seek the support of other community leaders to help secure adoption of technical innovation.

3.2 Patterns of Mobility

Although the farmers of the target area are thought of as sedentary, there are actually two types of movement

common in the area. The first of these is the constant search for work. Interviews in the Shalambood area indicate that many farmers seek employment throughout the year, except for the Gu season when agricultural activity is at its height.

The labor picture in the Shalambood area as yet is unclear. Both contract and casual labor are in high demand on nearby banana plantations, but people are said to seek jobs as far away as Mogadishu. The Head of the Cooperative for Qorioley indicated that yields had been going down because farmers had taken to arriving later and later at the beginning of soil preparation time in Gu season, and they were thus getting their crops in too late. When asked what they wanted from a project, some farmers said they wanted money to pay laborers to come for weeding, indicating that they had better things to do with their time. It is certain that there is high labor demand during some seasons of the year, particularly at the onset of the Gu, but more research will have to be done in a baseline survey before one can determine whether this high seasonal demand actually amounts to a labor shortage.

Another source of movement and migration comes from the relationship between farmers in the target area and the nomads. The Land Tenure Center Report indicates that 25 percent of the respondents had cattle, 6 percent sheep and goats, 1 percent camels and 1 percent donkeys. Farmers who have livestock herds over a certain size have to move their animals outside the target area once the agriculture season starts. There are several strategies for doing this. The first is to send the herds off with the sons of the family. The second is to send the herd off with the herd of a nomadic relative. The third is to hire a nomad. Any of these strategies necessitates travel or at least contact with the transitory populations who come to the area during the dry or jilal season (the dry season from December through March). At any rate one notices a continuous interplay between the nomadic and sedentary groups in the Shebelli region. This interplay highlights the role that livestock plays in the target area, supplying meat and milk to supplement the diet, manure for house construction, and hides for leather products.

It is difficult to determine the radius of travel for the AFMET extension agents, as their work in the area has once again just begun. The author visited the village of Boul Shiekh in nearby Qorioley district and found an AFMET extension agent on duty, although the season was wrong for assessing the quality of actual programming. One should point out, however, that the 8,000 + hectares of the target area should not be difficult to traverse with the trail

motorbikes said to be supplied to agents. Fuel supplied by the project could extend the range and frequency of agents' visits to farmers.

3.3 Previous Projects Design and Execution

The rehabilitation, which is the third component of the proposed project will upgrade an existing structure. As stated above, the Italians built the present canal system between the late twenties and the mid-thirties to support cash crop production in an attempt to recover some of their colonial administrative costs. It has been pointed out that the social structure of the communities living within the target area are related, in part, to the social structures established by the needs of the irrigated plantations. These features notably included the identification of individual smallholder plots within a particular *azienda* from Italian colonial times, the general structure of cooperation to maintain the canal system, the system of contract labor used on the banana plantations, and much of the heavy reliance on machinery (especially pumps and tractors) still found in the area.

The following are two nearby irrigation projects sponsored by other donors, whose farmers are to benefit from implementation of the adaptive irrigation research component of the proposed AID-supported project.

The first of these irrigation projects, the Genale-Bulo Marerta Project, financed by the African Development Bank is using a different strategy for irrigation improvement. An existing canal system has been rebuilt, with new realigned canals and land leveling, rather than the pragmatic rehabilitation proposed herein. Existing population has been moved off the land until work can be completed, but according to project personnel, once work has been completed, farmers will again return to their original land. This will be the responsibility of that project's implementation office.

Given the land registration situation in the Lower Shebelli Region, discussed above, it is difficult to imagine that such large-scale resettlement will be implemented easily and equitably, since traditional systems of organization and identification are being torn up like the land. Even if the original farmers can return to their land, they will return to re-parceled land with the basic social structure dislocated and will be forced to reorganize from zero.

Although no such massive restructuring and resettlement is contemplated for SWMP, it is likely that the experience of farmers in the Genale-Bulo Marerta area will affect the

psychological climate of farmers in the Shalambood target area, particularly given the already noted fears of farmers over their own potential tenure security. What is more disturbing, however, is that the PP Design Team was unable to find out exactly what happened to farmers temporarily moved off their land for construction. The experience of the Genale-Bulo Marerta Project area farmers will certainly affect attitudes of farmers in the Shalambood target area.

A second nearby irrigation project is now being planned by the IBRD to be carried out in Faraxaane, quite close to and northwest of the Shalambood target area. Two potential concerns result from these two projects. First, both the Faraxaane and the Genale-Bulo Marerta Projects will be drawing water from the same source. This may mean that farmers' expectations for water increase may be disappointed. Second, the nearby projects provide a larger area for the spread of the results of the adaptive research to be supported by the AID project. Dissemination of the adaptive research elements of the project will need to be effected over a far larger area that that being proposed for the AID-sponsored rehabilitation.

Much of the extension work now going on in the target area is being carried out through the parastatal Somalfruit, which is encouraging production of bananas with credit, extension, and input supply for larger farmers. One farmer pointed out that it requires at least 30 hectares for a farmer to realize enough profit to pay off his debt to Somalfruit for these services.

Although Somalfruit's extension and support is aimed directly at larger perennial-growing farmers, not at the small farmers of the project area, it is having an effect on other farmers in the target area. The Land Tenure Center reports that approximately 85 percent of the respondents surveyed would change crops if the supply of irrigation water improved. 55 percent said they would stop cultivating maize, and 32 percent would stop cultivating sesame. 60 percent said they would shift cultivation to fruit trees and palms, while 30 percent said they would shift to vegetables. Cereal production seems to have developed a low priority among farmers in the target area, due in part to the example of the success of larger farmers in growing fruit in the area. Allocation of water in the future between perennial and annual crop systems, and enforcement of allocation decisions, will grow in importance as an issue apace with increased water use efficiency.

A UN/FAO supported project is experimenting with a rural credit scheme in the nearby Qorioley area which supplies farmers with credit in-kind (fertilizer, seed, and field preparation) through the Commercial and Savings Bank of Somalia (CSBS) in Merka. The loans are at a straight 10 percent and are now to be extended to an eight month period

after an initial period of six months had been found to be too short. The project seems to be doing poorly, not because of the credit aspect, but because the inputs are either difficult to deliver (e.g., tractors for soil preparation), of poor quality (e.g., unselected seed), or inadequate (e.g., only urea is available as fertilizer). The farmers seem to be abandoning the experiment in the areas visited. The idea of small farmer credit has been introduced, and therefore could be taken up again, given a better thought-out technical package.

Drinking water is being piped into three villages near Qorioley by a Japanese group. This is something which needs to be studied further, possibly by other groups interested in the problem of drinking water, such as UNICEF, to see how the situation can be improved in the project area as well. It is likely that the improved situation in such nearby villages will increase demand for a better potable water supply within the project area as well.

Finally, the fact that there are refugee camps nearby could have an effect on the proposed project. Although rental agreements are still said to be uncommon, some farmers prefer to rent out their land rather than to work it themselves. It has been reported that under such rental agreements, 60 percent of the crop goes to the landholder. This gives the landholder a good profit, but also frees him to take advantage of non-agricultural opportunities.

It has already been pointed out that the rental of land is illegal under the present Land Law, and that such rental arrangements create disputes when renters fail to return land at the end of an agreement period. Many farmers are therefore afraid to rent their land.

The danger of losing one's land to a renter can be averted by forming sharecropping relationships with nearby refugees. Since refugees have no rights to local land, they cannot make claims on the land when their rental agreement is over. Although these relationships are still relatively uncommon, it is possible that the number of such agreements will increase in the future. This situation would benefit the small farmers as landlords, but give only marginal benefits to those actually working the land. With inheritence, there is some danger that a class of petty landlords might arise over time, unless the laws forbidding land rental and those demanding farmers cultivate their own soil are strictly enforced.

Although the refugee sharecropper might be better off because of this arrangement, and as a producer benefit from the proposed project, in the long run, such relationships do not provide the kind of smallholder benefits envisioned under the proposed project. Changes in the local economy brought about by the proposed project can be expected to

create an increasingly complex land tenure situation.

3.4 Maximum Information and Resource Distances

The proposed project has three parts: sub-area irrigation system rehabilitation, the basin-wide Shebelli River management, and a selective production-oriented program of adaptive irrigated research. The first two elements are physically limited by the geography of the project area: the limits of the irrigation system, the Shebelli and perhaps the Juba watershed as well. Of course one can argue that a lot will be learned about the nature of watershed management in general, but the success of a project comes out of the eye for detail: the attention paid to local details of the physical, biological, and social milieu.

Elements of the plans worked out for the Shebelli watershed such as the methods for regulating and apportioning water, the system of collecting revenue for the maintenance of the system, the streamlining of land registration procedures, and the systems developed to provide credit and inputs for farmers, will affect the way agriculture is carried out in the rest of the country as well.

The third element of adaptive research will be adaptable to the irrigated areas of Somalia as a whole. This and the complementary institutions for extension which need to package and deliver the results of the adaptive research to the farmers ought to be institutions with ramifications beyond the Shebelli river basin.

Of course the rehabilitation of the irrigation system will take time. Elsewhere in the Project Paper it has been estimated that once the project is complete it will take ten years for yields of farmers to reach the maximums theorized under this project plan. However one calculates the physical elements of the project, it will take a long time to see the full import of the investments made.

If one begins the socio-economic and institution-building interventions in advance of the beginning of construction, while construction design is taking place, the research ought to be well along and organizational elements in place once construction is done. Once the water is available, the extension work can begin over a two year period, with monitoring and follow-up until yields begin to iincrease substantially. Since the project area is a compact 8000 + hectares, dissemination should present no major problems as long as women's networks are developed. The nearby Faraxaane and Qorioley irrigation projects ought to provide a larger context into which project-sponsored

technical packages can spread.

4. SOCIAL CONSEQUENCES AND BENEFIT INCIDENCE

4.1 Intended Overall Project Beneficiaries

Figure M-3 overleaf represents an overall schematic of project beneficiaries and benefit incidence for the proposed project as a whole.

4.2 The Intended Project Beneficiaries within the Shalambood Area

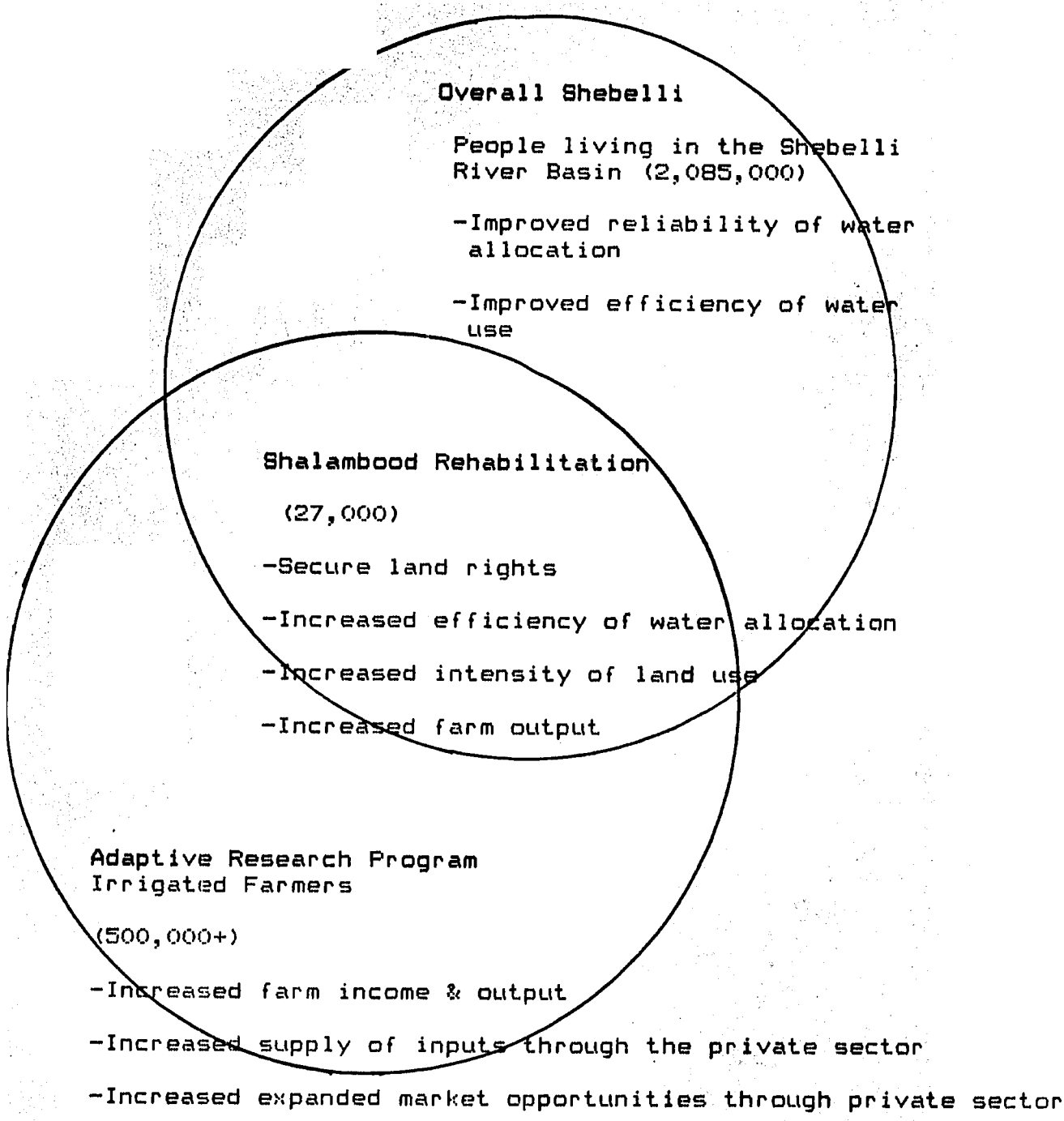
The sections which follow again concentrate on the benefit incidence of the infrastructural upgrading component of Shalambood rehabilitation on the populations of the target area where most grassroots project activities are intended to take place. The following groups are expected to be project beneficiaries at the grassroots level:

4.2.1 Small farmers, either on smallholder aziendas, or small holder cooperatives, or plantation laborers with subsistence plots living in the 8000 + hectare area made up of the area served by the Shalambood irrigation system. Small farmers are expected to benefit from increased access to water and increased water security brought about from the system rehabilitation itself and an overall improvement in system maintenance and water management. Farmers should soon begin to experience higher farm incomes, whether through increased food grain yields or the ability to grow new crops on their lands such as perennials (such as fruit trees) or other crops (such as vegetables). The question of whether increased water use as a result of this desired expansion of planting perennials instead of annual vegetables will have a serious effect on the project will have to be determined.

Farmers are expected to benefit from increased security of tenure, if a streamlined azienda-level registration procedure is enacted. Equity suffers, however, if increased security reinforces absentee landlordism and rent-taking at the expense of actual producers.

Farmers should benefit from adaptive research brought to them through a strengthened and more active extension service. Improvements of animal watering points and access roads should minimize the damage done by animals to the system and cut down on the number of disputes between farmers and nomads.

Figure M-3: Benefit Incidence of SWMP



4.2.2 Women in the project area should benefit from the other donor funded potable water supply projects. Women now walk over 3 kilometers each way to bring water to their households or have to pay So.Sh. 100 to have a barrel delivered in many villages. Improved village-level water supply would relieve this burden. USAID may consider LC generations to fund the deepening and widening of wells for drinking water through self-help experienced PVOs in the settlements of the target area.

Similarly, fuelwood gathering is a time-consuming activity for women in the Lower Shebelli. Three small sticks of wood, for example, are sold in the Boul Shiekh market for So.Sh. 5. As an activity outside of, but complementary to the proposed project, local currencies generated by AID's PL 480 program will support National Range Agency tree nurseries for fuelwood and windbreaks, which ought to alleviate some of the problems of finding fuel at a reasonable cost in the long run.

In addition, under other funding sources, USAID has begun work on a series of programs to involve women's organizations in the Shalambood target area, to strengthen the role of women in water management and in other areas.

Women are sometimes heads of households in the project area, and they are also heavily involved in the day-to-day work of agriculture. Women also seem to play a large role in marketing agricultural produce in the municipal markets of small villages. In the villages visited, for example, nearly all produce sellers were women. It is assumed, therefore, that women will benefit directly from the increases in yields and family income which will come as a result of this project, but targeted project activities will be needed to ensure this.

Little is known at present about how the household is financed in the Lower Shebelli region, so it is difficult to determine just how much of this benefit will directly accrue to women. A study on the socio-economic situation of women in the target area has therefore been proposed to help better predict such benefits.

4.2.3 Nomadic peoples visit the region during the jilal season each year. Although relationships are good between farmers and nomads, many of whom are kin, there are still disputes and problems when cattle and other animals damage standing crops or waterworks. Nomads are expected to benefit from waterpoints to be constructed as part of the rehabilitation of the irrigation system, and from the improvements to be made at crossing points and along roads.

4.2.4 It was estimated that 25 percent of the population in the target area are landless laborers, many of whom live in villages attached to large plantations and

other of the larger landed entities in the project area. Although it is likely that the project will increase the absolute demand for these laborers on the banana plantations year-round and will most likely increase seasonal labor demands from other farmers as that group's income begins to increase, there needs to be an element in the project that specifically addresses the problems of this landless laboring group.

A first step in this direction ought to be a survey of those living in landless laborer villages or camps in the Shalambood target area. This needs to be followed up with frequent contacts and special benefits for those living in these camps. Improvement in the number of individuals receiving labor contracts with subsistence land provided ought to be sought through the project, and technical packages developed, through irrigated research, to increase the subsistence production on these small-holdings. Frequent monitoring of the conditions of this unfortunate group needs to be carried out, coupled with an urgent effort to improve their nutritional and medical condition, should these deteriorate.

Likewise a land census, a registration program and frequent monitoring of the land tenure security situation in the Shalambood target area needs to be carried out to avoid the possibility of the proposed project having the negative effect of a possible land grab by large investors driving smallholders off the land increasing the size of this class of landless laborers.

According to the Lahmeyer report, only 23 percent of the people in the target area have access to safe drinking water. It is not likely that any of those living in the villages of landless laborers are among them. There is a high incidence of gastrointestinal diseases as well as bilharzia in the region which exacerbates labor problems. The infant mortality rate is reported as being 174 per thousand, on the average for the Lower Shebelli Region, but is probably quite a bit higher, with 20,000 people for each doctor. It is likely that these conditions are even worse among the landless laborers.

4.3 Adverse Effects of the Project

The most serious adverse effects of the project might involve those whose land tenure is not very secure, particularly if the improved irrigation in the proposed project area sets off a land grab. The problem and its potential solutions have been discussed elsewhere in the Social Soundness Analysis. Corollary to this is the danger of too rapid an expansion into banana as a crop.
Even with the rehabilitation, there is not likely to be

enough water for the entire area to become monocropped in bananas. There is a danger, however, that a continuing process of land appropriation in the Shebelli might lead, as Hoben has pointed out, to a recreation of patterns of employment, land use and land control that resemble those of the 19th century. In this scenario, local residents would increasingly become wage laborers on plantations as their own cultivation becomes increasingly marginalized.

4.4 Indirect Effects

Indirect effects might be better termed "unintended effects". Unlike "direct effects" which are planned project results directly affecting intended beneficiaries, "indirect effects" are unintended or untargetted results which can be the direct result of the project, but which benefit those outside the intended recipient group. A good example of such negative "indirect effects" would be to the benefit of the owners of the various large farm entities in the target area. These large farm owners are not the intended project beneficiaries, yet if one looks at the placement of these large farms, one notices that they are grouped along the primary canal and the most heavily served upstream sections of the secondary canals (see Figures M-1 and M-2 above).

The rehabilitation of the canal system will of course improve the amount and certainty of water in all canal areas, and therefore even before the water reaches the small independent farmers, who are the primary focus of the proposed project, it will reach the larger farms of the banana and other perennial growers. Although these large farmers are being directly benefitted by the project, they are recipients of unintended and therefore indirect effects. Since the primary purchaser of bananas in the area is the parastatal organization called Somalfruit, this parastatal will therefore be the largest recipient of these indirect effects.

In a more positive light, other indirect beneficiaries to the project include:

- the general public that has more domestically produced food for consumption, saving national foreign exchange for non-food import needs;

- tradespeople in towns who sell to farmers who will likely earn more disposable income;

- people involved in the processing, selling and transport of food; and

- those involved in the sale and transport of farm inputs.

ANNEX N

TRAINING PLAN

ANNEX N: TRAINING PLAN

1. OVERVIEW

Without substantial amounts of training, the Shebelli Water Management Project cannot be implemented. At almost every level of DILU and the new MOA Directorate of Research, supplemental training of one kind or another is essential.

The training program to be launched and carried out under the project is a crucial element in ensuring project success. Training will commence early in the life of the project and will be directed at a wide spectrum of individuals and groups. These include:

1) MOA staff of the DILU and Directorate of Research involved in the irrigated agriculture sector;

2) Extension agents and trainers from AFMET;

3) Research professionals at the Central Agricultural Research Center (CARS);

4) Teaching staff at the Faculty Agriculture (FOA) and the Faculty of Engineering (FOE) of the Somali National University (SNU); and

5) the farmers/irrigators of the Shalambood area.

The absence of adequate support for training as part of irrigation development projects in Africa was recently noted in a conference conducted by the FAO. Conference participants emphasized the importance of strengthening human resources in such projects, at both the farmer and technician levels.

The training to be conducted under the project is one of those components which will have a broader area of impact than the Shalambood target area alone. The training specified below is designed to contribute to the entire Shebelli River basin's irrigated agricultural potential by expanding the human capacity to generate, adapt, transfer, and utilize information that will contribute to effective water management and use. This implies providing training and other resources to relevant water management, research and extension/education units operating in the area.

2. TRAINING COMPONENTS

This section details the various modes of training contemplated for the project. Each type contributes an added

TABLE 9: PROJECTED EXPENDITURES PROJECT COORDINATION & SUPPORT
(U.S.$ 1,000 @ So.Sh.90 = U.S. $ 1.00)

LINE ITEM	TOTAL UNITS LOP	1987 AID	1987 GSDR	1988 AID	1988 GSDR	1989 AID	1989 GSDR	1990 AID	1990 GSDR	1991 AID	1991 GSDR	1992 AID	1992 GSDR	SUB-TOTALS AID	SUB-TOTALS GSDR	TOTALS U.S.$
1. PERSONNEL		60.0	0.0	157.6	49.9	218.0	59.1	284.0	59.1	244.4	59.1	318.0	59.1	1282.0	286.1	1568.1
Expatriate L-T	8 py	60.0	0.0	118.0	40.5	218.0	40.5	218.0	40.5	218.0	40.5	118.0	40.5	950.0	202.3	1152.3
Chief of Party	4 PY	0.0	0.0	85.0	0.0	170.0	0.0	170.0	0.0	170.0	0.0	85.0	0.0	680.0	0.0	680.0
LocHireTrngCoor	4 PY	0.0	0.0	15.0	0.0	30.0	0.0	30.0	0.0	30.0	0.0	15.0	0.0	120.0	0.0	120.0
FSU Support	-	60.0	0.0	18.0	40.5	18.0	40.5	18.0	40.5	18.0	40.5	18.0	40.5	150.0	202.3	352.3
Expatriate S-T	12 PM	0.0	0.0	39.6	0.0	0.0	0.0	66.0	0.0	26.4	0.0	200.0	0.0	332.0	0.0	332.0
(Procurement	3 PM)															
(Evaluation	5 PM)															
(Phase 2 Des.	4 PM)															
(Audit	)															
Somali staff	-	0.0	0.0	0.0	9.4	0.0	18.6	0.0	18.6	0.0	18.6	0.0	18.6	0.0	83.8	83.8
2. TRAINING		13.0	0.0	156.5	50.1	254.0	44.5	296.0	44.5	233.0	44.5	167.0	44.5	1119.5	228.1	1347.6
Somalia MS	32 MS	13.0	0.0	136.5	5.6	134.0	44.5	216.0	44.5	193.0	44.5	127.0	44.5	819.5	183.6	1003.1
Eng.Language	40 Stu.	0.0	0.0	20.0	44.5	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	44.5	144.5
3rd Country S-T	20 PM	0.0	0.0	0.0	0.0	40.0	0.0	80.0	0.0	40.0	0.0	40.0	0.0	200.0	0.0	200.0
3. COMMODITIES		0.0	0.0	140.0	0.0	9.0	0.0	14.0	0.0	9.0	0.0	9.0	0.0	181.0	0.0	181.0
Vehicles	3	0.0	0.0	75.0	0.0	9.0	0.0	9.0	0.0	9.0	0.0	9.0	0.0	111.0	0.0	111.0
Office Equip.	-	0.0	0.0	65.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	70.0
4. CONSTRUCTION		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. OTHER		0.0	0.0	10.0	10.0	22.0	10.0	22.0	10.0	15.0	10.0	10.0	10.0	79.0	50.0	129.0
Off.Rent, O&M	var	0.0	0.0	10.0	10.0	22.0	10.0	22.0	10.0	15.0	10.0	10.0	10.0	79.0	50.0	129.0
6. CONT & INFLATION		0.0	0.0	23.2	5.5	51.6	11.6	97.1	17.9	108.1	24.5	139.2	31.4	419.2	90.9	510.0
TOTAL		73.0	0.0	487.3	115.5	554.6	125.2	713.1	131.5	609.5	138.0	643.2	144.9	3080.7	655.1	3735.7

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dimension to overall training activities. The diversity of institutions and training requirements represented in the project necessitates the utilization of multiple training delivery mechanisms.

2.1 Training Plans

The institutional structures and responsibilities outlined for the new DILU (ex-DLWR) require that this organization perform certain functions which are not, at present, conducted anywhere else in Somalia. Other institutions cooperating in the project, principally the MOA's new Directorate of Research, and the Somali National University's Faculty of Agriculture will also be asked to carry out responsibilities beyond their current capabilities for the benefit of the project.

It is, therefore, essential that a training plan for each component be carefully developed during the first 6 months of the project, with up-dates or adjustments made part of the annual planning cycle. Such plans should be a collaborative effort between technical assistance contractors and the implementing agencies (both new and pre-existing), which will be involved in project execution. The plans should identify existing human resources and indicate critical areas for training, both long-term and short-term. It will be important to seek a balance between personnel training needs and those training resources available to the project.

The following sections identify areas of concern where additional education and staff training are required. The items indicated serve as a basis for initiating training early in the project and are a guide to the formulation of the aforementioned training plans.

2.2 Long-Term Training

2.2.1 Background. Long-term training forms the foundation of the project's training program. This refers to formal educational training for advanced degrees for Somali technicians/professionals. When this type of training takes place at a U.S. or other foreign university, participants require a minimum of two years to complete coursework requirements.

USAID/Somalia has not been satisfied with the results of such degree education in the recent past, as after the time and expense investments have been made, approximately half the Somali participants have not returned to the country to assume their positions. This practice has had an extensive negative impact on those projects which have been sponsoring participants.

USAID personnel, therefore, propose that the Shebelli Water Management Project implement an innovative approach to long-term participant training -- one which would provide adequate formalized training while avoiding the problems of participant dropout. Under Phase 1, Somali participants will receive courses in Somalia which could lead to an advanced academic degree awarded by the Somali National University's Faculty of Agriculture and Faculty of Engineering.

This innovative approach to long-term academic training has several merits. One, it holds the potential of training more individuals in a comparatively shorter time span than sending relatively few participants abroad throughout the life of the project. Two, it would eliminate the problem of non-return after degree completion, yet still offer a viable education and degree. Three, participants would not be attending school full time except when a course is being delivered in-country. They would thus be able to otherwise assume their normal responsibilities, contributing to project execution even during the period of their advanced degree studies. Finally, as they progress, what is learned would be immediately applicable to their work situation, thereby advancing the "multiplier" effect that long-term training seeks to achieve. The approach forces course subject-matter to be considered by both the professor and the student in light of Somali conditions and circumstances.

This basic approach has some precedent in Somalia. Late in 1982 a program was established through funding from the World Bank which linked the Somali Institute of Development Administration and Management (SIDAM) and California State University, Fresno (CSUF). Essentially, CSUF implemented a program at SIDAM in which its faculty members have taught courses leading to an MBA (Master's in Business Administration) degree. The first graduating class, after some three years, received their MBA degrees from CSUF, and forthcoming degrees of MBA will now be awarded by SNU with TA to SIDAM continuing under the AID-funded SOMTAD Project.

It should also be noted that AID has successfully supported the establishment of a new department of Range Science at the FOA under the Central Rangelands Development Project. Although the start-up was longer than anticipated, both USAID/Somalia and the FOA have learned about each others' procedures and requirements. When that program began, it was necessary for the President of Somalia to approve the new curriculum. SNU has since streamlined procedures so that the University Board can approve new curricula -- including those for Master's programs.

Formal education in both agriculture and irrigation engineering in Somalia is provided by the FOA and FOE of SNU. The FOA offers the equivalent of a BS degree with no specific major area of study designated. There have been an average of 27 graduates per year over the last four years. The FOA was founded in 1971 and receives substantial financial aid from the Italian government.

The level of academic training held by the Somali teaching staff of the FOA is relatively limited. The following figures indicate the highest degrees held by the current 38 faculty members:

Degrees held	Number
PhD	1
Master of Science	8
Post graduate Laureate (Italian)	10
Bachelor of Science (SNU)	5
PhD students *	4
MS students *	8
Post graduate Laureate students *	2
Total	38

*Currently pursuing degrees with overseas institutions, mainly the U.S.

Some eleven of those now seeking advanced degrees abroad are sponsored by USAID. The following table indicates the discipline area of current staff, listed by department. The degrees shown combine both those who have been awarded the degree and those currently completing degree requirements.

Department	PhD	MS	PGL	BS	Totals
Plant Production & Protection	2	2	8	1	13
Animal Husbandry		2	1	1	4
Rural Engineering	1	3			4
Agricultural Economics	1	1	2		4
Range Management & Botany	1	4		1	6
Ag. Chemistry & Soils		4	1	2	7
Totals	5	16	12	5	38

The latest six-month report prepared by the FOA indicates that of those not pursuing studies abroad, some 36 percent are on full-time appointments, 32 percent are three-quarters' time, and the remainder are half-time or less. The TAMS report indicates that the ratio of students to teaching staff is 3.2:1, which may indicate an under-utilization of teaching staff. It should be noted that, in addition to the Somali lecturers, there are generally between 10 and 12 Italian professors who also teach courses. Instruction in the FOA is in Italian, except the Range Science Department, where instruction is in English (and is funded by AID's Central Rangelands Development Project).

A review of the Faculty's curriculum indicates that graduates receive a very general education in agriculture. All agriculture courses are taken during the last five semesters of study. Students also complete a one-month supervised practical work experience during the third year.

Many faculty members are also involved in research in their respective disciplines. At present, some 17 research projects are in progress, all of which deal with circumstances in Somalia, many directly applicable to the Lower Shebelli region.

The FOA and FOE do not currently award MS degrees, though they are empowered to do so. Since the level of academic training currently held by FOA/FOE faculty is too limited to support the MS-level specialized Irrigation Engineering and Agronomy training needed by SWMP 1 counterparts at DILU and CARS, turn-key MS training by a U.S. University offers the geatest chance of success for Phase 1. FOA/FOE faculty will benefit from collaboration with U.S. short term advisors in course delivery. Eventually, if the MS program is successful and continues under Phase 2, it is expected that teaching responsibilities will progressively be assumed by FOA/FOE faculty.

2.2.2 Long Term Training Mechanism: Turn-key MS Instruction Delivered by a U.S. University. The SWMP 1 pilot program, as an interim experiment, will involve the awarding of MS degrees by Somali National University on the basis of turn-key instruction provided wholly in Somalia by a U.S. University. All coursework and other graduation requirements will be completed in Somalia with short term U.S. university faculty contracted to provide teaching assistance in English. There will be no formal empirical research and thesis requirement; only an MS project report will be required.

Under oversight of SNU's FOA and FOE, the U.S. university and FOA/FOE professors will design and deliver courses tailored to meet the project's and GSDR needs which will, as a successfully completed total package, justify award of SNU Master's degrees in Irrigation Engineering or Agronomy.

The MS project reports would not require such close supervision to complete. Since the University is under the same contract for technical assistance as the advisors to DILU and CARS, those advisors will be expected to provide guidance and advice to students preparing their reports. Visiting short-term professors who come to impart courses could also advise and supervise during their venue in the country. Additionally, a supervising professor could be sent periodically for a 3-4 week period (for example) exclusively to assist participants who may be in the MS report preparation phase.

The Chief of Party of SWMP's long term technical assistance contract will supervise and coordinate the U.S. University's design and delivery of courses in Somalia. The contract will fund two

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additional positions which will assist the COP in this effort: (1) a full time expatriate resident in Somalia who will be hired locally (but paid in dollars) to work with FOA/FOE and SNU as Off-Campus Coordinator for the U.S. University; and (2) a half-time Campus Coordinator on campus at the U.S. University to backstop short term faculty trips.

The recommended program follows:

2.2.3 Proposed MS Program. The objective of the proposed MS program is to increase the number of Somalis with the necessary skills to manage and sustain the various components of the Shebelli Water Management Project. The FOA, FOE, Ministry of Agriculture and USAID/Somalia agree that Phase 1 will focus on agronomy and irrigation engineering. Only these two majors will be offered during Phase 1. As experience with the program is gained, consideration could be given to additional areas of emphasis.

A U.S. university with expertise in these discipline areas will be a part of, or a sub-contractor to, the project's long term technical assistance contract, and will work with FOA/FOE to make all the internal arrangements necessary to offer curricula of study and academic degrees. Considering the common needs of Somali technicians in these two disciplines, a single curriculum will be offered for all Somali students (in Somalia) up to 30 credit hours (sample based on quarter hours of credit). At that point each participant will select one of two "majors" -- Agronomic Science or Irrigation Science.

The proposed curriculum is as follows:

Joint Curriculum

(Required courses)	Credits
General Soils (with Laboratory)	5
Irrigated Soils	5
Soil and Plant Nutrition	5
Soil and Water Conservation	5
Soil Identification & Interpretation	5
Basic Research Methods in Agriculture	5
	30 hrs

Agronomy Option: FOA

(Required Courses)	Credits
Plant Physiology	5
Plant Breeding	5
Vegetable Production	5
Soil & Plant Nutrition	5
Entomology	5
	25

Irrigation Option: FOE

(Required Courses)	Credits
Principles of Hydraulics	5
Irrigation Principles and Practices	5
Drainage Systems	5
River Management	5
Environmental Issues and their Mitigation	5
	25

The preceding set of courses will be given in English by qualified U.S. university faculty members with assistance from FOA Professors. The curriculum will be fixed and no elective courses are planned. The curriculum as shown will be delivered in the following fashion. One course is to be taught each quarter of the year, so that four courses are taught per year. Calculations are based on the assumption that a professor will be in Somalia for about 5 weeks when teaching a course. Courses will be taught 5 days a week for three weeks with 3 hours of class time per day, totalling 45 hours of instruction per course. Friday is a day of rest and the other day is for preparation and/or a make-up class. The participants will, therefore, be involved in these intensive block courses for three weeks at a time. The initial week of each visiting professor's stay will be used for course planning with FOA/FOE counterparts; the final week will be used to write a course evaluation report, and to redesign the course content for the future (if necessary). To the extent feasible, the U.S. University will encourage each participating faculty member to assume responsibility for teaching a number of different courses in their curricula; this will foster long term relationships between U.S. and FOA/FOE programs, ease communication, and reduce time spent orienting and back-stopping U.S. faculty members new to the program.

By the end of the first academic year, students will have 20 hours of credit toward their degree. After one and one-half years, participants will select one of the two options. Realistically, this will need to be planned from the outset so as to assure balance in the two options, and thus meet both DILU and Directorate of Research staffing needs. From this point on, two courses will be taught each quarter year, one in each option, supervised by the FOA or the FOE. Ideally, at the end of 2 3/4 years all participants would have completed coursework.

It is estimated that 40 students/participants would jointly take the core curriculum, splitting into two groups of sixteen for the optional courses (student attrition of 20 percent is estimated). The classes for specialized study must remain limited in size in order to maintain a realistic professor-to-student ratio.

The 50 percent of the trainees selected for the MS in Irrigation will be recruited from DILU staff and the 50 percent selected for the MS in Agronomy will be recruited from the MOA Directorate of Research (especially ARI and CARS), the FOA, NES and other AFMET units.

In order to be selected, potential students must meet the English language requirement established by the U.S. university. For the first "pilot" sequence of courses, preference must be given to those students with adequate

English. If it is decided to continue the program, SWMP will insist that all participating institutions will be encouraged to devise a means for extending this educational opportunity to all of their candidates on an equitable basis.

Before the end of coursework, participants will have selected the topic for their reports. With a little planning, these could be well underway by the time coursework is completed. During the post-coursework period, a professor will be sent by the U.S. university to supervise and assist students in the completion of their reports. As courses are on-going each quarter, there will be further opportunities for students to receive basic assistance. All reports will receive the review and approval of a committee at the FOA/FOE. SNU Master's degrees will be awarded after all approvals have been obtained.

The foregoing scenario would provide graduates with the same basic hours of classroom instruction as if they were on-campus in the U.S. The degree takes a somewhat longer period of time to obtain, but not inordinately so. Most of all, the scenario is flexible. If funds are limited, it can be elongated without materially altering the scheme. If funding is plentiful, on the other hand, then after the first core series is completed, the U.S. university could assist the FOA/FOE to begin to offer those courses again with new participants, while at the same time continuing to train the first groups in the Agronomy/Irrigation options series as planned. Other alternatives could also be pursued.

Potential students for the MS program must achieve a minimum TOEFL score of 525 or they will not be allowed to begin SWMP-funded MS course work.

As soon as possible after the Project Agreement is signed, DILU, CARS, AFMET, and FOA will nominate staff for the 40 training slots which will be offered by the SWMP MS training plan. A committee made up of representatives from DILU, CARS, AFMET, and USAID will make final determination of candidates for the MS training. Local currency is budgeted for these 40 students to be tested by USIS for TOEFL scores and then placed in the appropriate level of English classes under USIS through AID's SOMTAD Project. This training will be conducted in evening classes totalling 15 hours/week taken on their own time.

The SWMP local currency budget also allows other staff from the four GSDR entities to study English under USIS (SOMTAD) to increase their effectiveness in working with expatriate TA and in reading technical journals. This would also be given as part time evening classes taken on their own time.

The U.S. university under contract to provide SWMP's MS courses in Somalia, before starting the core subject matter training, will administer another TOEFL test to nominated students. If necessary, the contract university will then provide up to 3 person-months of short-term TA to deliver an intensive, full time English training program in Somalia for students still deficient in English. Students will be divided by TOEFL level into three classes: 400-450, 450-500, and 500+. Two locally hired native English speakers will be hired by the U.S. university to assist its own ST English teacher to provide the three months of intensive English training. During the training, students will need to be released from their regular staff functions to concentrate wholly on developing English skills adequate for MS short courses under this training plan.

2.3 Counterpart Training

2.3.1 On-the-Job Training. Project management and execution will require the services of several expatriate long and short-term specialists. These individuals will be responsible for providing a large share of the technical training delivered in-country, and they will be expected to utilize a variety of modalities. One of the most significant is the on-the-job training that will they will give to assigned GSDR counterparts. While counterparts assist long-term advisors in applying their expertise in the Somali context, the advisors will help the counterparts increase their technical knowledge. This knowledge/experience transfer will occur as the advisors and counterparts work together in field operations and events.

The long-term TA and counterparts will both have multiple opportunities to conduct short-courses, workshops, and seminars and to participate in the in-service training of other technicians involved in project execution. Provision of short-term seminars should be anticipated and reflected in the statement of work for all advisors and GSDR counterparts. Wherever feasible, the more formal training opportunities need to be identified, planned, and coordinated within the project's training plans.

2.3.2 Short-Term Participant Training and Study Tours. Another vehicle for training professional staff in the project, especially in technical disciplines, is short-term participant training abroad. Project leaders will assess the training requirements of personnel and look for useful and appropriate short-term courses to meet those requirements. These will be incorporated into the project's training plans.

The project will plan to finance several individuals per year during the first phase. Suggested organizations which provide training in the disciplines of interest to the SWMP, and a brief description of their credentials, are:

1) Salt River Project, Phoenix, Arizona (SRP). This is a non-profit U.S. water users' organization which operates an extensive irrigation system in arid conditions similar to those in Somalia. SRP's International Division is under contract to USAID/Egypt to implement a Professional Employee Exchange Program for on-the-job training of Egyptian Ministry of Irrigation staff.

2) Egerton College, Njoro, Kenya. This school is excellent for delivering tailor-made, lower level, practical courses, and has been actively supported by USAID/Kenya.

3) University of Nairobi, Faculty of Agriculture, Nairobi, Kenya. Faculty is good and could offer high level expertise in a variety of subjects.

4) University of Ghana, Legon, Accra, Ghana. Maintains an active research program at the Kpong experimental station with significant experience in black clays.

5) International Research Center for Agriculture in the Semi-Arid Tropics (ICRASAT), Hyderabad, India. Very extensive experience in cowpeas, sorghum, and groundnuts, and with black and other clay soils. Also excellent reputation in animal traction.

6) Asian Vegetable Research Development Center (AVRDC), Taiwan. Very good reputation in vegetable research and production.

7) University of the Philippines, Los Banos, Philippines. Maintains a respected program in fruits and vegetables.

8) International Irrigation Center, Logan, Utah, USA. This center was organized specifically for providing training in irrigation. Currently offers some 13 separate courses on different subject matter each year.

9) Agricultural Development Bank of Pakistan, Islamabaad, Pakistan. To investigate model credit programs during preparation of Phase 2 project design, directors of the Commercial Savings Bank of Somalia would benefit from study tour exposure to this Bank's mobile credit system, as well as rural credit institutions in Bangladesh, and other pilot programs.

Another alternative would be for the project to investigate the possibility of having one of these organizations bring a short-course to Somalia. For example, the project could contact the International Irrigation Center (IIC) and work out the details of sponsoring a six-week course in on-farm irrigation management (which it currently offers) in Somalia. This seems quite feasible, as the IIC is now beginning a program of instruction "in-country" with two courses occurring in Rabat, Morocco during 1987. If such an arrangement were to be made, a significant number of FEA's, SMS's, FOA staff and other project-related technicians could receive very good training at a reasonable cost.

2.4 Farmer Training

One of SWMP's major objectives is to test producer response to a series of improvements in the Shalambood target area, as described elsewhere in this document. One key ingredient in the benefit package is farmer-level training. Annex J: Irrigated Agricultural Production in Shalambood and Research Needs, details soils problems to be addressed by supportive adaptive research. The resulting information needs to be disseminated to farmers -- those who can most directly and immediately benefit from it. Ultimately, farmers' agricultural and water use practices need to be improved. Therefore, the training of farmers through the extension mechanism is critical.

For purposes of this project, farmer training is generally synonymous with the term "extension". It refers to the mechanism whereby farmers are contacted and trained by the extension agent operating at the most grass-roots level. The current system for conducting agricultural extension among farmers is detailed in Annex J. Training of this type is now occurring in the Shalambood area and elsewhere in the Lower Shebelli region.

AFMET Field Extension Agents (FEA's) typically have graduated from one of the six agricultural high schools in the country, with no further education. They have little or no technical expertise in irrigation water management and appropriate on-farm water use.

The extension system carries out monthly training for FEA's at its Extension Training Centers, with the Shalambood target area served by ETC Genale. These 2-day training sessions are conducted by Subject Matter Specialists (SMS's) and various extension supervisors from the district and regional levels. However, the overall mechanism needs support

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to make training make meaningful and productive, and to provide intensive interaction and practical experience in water management and use techniques. This includes specialized training and preparation for those responsible for instructing others.

Though core support to AFMET is an IBRD responsibility, the project can directly contribute to farmer-level training by supporting partial-day, day-long, or even occasional week-long training sessions at ETC Genale to disseminate SWMP research findings. This could include the participation of either long-term or short-term technical assistance and assistance to the SMS's in preparation of their presentations. SWMP support for farmer training may also include short field trips for small groups of farmers, for example, to see water management techniques practiced in another area.

Special measures will be put in place, based on the findings of the SWMP baseline strategy, to ensure that women farmers can and will participate in all grass roots training activities. To the extent feasible, SWMP will attempt to recruit a proportionate share of female FEA's to reach the many female farmers in Shalambood (who are known to have a much lower literacy rate than males, and may thus require specially tailored training materials).

ANNEX O

DETAILED BUDGET ESTIMATES AND DRAFT SCOPES OF WORK

STANDARD COSTS

ITEM	UNIT	UNIT COST FX (US$)	and/or	UNIT COST LC (SoSh)
1. PERSONNEL				
1.1 Expatriate longterm (includes everything)	py	$210,000		
1.2 Expatriate short term (includes travel and perdiem)	pm	$20,000		
1.3 Somali Government				
senior professional	py		SoSh.	600,000
mid-level	py		SoSh.	180,000
support technical	py		SoSh.	120,000
support clerical	py		SoSh.	96,000
driver	py		SoSh.	144,000
1.4 Somali Private Sector				
senior professional	pm		SoSh.	45,000
mid level	pm		SoSh.	20,000
clerical	pm		SoSh.	1,000
driver	pd		SoSh.	500
skilled labor	pd		SoSh.	500
unskilled labor	pd		Soh.	300
1.5 Per diem				
Expatriate				
Mog - Hotel	pd	$44		
Mog - USG	pd	$38		
Other Somalia	pd	$34		
Somali				
Other	pd		SoSh.	1000

ITEM	UNIT	UNIT COST FX (US$)	and/or	UNIT COST LC (SoSh
2. TRAINING				
*Note if GSDR SoSh contribution required for airfare for 2.1 or 2.2.				
2.1 U.S.				
Long term academic	py	30,000		
Short term	pm	10,000		
2.2 Third Country				
Short term	pm	5,000		
2.3 In-country				
Short term academic p-week (e.g. Utah modular program)			SoSh.	5600
Short term non-academic (e.g. farmer training: estimate per day)	pd		SoSh.	100
3. TRANSPORT Add 10% for spare parts				
4 door sedan				
CIF Mog purchase	1	22,000		
4 x 4 Short wheel base				
CIF Mog	1	22,000		
4 x 4 Long wheel base				
CIF Mog	1	22,000		
4 x 4 Pick up				
CIF Mog	1	25,000		
Minibus				
CIF Mog	1	25,000		
Trail Motorcycles				
CIF Mog	1	3,000		

For vehicles, use average SoSh 250,000 per year for diesel and SoSh 350,000 per year for petrol running costs. For motorbikes, use SoSh. 60,000 per year.

4. OTHER				
PC, CIF Mog with all necessary hardware (including monitor, battery pack/stabiliser)		$6,000		
Laptop computer, similarly equipped as PC		$4,000		

TABLE 12: PROJECTED EXPENDITURES SHALAMBOOD REHABILITATION COMPONENT
(U.S.$ 1,000 @ So.Sh.90=U.S.$ 1.00)

LINE ITEM	1987 AID	1987 GSDR	1988 AID	1988 GSDR	1989 AID	1989 GSDR	1990 AID	1990 GSDR	1991 AID	1991 GSDR	1992 AID	1992 GSDR	SUB-TOTALS AID	SUB-TOTALS GSDR	TOTALS U.S.$
1. PERSONNEL															
2. TRAINING															
3. COMMODITIES															
4. CONSTRUCTION															
Rehabilitation	0.0	0.0	0.0	0.0	1020.3	129.9	2846.3	537.1	1072.7	317.4	0.0	0.0	4939.2	984.4	5923.6
Design & Superv	0.0	0.0	827.1	216.4	751.1	256.2	198.5	40.1	174.7	31.7	0.0	0.0	1951.4	544.4	2495.8
5. OTHER															
TOTALS	0.0	0.0	827.1	216.4	1771.4	386.1	3044.8	577.2	1247.4	349.1	0.0	0.0	6890.6	1528.8	8419.4

4. SHALAMBOOD TARGET AREA CIVIL WORKS REHABILITATION COST ESTIMATES

The following pages provide detail on the cost estimates used in the PP for the Shalambood target area civil works rehabilitation. The costs were developed by the PP Design Team based on figures used by TAMS and later figures provided by the World Bank. No bills of quantities on which to base estimates were available and time precluded their development. In most cases the costs are based on TAMS figure adjusted to 1987 prices. Where the TAMS and World Bank figures are significantly different, the Design Team has chosen one based on the best information available, and adjusted it accordingly. All costs assume full rehabilitation of the 8,020 net hectares target area (or 10,211 hectares gross) over an 8-10 year period.

4.1 Summary of Cost Estimates

Table STA-1: below summarizes the civil works rehabilitation costs for 8,020 hectares.

Table STA-1: Summary of Cost Estimates
for 8,020 Net Hectares
(U.S. $1,000 with So.Sh. 90= U.S.$1.00)

	FX	(%)	LC Equivalents	(%)	Total
Genale Barrage	3148.6	(88)	429.4	(12)	3578
Irrigation System (Yassin & Secondaries)	4350.1	(73)	1608.9	(27)	5959
Drainage System	2817.0	(75)	939.0	(25)	3756
Road System	519.6	(60)	346.4	(40)	866
Tertiary Canals	1374.8	(40)	2062.2	(60)	3437
Collector Drains	194.4	(40)	291.6	(60)	486
sub-totals	12404.5		5677.5		18082
Construction Supervision 10% LOP	1240.4		567.8		1808.2
	13644.9		6245.3		19,890.2

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4.2 Phase 1 Civil Works Rehabilitation Costs

Estimated costs for the proposed Phase 1 works follow. The Engineering Design will determine desired phasing for subsequent phases.

(US $ 1,000)

	FX	LC Equivalent	Total
Genale barrage	3,148.6	429.4	3,578.0
Yasin feeder reach and IInd to IVth	824.0	304.8	1,128.8
IVth Secondario	294.0	108.7	402.8
SUB-TOTAL	4,266.6	842.9	5,109.5
10% supervision	426.7	84.3	511.0
TOTALS	4,693.3	927.2	5,720.5

The detailed derivation of these and the total costs follows.

4.3 Reevaluation of TAMS' Estimates

TAMS costs were reevaluated in two ways. In the first case, the unit costs in TAMS Feasibility Study, Annex IV, were increased by estimated factors for indirect costs (35%), physical contingencies (10%) and the contractor's overhead and profit (10%), or 1.35 x 1.1 x 1.1 = 1.634. The resultant amount in Somali shillings was then converted to U.S. dollars at So.Sh. 90 = U.S.$ 1.00. These adjusted unit rates are presented in Table STA-2 as "TAMS".

The adjusted rates were also compared to a series of World Bank-developed rates provided to the PP Team by the DLWR and found in Table STA-2 as "WB". A "WB/TAMS" ratio is shown to highlight differences.

The PP Design Team chose what appeared to it to be the most accurate rate based on available information, and adjusted the 1986 figures by 10 percent (5 percent for price escalation and 5 percent to account for the variation in exchange rates). The resultant figures in Table STA-2 form the basis for the PP estimates.

TABLE STA-2: UNIT COST COMPARISONS U.S.$ (1987)

	WB	TAMS Adjusted	WB/TAMS	PP Design (WB or TAMS adjusted plus 10%
1. Earth Works				
1.1 Bush Clearing, ha.	720.00	961.00	0.75	800.00 WB
Stripping m2	0.36	0.76	0.47	0.40 WB
1.2 Excavation and fill				
from channels m3	2.30	0.50	4.60	2.53 WB
from narrow areas m3	2.30	1.00	2.30	2.53 WB
from structures excav.	3.00	0.99	3.03	3.30 WB
from structures backfill	2.80	1.79	1.56	3.10 WB
2. Concrete				
2.1 Lean concrete m3	44.60	100.00	0.45	110.00 TAMS
2.2 Mass Concrete m3		125.00		138.00 TAMS
2.3 Reinforce Conc. m3 (w/formwork and rebars)	125.00	250.00	0.50	275.00 TAMS
2.4 Concrete lining m3 (mesh reinforcement)	108.00	200.00	0.54	270.00 TAMS
3. Structure Rehab				
3.1 Metal works kg.	6.60	7.00	0.94	7.70 TAMS
3.2 Concrete (unreinforced) m3				110.00 TAMS
3.3 Gabions m3	89.00	80.00	1.11	90.00 TAMS
4. Barrage				
Coffer dam m3		5.50		6.05
Excavation m3 (desilt of channel)		11.10		12.21
Excavation m3 (structures)		8.90		9.79
Backfill m3		8.90		9.79
Concrete repair m3		714.00		785.40
Dredging m3		7.10		7.81
Rip Rap m3		approx 30		33.00
Fabric m2		3.60		3.96
Demolishing of steel work kgs		5.50		6.05

4.4 Genale Barrage Cost Estimate

The TAMS' (Annex IV, Irrigation) unadjusted estimates for the cost of rehabilitating the Qorioley, Falkeerow and Genale barrages follows. These are in 1986 prices and exclude TAMS' estimated 16 percent for design and supervision.

Qorioley	M.So.Sh.	121.214
Falkeerow		118.945
Genale		154.095

The corresponding new WB estimates for Qorioley and Falkeerow in 1986 are:

Qorioley	M.So.Sh.	133.181
Falkeerow		145.075

The World Bank did not develop new estimates for Genale. The PP Team thus developed coefficients for Qorioley and Falkeerow, and an average coefficient for the two:

	TAMS	WB	WB/TAMS
Qorioley	121.214	133.181	1.099
Falkeerow	118.945	145.075	1.220
Qorioley & Falkeerow	240.259	278.156	1.160

The average cost coefficient 1.16 was then multiplied by 1.05 for price escalation, and 1.05 for exchange fluctuation, resulting in an average coefficient value of 1.279 from 1986 TAMS' estimates to 1987 escalated WB estimates. The coefficient was then applied to TAMS Genale rehabilitation cost estimates. TAMS estimates also required application of the 1.634 factor explained in 4.2 above.

Thus, the cost estimate for the Genale barrage is:

Direct costs - TAMS		154,095
WB Factor		1.279
		197,088
Indirect cost, O&M + Profit		1.634
	M. So.Sh.	322.042 or
	M. US $	3.578

Following the TAMS report, this is estimated at 88 percent FX and 12 percent LC.

4.5 Irrigation System Rehabilitation (Yassin and Secondary Canals) - Cost Estimate

TAMS' developed estimates for the Yassin and Secondary, or branch, canals, including turnouts to tertiaries based on the assumption that the irrigation system would be concrete-lined and would achieve velocites of a minimum of .5 m^3/s, through significant slope and head conditions. The resulting estimate is for the total civil works rehabilitation construction costs, excluding 16 percent allocated to Design and Supervision:

Yassin Canal	M. So.Sh.	113.270
Branch Canals	No. 1	58.414
	No. 2	50.351
(new)	No. 3	23.378
	No. 4	40.455
(new)	No. 5	27.065
Total Direct Costs		312.933

Source: TAMS Feasibility Study Annex IV Table 3.6.1 P. 108

In this report, No. 1 branch canal is the Second Secondario, No. 2 branch is Third Secondario, and No. 4 branch is the Fourth Secondario. No. 3 and No. 5 were proposed new canals. The total cost for the Yassin plus rehabilitation of those three existing secondarios as proposed by AID (i.e. excluding the new No. 3 and No. 5 proposed by TAMS) would be M. So.Sh. 262.490.

The WB reevaluated the Farxaane perimeter rehabilitation costs at the same time as the barrage costs in 4.3 above. From TAMS M. US$ 12.651, they came up with M. US$ 15.174 or, in terms of 1986 conditions, an increase of 1.194 (plus 19.4 percent). Adding 10 percent for inflation and price escalation brings this factor to 1.313, or plus 31.3 percent, which compares rather well with the same calculation for Qorioley and Falkeerow (plus 27.6 percent).

In the case of the Shalambood irrigation system rehabilitation (Yassin and Secondary canals) the following discount and increase was applied to the TAMS' figures by the PP Design Team:

- for unlined canals against lined ones, minus 37% or .630
- unit rates revision and 1986-87 escalation, plus 31.3% or 1.313
- combined minus 17.3% or .827

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Thus, the proposed irrigation system rehabilitation (i.e. less the 2 new canals) 1987 estimates based on this methodology would be:

M. So.Shs. 262.490 x .793 = M. So.Sh. 208.154 (A)

The design proposed for AID funding will, however, provide desiltation facilities, in terms of deepening and widening a selected reach of the Yassin and selected secondary canals.

Canals widening would result in the following adjusted quantities:

Section increase	
Length	50 m^3/m
Operation and maintenance tracks	1,000 m
(Widening 4-6 meters for machine access)	10 m^3/m
Extra excavation	50,000 m^3
Extra fill	10,000 m^3
Concrete for inlet structures w/baffles or concrete	120 m^3

The costs associated with these increases are:

1987 Costs (Source indicated)	M. So.Shs
Excav. 50,000 x $2.53 (WB) x 90 So.Sh.	11.385
Fill 10,000 x $2.53 (WB) x 90 So.Sh.	2.277
Concrete 120 x $ 275 (TAMS) x 90 So.Sh.	2.970
Sub-Total	16.632
Plus 30% for contingency	4.990
M. So.Shs.	21.622 (B)
or M. US$	.240

TAMS figures were based on a perimeter size of 5,280 hectares (gross). This PP has been developed based on a perimeter of up to 10,211 hectares (gross), or an increase of 94 percent.

This increase requires the following adjustments to the TAMS design:

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-The Yassin Canal capacity must be increased from 8 to 10 m^3/s at the head works, for a general section increase of about 25 percent, which would result (very approximately) in additional excavation by 15 percent and fill by another 5 percent;

-An extra offtake structure for the VIth Secondario branch canal must be added. This will require a Yassin Canal increase of about 10 percent, or 113.270 x 0.10 = M. So.Shs. 11.327 (C);

-The costs of rehabilitating the Vth and VIth Secondario branch canals must be added, plus probably an extra sub-branch canal for a total new length of 14.3 kilometers, or M. So.Shs. 87.105 (D);

Based on these revisions, the estimated total cost for irrigation system rehabilitation up to the tertiaries would be:

	M. So.Sh.	
Irrigation system	208.154	(A)
Canal widening	21.622	(B)
Adj. for increase in Gross hectares 5280 to 10,211	11.327	(C)
Rehabilitation Vth and VIth Secondarios plus one extra sub-branch canal	87.105	(D)
	328.208	
Indirect cost, O/H and profit	1.634	
M. So.Sh.	536.292	or
M. US $	5.959	

These costs are estimated to be 73 percent FX and 27 percent LC.

4.6 Drainage System

The estimated costs for an unlined drainage system, including a drainage pumping station, are M. So.Sh. 129.094. The PP team recommends an increase in the branch drains of

about 10 kilometers or 29 percent, and an increase in pumping capacity of 25 percent. This results in the following cost estimates for the drainage system:

Main drain and out fall	M. So.Sh.	18.295
Branch drain No.1		5.615
No.2		4.277
No.3		5.100
No.4		3.807
Drainage pumping station		92.000
Sub-total		129.094
PP team proposed increases increase to branch drains (18.799x.29)		5.452
" " (92,000x.25)		23.000
		157.546
Increase by WB Factor		1.313
		206.858
Increased by O/M, contingencies and profit		1.634
M. So.Sh.		338.006
M. US$		3.756

The estimated breakdown is 75 percent FX and 25 percent LC.

4.7 Road System

Excluding the Mogadishu-Shalambood-Qorioley paved road, the target area has approximately 82 kilometers of roads, as follows:

- existing tracks, about 14 km
- O&M roads along canals and drains, about 68 km

The USAID Mission has determined that no new roads are necessary. Rehabilitation and upgrading of the existing road system is estimated as follows:

-O&M roads, coralstone surfacing, at So.Sh. 300/m^2, 68,000 x 3 x 300		61.200
-existing tracks coralstone surfacing, at So.Sh. 200/m^2 14,000 x 6 x 200		26.800
Total Road System	M. So.Shs.	78.000
or	M. US $	.866

The estimated breakdown is 60 percent FX and 40 percent LC.

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4.8 Distribution System

The physical rehabilitation undertaken by the project is currently assumed to cover only down to the farm gate or a group of small farms' gates, an area of not less than .25 hectares. Tertiary canals, with their quarternary outlets, would thus be part of the proposed rehabilitation work, while the quarternary network would be left to farmers and/or users' groups. This preliminary assumption could change over time, as more is learned. This assumption applies to tertiary drains as well.

TAMS provided for the following:

60 km of tertiary canals	M. So.Shs.	120.466
43.5 km of collector drains		10.685

These costs must be adjusted to take into account lack of concrete lining and increase in the area to be covered, as follows:

Distribution canals 60 km (TAMS)	120.466	
Decrease for unlined and 37% WB Factor 31.3% net	.827	
	99.625	
Increase 60 km to 114 km 52%	1.900	
	189.288	
Increase cost, O/H and profit	1.634	
M. So.Sh.	309.297	or
M. US $	3.437	
Collector drains (unlimited) (TAMS)	10.685	
Increased by WB Factor	1.313	
	26.795	
Increased cost, O/H and Profit	1.634	
M. So.Sh.	43.783	or
M. US $	.486	

The estimated breakdown is 40 percent FX and 60 percent LC.

Two Stages
Prelim/Final
Design Reports

SCOPE OF WORK

SHALAMBOOD IRRIGATION REHABILITATION

1. BACKGROUND

DRAFT

To be completed.

2. DETAILED SCOPE OF WORK

2.1 General

The Contractor is required to prepare a detailed engineering design leading to complete and comprehensive tender documents for the rehabilitation of the Shalambood irrigation system (apprx. 8,020 ha. net) and barrage at Genale in the Lower Shebelli Region.

The Contractor will:

1) Undertake or sub-contract for Complementary Investigations, including: preparation of base maps from aerial photos and topographical/ground surveys; and geotechnics/materials surveys of all major structures and channels.

2) Specify and conduct site investigations and strip surveys.

3) Undertake all additional surveys and investigations necessary for design to the required standard.

4) Design and specify all features of the works in such detail as will enable a competent international contractor to make an accurate estimate of costs on a sound basis for competitive bidding.

5) Prepare an estimate of the costs of the complete works based on a detailed analysis of current costs of similar works in Somalia modified by due consideration of the particular conditions prevailing in the project area and market forces applicable to international competitive bidding.

2.2 Basis Of Design .

The Contractor is required to note that irrigation is at present being carried out throughout the target area by means of a complex network of public and private channels and that the barrage at Genale though in a poor state of repair is in use. The design of the rehabilitated works will be based on the principles of:

- minimal disruption to farming;
- retention of existing farm boundaries as far as is reasonable and practicable;
- minimal acquisition of private land for new or rehabilitated channels;
- use of materials and methods of construction appropriate to Somalia.

The Contractor is further required to note that the design should lead to a phased civil works rehabilitation schedule as follows:

Phase 1: Genale barrage rehabilitation, Dhamme Yassin feeder reach and channel from second to fourth secondarios, including turnouts to second, third and fourth secondario. Fourth secondario rehabilitation with turnouts to tertiaries.

Phase 2: Dhamme Yassin to fifth and sixth secondarios. Drainage and pumping station. Road and track up-grading. Other secondarios (second, third, fifth, sixth) subject to land tenure situation and availability of funds.

The Complementary Investigations and Detailed Design will be completed for the entire target area. Two IFB's will be required, one for Phase 1 works and one for Phase 2. The Engineer's Analysis of Bids will be required for Phase 1 only.

2.3 Complementary Investigations

2.3.1 Aerial Photography and Mapping. • The contractor will undertake itself or sub-contract for aerial photography of the following:

Target Area	10,211 hectares
Target Area fringe 50 km x 0.2 km width	1,000 hectares
Total Area	11,211 hectares
Rounded to	12,000 hectares

Mapping will be undertaken or sub-contracted for as follows:

- ground stereo preparation (see ground survey);
- air photographs taken with 55-65% overlap on flightlines and 30-40% one line to the next;
- photogrammetric restitution with 2 sets of maps to produce:

  a) Blind Map with regular level spots, mean density 1 spot every 20 meters land (20 to 30 spot per hectare) level spots data to be digitalized on currently used disks, available to the owner;

  b) Present Land Use map with rivers, canals, roads, human settlements, etc. plus 0.20 or 0.25 meter interval contour lines, plus toponymy of the area, etc.

Required air photographs should be taken at a scale not more than 1:10,000, for enlargement to 1:2,000. The map background could be an orthophoto map from enlarged, rectified and assembled photographs (rectified mosaic map) so as to show most of the photograph details on the land use map.

Maps will be produced as follows:

	Scales
- Location Maps (including perimeter, borrow areasquarries, construction camp location, etc).	1:200,000 1:50,000
- Soils Map (irrigability, drainability, unusable lands etc)	1:10,000
- General Layout Maps - irrigation and drainage discharge distribution and channel sizes and types; - irrigation canals and drains structures, location and main characteristics;	1:10,000
- Detailed maps, alignments and curves of canals and drain axis, location of structure, coordinates, right of way limits, in perimeter borrow areas, etc.	1:2,000

2.3.2 Topography (Ground Survey) The Contractor will undertake stereo-preparation of the mapping operations, including the necessary second order base triangulation (12,000 hectares), as follows:

Canal and drain strip survey:

- longitudinal profiles, scale	H 1/2,000 V 1/50
- cross section, scale	H 1/200 V 1/200

Approximate lengths of longitudinal profiles are:

- Main canal (Yassin)	13 km
- Secondary (Branch canals)	35 km
- Main drain	8 km
- Secondary drains	30 km

The tertiary and quarternary canals and drains' alignments will be taken from the 1:2,000 scale maps. The approximate number of cross sections to be taken, at an average interval of 30-40 meters, or about 30 transverse profiles per kilometer, follows:

- Main canal (50 meter mean width)	400 transverse profiles
- Branch canals (30 meter mean width)	1,000 transverse profiles
- Main and branch drains	1,000 transverse profiles

All pofile data to be digitalized on currently in use disks.

The Contractor will undertake detailed analyses of irrigation system structures, as follows:

-Genale Barrage, area 1.5 ha. including detailed leveling of existing structure, with relevant cross sections and blow up details (1:100, 1:50 and 1:20);

-Existing and future main structure sites:

Approximate number	100
Approximate total area	10 hectares
Scales as required (1:100, 1:50 and/or 1:20)	

2.3.3 Geotechnic and Materials Investigations

Genale Barrage Investigation

Core drilling of structural samples of the Genale barrage shall be taken, 8 each, through 5 to 10 meter deep boreholes (estimated total length, 60 meters.); 15 to 20 samples will be drilled and tested (half disturbed and other half non-disturbed samples).

Main and Branch Canals

The geotechnic and materials survey will include the following investigations and analyses:

- observation pits (*)	(1.00 m depth)	20
- boreholes (*)	(1.50 m depth)	30
- undisturbed samples		10
- disturbed samples		60
- lab analyses, including size distribution, bulk density and specific weight, Atterberg limits and plasticity index, Proctor tests;		40

- triaxial shear tests and/or casagrande shear box tests under saturated and drained conditions)	20
- penetrometer test, at main structure sites	30

* Analysis will include soil and subsoil strata description, and water table level and conductivity.

Roads

The geotechnics and materials surveys will investigate:

- o road tracks along main and branch canals and drains investigated together with canals and drains;
- o road and track infrastructure and surfacing will require Los Angeles Rattler and California Bearing Rates tests.

Main Drainage System

The Contractor shall perform the following investigation tests for design of the main drainage system:

- Observation pits	10
- boreholes	15
- undisturbed samples	5
- disturbed samples	20
- shear tests	8
- penetrometer tests (main structures and pumping station sites)	5

Borrow Areas

The Contractor will identify and test approximately 10 hectares of borrow areas required to supply embankment materials:

- site number	3 to 5
- boreholes	20
- undisturbed samples	20
- disturbed samples	30
- shear tests for embankment design parameters	12

Construction Materials

The Contractor shall identify and analyse sites for supply of the following aggregate materials:

- sand;
- crushed gravel
- stone (building and rip rap)

Tests will include size distribution (sieve) analysis specific gracity, humidity content, CBR and other such tests as required to ensure suitability of materials for intended use.

Structural Concrete Conditions

The Contractor will undertake core drilling and testing of concrete cylinder from main existing structures in addition to those for the Genale barrage.

Soil Irrigabilityand Drainability

The Contractor will prepare a detailed, scale 1:10,000 soils map, including soil class and sub-classes as suitable for irrigation and for preliminary irrigation scheduling. Some insights on drainability are to be incorporated in the map, as required:

- observation pits	(.6 - .8 m depth)	10
- boreholes (auger)	(1.00-1.50m dpeth)	50
- sampling and analyses		60

2.4 Engineering Design. The Contractor will evaluate the conditions and undertake design of the Genale Barrage rehabilitation works. TAMS' preliminary design was based on the assumption that bulk part of the structural masonry of the barrage, including its foundation arrangements, was generally sound. The TAMS estimates are based on this assumption, with estimates that rehabilitation would require a limited amount of solid concrete reconstruction and a general replastering and refurbishing, with all the gates, stop logs and pipes and corresponding operation outfits, including hoists, gears, railings, etc. being pulled out and replaced by new ones.

At this stage, the PP Team thinks no major alteration to the TAMS engineering design will be necessary in the Final Design, except that, as usual and customary, maps, plans drawings, bill of quantities computations, etc. will be more detailed. It is hoped that no major changes will be required after the geotechnical and structural investigation and observation of the barrage are carried out.

The Contractor will determine and design the discharge trees for the irrigation and drainage, in cooperation with the

personnel at CARS and the MOA. Design concepts and parameters will include decisions based on Complementary Investigation, as regards:

- canals, drains, roads, and tracks typical sections;
- slope of banks, proportions width to depth, O and M roads and tracks, etc.;
- canals and drains rights of way and corresponding arrangements;
- origin of fill materials (canal and drain excavation and/or borrow areas);
- velocities (maximum and minimum), slopes, command head, etc.;
- regulators, partition and crossing structures, offtakes, turnouts, measuring arrangements, etc.;
- typical, provisional layouts for farm irrigation and drainage;
- tentative irrigation schedules (intervals and depths);
- provisional operation and maintenance procedures.

2.4.1 Layout. The underlying intent of the layout of channels is that farms as they exist at present will be provided with irrigation supplies and drainage. Each farm or group of farms down to 1 ha in area will have direct access to an irrigation channel at its lowest. The channel layout will conform to the alignments of existing channels in so far as this is consistent with the principles of good design.

No major change in the general layout and alignment of main and branch canals appears ~~appears~~ necessary. Some channel rights of way may have to be enlarged including the reaches for the desilting facility as well as for future drains.

Similarily, existing structures, after observation and analysis of their structural soundness, will need to be rehabilitated, including the replacement of gates and operating grears. No location change is anticipated at this time.

It is accepted that it will be necessary to locate some channels (essencially drainage) on what is currently cultivated land, and that some minor reallocation of land will be essential to preserve the technical viability of the channel system. The Contractor will prepare layout drawings and accompanying notes which clearly indicate where such encroachments on individual land holdings will occur with respect to the primary to quanternary channel layout over the area. In order to avoid disputes at the time of construction the Contractor will, in collaboration with the Ministry of

Agriculture, participate in meetings with representatives of the farming community to present the rationale of the layout and explain the detail of its impact on individual land holdings.

2.4.2 Water Management. The Contractor will prepare a detailed plan for water management of the system from the intakes to main canals through to the farm outlets. This will include details of the system of rotation of supplies between individual farms and the method to be used by the administration for distributing supplies when the available water is less than requirements. Detailof the administrative organization will be given with particular attention to the division of responsibility between farmers associations or groups on the minor channels and the Ministry of Agriculture's organization controlling the major canals. Collaboration with the SWMP 1 Technical Assistance Contractor, USAID, and the MOA is required.

2.4.3 Canal System. The canal system rehabilitation will be designed to cope with the heavy silt load of water from the Shabelli River. It is intended that the canal system will have the following features:

- a low-velocity head reach on the main canal in which a substantial proportion of the suspended sediment will be deposited. The width of this sedimentation reach will b such that silt can be removed by machines located on the banks, and provision will be made for the disposal of such material;

- a system of unlined main, branch and distributory canals which will convey the water emerging from the sedimentation reach with minimal sediment deposition or scour;

- a system of water courses and minor channels which will deliver water to each individual farm orgroup of farms down to 1 ha in size and to smaller farms as far as is reasonable. Since sediment will be deposited in these channels the design will be such as to ease the task of cleaning by farmers as far as practicable;

- a velocity that limits breeding of water borne disease carriers;

2.4.4 Drainage System. The drainage system will be designed to remove surface run off resulting from excess irrigation and storm rainfall. The criterion for storm run-off

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will be that flooding of low lying land will be limited to a maximum of four days durtation occuring more that once in five years.

Owing to the moderate to high salinity of water from the Shebelli river there is, in the long term, a risk of soil salinisation. In the short term, it is intended to provide a measure of water table control by the provision of 1.5 m deep open lateral drains (quaternary drains). The laterals are to be designed in such a manner that they could be modified to take the outfall of sub-surface field drainage pipes should these be economically justified in the future.

It is anticipated that until there is substantial subsurface drainage the water from the drainage system will be reusable for irrigation. The consultant will check the validity of this assumption. If it is confirmed as correct, the drainage system will be designed to discharge through a pump station back into a secondary canal which will be remodelled as necessary to carry the flow. Consideration of the problem of salinity shaws that, in the medium to long term, a regional drainage system will be required. The Contractor will therefore design the drainage outfall drain. Should the consultant show that the assumption that the drainage water is reusable is invalid, he will immediately alert USAID and the Ministry of Agriculture to the urgent need for a regional outfall.

2.4.5 Channel surveys and Design. In order to design primary and secondary canals and drains to a standard suitable for bid purposes it will be necessary for the Contractor to carry out surveys of alignments. To avoid repetition of this works in the construction phase, these alignments will be marked by robust concrete monuments, appropriately offset from the centreline, identifying intersection points and other points sufficient for positive identification of the alignments at a future date.

Rehabilitation of primary and secondary channels (canals and drains) will be designed for the complete channel network. Rehabilitation of tertiary and smaller channels will be designed in detail for such area as the Contractor may judge necessary in order to obtain an accurate determination of quantities. They shall be typified thereafter.

2.4.6 Structure - Irrigation Systems

The Contractor will privide detailed designs for all structures required throughout the irrigation system. Drawings are required in sufficient detail for bid purposes.

Regulating structures will be robust, easily maintained and easily operated. Upstream control will apply.

Structures will be designed to withstand the effects of the expansive clays found in the project area.

Flow measurement is required to an accurecy of ± 5% at the heads of primary, secondary and tertiary canals. This may be provided by calibration of the control structure or by a separate device in each case.

2.4.7 Drainage Pump Station

A full specification for the drainage pumps will be provided by the consultant to enable the contractor to obtain quotations from reputable manufacturers and provide detailed drawings in support of this tender.

The pump station will designed as a structure appropriate for typical pumps as specified. Drawings will be provided in sufficient detail for the contractor to have a clear perception of the structure required.

2.4.8 On-farm works. On-farm works to be designed in collaboration with the farmers during implementation.

2.4.9 Barrage. Designs will be prepared for the rehabilitation of the Genale barrage. These will be based on site investigations and tests on the existing structures as deemed necessary by the Contractor.

Drawings of the control gates will be provided by the consultant, and the gates will be provided by the consultant, and the gates will be specified in sufficient detail for the Contractor to obtain quotations from reputable manufacturers and provide sample detailed drawings in support of his tender.

The design for the structures will be complete to the extent compatible with flexibility in the final dimensions of the gates.

The hydraulic design of the works downstream of the gates will take account of the energy dissipation required under all flow conditions and the need for permanent stablisation of the scour hole downstream of each structure.

Design will be based on a thorough appreciation of the regime of the river flow and the range of functional requirements for the passing or diversion of flow.

The problems caused by the heavy silt load and floating debris will be addressed in the design. The structure will be robust. The gates will be robust, easy to operate and easy to maintain.

2.4.10 Implementation Schedule. The Contractor will prepare a schedule for implementation of the rehabilitation. This will include a plan for the maintenance of irrigation supplies to farmers during construction and the minimisation of disruption to agriculture.

3. Preparation of IFB

3.1. Documents. The Contractor will provide two comprehensive sets of tender documents one each for phase 1 and Phase 2, including:

- General and particular conditions of contract
- Specification of all works
- Bills of Quantities
- Tender drawings

3.2 Engineer's Analysis of Bids - Phase 1 Only. The Contractor will assist and advise the client as required in the process of putting the Phase 1 work out to tender. Following the opening of bids the Contractor will analyse and evaluate the bids received and prepare a report to the client with his recommendations.

4. Timing and Duration of Services

The Contractor will mobilize his team and commence his services within 30 days of signing the contract agreement.

Complete draft tender document will be submitted to USAID and the Ministry of Agriculture:

- by 31 December, 1988 for Genale barrage;
- by 31 March, 1989 for the irrigation system Phase 1;
- by 30 June, 1990 for the complete target area.

Final tender documents will be completed and submitted within six weeks of approval of the drafts.

4. Reporting

The contractor will submit the following reports:

- The inception report setting out design concepts and criteria, within thirty days of commencement of services;

- Brief monthly notes of progress; and

- Working papers, produced in the course of services on topics affecting design e.g. water management.

5. Standardization of Structures

In order to avoid the proliferation in Somalia of different types of minor structures such as culverts, turn-outs, and smaller canal head regulators, the contractor will endeavour to standardize on designs used elsewhere by the Ministry of Agriculture where these are appropriate.

6. Site Investigation

The contractor will be required to specify and conduct site investigations for the rehabilitation of Genale barrage. The cost of these investigations will be included in the design services.

7. Cadastral Survey

A detailed cadastral survey of the target area will be carried out during Phase 2 of project implementation, but will be initiated during the preparation stage at a limited area.

8. Topographic Surveys

The consultant will carry out longitudinal surveys of the alignments of primary and secondary canals and drains as a basis for his design. The cost of these surveys will be included in the oveall fee for services.

9. Transport and Office Facilities

The consultant will provide transport and office accommodation for his team while working in Somalia.

10. Staffing and Logistics

The following illustrative listing of staffing and logistics has been developed as a basis for cost estimates.

Design Staffing

- 1 Design Team Leader, a Professional Engineer with at least 10 years experience in design of irrigation and drainage system in developing countries, and coordination of design teams (Expatriate)	15 pm
- 1 Hydraulic-Irrigation Engineer, minimum 5 years experience (Expatriate or Somali)	9 pm
- 1 Soil Scientist-Tropical Agronomist, 15 years experience in tropical rural systems (Expatriate)	3 pm
- 2 Soil Scientists (Somali)	18 pm
- 1 Drainage Engineer, minimum 5 years experience (Expatriate)	4 pm
- 1 Concrete Barrage and Dam Expert, at least 15 years of experience in the field (Expatriate)	1.5 pm
- 1 Foundation Geotechnician, with 15 years experience or more, particularly in structures founded on clayey soils (Expatriate)	1.5 pm
- 1 Slide and Sluice Gate Specialist with 10 years minimum experience in barrage and irrigation structure equipment (Expatriate)	1 pm
- 1 Civil Works Engineer, experienced structures (offtakes, turunouts, etc.) including existing structures rehabilitation (Somali)	2 pm
- 1 Senior Irrigation-Drainage Design Specialist, more than 15 years experience, for inception and supervision of the design activities (Expatriate)	3 pm

- 1 Drawing Office Manager and Supervisor in-charge of 10-12 draftsmen, quantity surveyors, for map and drawing production, more than 10 years, experience, (Expatriate or Somali) 14 pm

- 10-12 Draftsmen and Quantity surveyors with Civil Works experience (Somali) x 15 mos 150 pm

- 1 Junior Engineer, trained in micro-computer operations for hydraulics and civil works computations and quantity survey (Somali) 15 pm

- Typists, clerks, drivers, non-professional personnel (Somalis) 75 pm

In total, over a period of 15 months:

52 person months	Expatriates
260 person months	Somalis

Somali staff would be from a private organization, joint venturing with or subcontracted by the Design Engineer with approval of MOA and USAID. The Engineer could do in-house sub-contract for the aerial photos and mapping, topo/ground survey (possibly the Somali firm for part of this), and geotechnics tests.

Design Equipment and Housing

Imported Design Equipment

- Word Processor	1
- Photocopier	1
- Micro-computer (20 Mbytes capacity)	1
- Printer and Tracing Table (Plotter)	1
- Drawing tables, stools and drawing sets, rulers, triangle, hand calculators, etc.	0
- Blue printing machine	1

Offices

The Design Team will require an adequate space to accommodate:

399x

3 Engineers Offices	m^2	60
1 Secretarial Office	m^2	25
1 Drawing hall (10 tables)	m^2	75
1 Blue print room	m^2	20
TOTAL	m^2	180

Transportation

2 long frame 4 WD 8 seat cars
3 short frame 4 WD 8 seats cars
1 small 15 seats, personnel bus

11. Estimated Costs of Engineering Design

Follwing are the estimated costs of the engineering design. Note that the standard costs used in the PP and not always applied. The Contractor will have duty-free entry and AID privileges but no FSU support. Lodging is thus assumed to be less expensive, as due to the short duration of the contract "westernization" will not be required. The Contractor will be required to provide all support under the contract.

ENGINEERING DESIGN COSTS
(U.S. $ 1,000 @ So.Sh. 90 = US $ 1.00)

	FX	LC Equivalent	TOTAL
1. PERSONNEL			
Expatriate			
52 pm x $ 15	780.0	-	780.0
Somali			
260 pm x $ 300	-	78.0	78.0
2. EQUIPMENT			
Office & Field	60.0	20.0	80.0
Vehicles 6 x $ 22	132.0	-	132.0
3. OPERATING			
Office rental & Utilities	-	30.0	30.0
O&M 15m x $ 5	25.0	75.0	100.0
4. SUB-CONTRACTS			
Mapping - 12,000ha. @$ 18	162.0	54.0	216.0
Topo/Ground	120.0	130.0	250.0
Geotech/mat.	10.0	10.0	20.0
	1,289.0	397.0	1,686.0

ANNEX P

ENVIRONMENTAL THRESHOLD DECISION

ANNEX P: ENVIRONMENTAL THRESHOLD DECISION

1. Project: Shebelli Water Management (649-0129)
2. Country: Somalia
3. Funding: $ 50 Million
4. Life of Project: 10 years
5. Environmental Threshold Decisions Recommended:

   A positive threshold determination for project component 1, with Environment Assessment recommended, a negative determination for project component 2, and a positive threshold determination for project component 3 with Environmental Assessment recommended.

I. Description of Project Activities

The project is an integrated effort to increase the production of agriculture in a portion of the Shebelli River Basin by improving the system of water allocation and management and cropping methods. Project efforts will focus on three components:

1. Strengthening the GSDR capability for Shebelli River management and administration basin-wide;

2. Strengthening supportive adaptive irrigated agricultural and software research, and

3. Upgrading irrigation system infrastructure to improve the intensity and efficiency of irrigated agriculture in the Shalambood target area.

Component No.1, strengthening GSDR capability for Shebelli River management and administration, will consist of provision of long and short term technical assistance, training, and commodities to assist the GSDR in establishing a more appropriate management system for river resources.

Component No.2, strengthening adaptive irrigated agricultural research, will consist of provision of short and long term technical assistance and commodities to develop improved packages of tested irrigated technologies for the production of key food crops. Additional tasks undertaken under this component will include technical assistance for baseline socio-economic studies and funding for formal and nonformal training activities. A small amount of funding will be used to construct housing for the use of project-financed technical assistance personnel, renovate offices and laboratories, and to rehabilitate irrigation works, as needed, on the project's experimental agricultural research facilities in Afgoi.

402x

Component No.3, upgrading Shalambood irrigation infrastructure to improve the efficiency and intensity of irrigated agriculture, will consist of engineering design and related studies and rehabilitation of the physical infrastructure of irrigation along a portion of the Shebelli River. The bulk of construction and rehabilitation activities will occur during Phase 2 of the Project.

II. Environmental Discussion

The activities to be undertaken under component No.1 of the project fall within classes of actions not generally subject to the environmental procedures set forth in Section 216.3 of Regulation 16. The activities fall within the category of "education, technical assistance, or training programs" or alternatively could be considered "studies, projects, or programs intended to develop the capability of recipient countries to engage in development planning." These activities normally do not have direct effects on the environment, and therefore are eligible for categorical exclusion under Section 216.2 c (2)(i) and (xiv) of Regulation 16. In this case, however, the basinwide technical assistance will establish engineering and design criteria for basinwide irrigation infrastructure design, maintenance and operations, with an ensuing direct impact on the environment. A positive threshold determination with Environmental Assessment is recommended.

The activities to be undertaken under Project Component No.2 fall generally within the classes of actions not subject to the environmental procedures set forth in Section 216.3, since they comprise "controlled experimentation exclusively for the purpose of research and field evaluation which are confined to small areas and carefully monitored." [Section 216.2 c (2)(ii)]. However, to the extent that any housing units are renovated or constructed using project funds under this component, such activities can not be considered for a categorical exclusion.

No more than approximately $ 600,000 in foreign exchange costs and local currency equivalent is anticipated to be spent for housing and office construction under this component over the life of the project. The bulk of these expenditures will be in Somali shillings which will be contributed by the GSDR. AID funds will only be used, if necessary, for imported construction commodities. It is anticipated that only four residencies and a guesthouse for research technical assistance at Afgoi, a guesthouse for technical assistance to water users' groups at Genale, and a limited amount of new agricultural research offices/lab space at CARS in Afgoi will be built under this component of the project, and any environmental efforts of this construction will be minimal. A negative determination for this project component is recommended.

The activities to be undertaken under component No.3 of the project are of the classes of actions normally having a significant effect on the environment and under section 216.2 (d)(1)(ii), irrigation or water management projects require an Environmental Assessment or IEE to be prepared. A draft scoping statement for the environmental assessment has been prepared and circulated for comment within the Africa Bureau. The Environmental Assessment will consider primarily those aspects of the project which will be funded under Phase 2 of the project, and will thus be completed prior to the time funds are obligated for such Phase 2 construction or rehabilitation; any mitigating measures recommended will be included in the final design of Phase 2. However, the critical irrigation system rehabilitation and basinwide design and management activities to be funded under Phase 1 will also be considered in the E.A.

Only the most urgently required rehabilitation activities - rehabilitation of the Genale barrage, rehabilitation of the Yassin canal feeder reach and possible new desiltation facility, rehabilitation of one secondary canal and control gates along the Yassin - will be funded under Phase 1. For these urgently required activities, funds will be obligated prior to commencement of the Environmental Assessment. In order to avoid an irreversible commitment of resources for these activities before environmental review is completed, a requirement for the completion of environmental review of these activities will be included in the Grant Agreement as a condition precedent to disbursement of irrigation system rehabilitation funds.

III. Recommendations

It is recommended that you:

a. Approve a categorical positive threshold determination and the attached scope for an Environmental Assessment of activities in project component No.1;
b. Approve a negative determination for activities in project component No.2, and
c. Approve a positive threshold determination for activities in project component No.3 and the attached scope for an Environmental Assessment of this component.

Action Recommended by: _____
Mission Director

Cleared by: _____
Bureau Legal Advisor

Approved by: _____
AA/AFR

Concurrence: _____
rica Bureau Environmental Officer

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PP RUEHC RUEHNR
DE RUEHMG #3764/01 098 **
ZNR UUUUU
P 081220Z APR 87
FM AMEMBASSY MOGADISHU
TO RUEHC / SECSTATE WASHDC PRIORITY 6965
INFO RUEHNR / AMEMBASSY NAIROBI 8123
BT
UNCLAS SECTION 01 OF * MOGADISHU 03764

CLASS: UNCLASSIFIED
CHRGE: AID 4/6/87
APPRV: A/DIR:DPFEIFFEI
DRFTD: PROJ:DPHINDL
CLEAR: 1.A/DD:EBIRGEL
2.ENG:SPATTON
3.AGR:RCARPENTI
DISTR: A/DIR A/CDA A/I
PROJ ENG

AIDAC

FOR AFR/TR/PRO, BESSIE BOYD AND NAIROBI FOR REDSO GAUDET AND RLA

E.O. 12356: N/A
SUBJECT: SOMALIA - SHEBELLI WATER MANAGEMENT PROJECT (649-0129) - REVISED SCOPING STATEMENT FOR ENVIRONMENTAL ASSESSMENT ACTIVITIES

REF: NAIROBI 05422

1. NOW THAT PROJECT COMPONENTS HAVE BECOME BETTER DEFINED, USAID/SOMALIA BELIEVES THAT REFTEL SCOPING STATEMENT FOR ENVIRONMENTAL ASSESSMENT REQUIRES MODIFICATION TO ADDRESS A NARROWER RANGE OF ISSUES TAILORED TO PROJECT INTERVENTIONS WHICH WILL BE PROPOSED IN THE PP. A REVISED SCOPING STATEMENT, AS REQUIRED BY REG 16, SECTION 26.3 (A) (4) IS HEREBY SUBMITTED FOR REVIEW BY THE BUREAU ENVIRONMENTAL OFFICER. AN ENVIRONMENTAL THRESHOLD DETERMINATION WAS DRAFTED BY RLA FOR INCLUSION IN PP, AND ITS RECOMMENDATIONS ARE REFERENCED BELOW.

2. PROJECT COMPONENTS:

(A) LONG AND SHORT TERM TECHNICAL ASSISTANCE TO STRENGTHEN MOA CAPACITY TO MANAGE THE SHEBELLI RIVER IRRIGATION SYSTEM. THIS COMPONENT WILL INVOLVE: A LAND REGISTRATION CAMPAIGN; COMPUTERIZED HYDRAULIC MODELLING TO ESTABLISH A WATER ALLOCATION SYSTEM; ASSISTANCE IN FINALIZATION OF AN EQUITABLE NATIONAL WATER LAW; TRAINING AND STUDIES TO ESTABLISH EFFECTIVE MANAGEMENT, REPAIR AND MAINTENANCE PROGRAMS FOR THE SYSTEM'S EXISTING WATER CONTROL STRUCTURES (BARRAGES, WEIRS AND RESERVOIR); THE ESTABLISHMENT OF POLICIES ON WATER PRICING AND SUB-SECTORAL ALLOCATION OF IRRIGATION WATER (E.G. BETWEEN PERENNIAL AND ANNUAL CROPPING SYSTEMS); AND PROCUREMENT OF SUPPORTIVE COMMUNICATIONS AND OFFICE EQUIPMENT. TRAINING AND TECHNICAL ASSISTANCE WILL TARGET THE MOA DIRECTORATES OF IRRIGATION/LAND USE, RESEARCH STAFF, AND WATER USERS' ASSOCIATIONS IN THE SHALAMBOOD SUB-AREA. RLA HAS RECOMMENDED A CATEGORIAL EXCLUSION FOR THIS COMPONENT BASED ON LEGAL INTERPRETATION OF REG. 216. HOWEVER MEO BELIEVES AND PROJECT COMMITTEE AGREES THAT THE STANDARDS SET BY THE

BASIN WIDE TECHNICAL ASSISTANCE COMPONENT WILL HAVE A DIRECT EFFECT ON THE ENVIRONMENT AND SHOULD THEREFORE BE INCLUDED IN THE ASSESSMENT. A POSITIVE THRESHOLD DETERMINATION IS THEREFORE RECOMMENDED FOR THIS COMPONENT, WITH E.A. REQUIRED.

(B) IRRIGATED ADAPTIVE AGRICULTURAL RESEARCH: LONG-TERM AND SHORT-TERM RESIDENT TECHNICAL ASSISTANCE WILL BE PROVIDED TO CONDUCT PRODUCTION-ORIENTED RESEARCH AND TRAINING ON A SELECT AGENDA OF ON-FARM WATER MANAGEMENT AND CROP-SOIL WATER RESPONSE ISSUES. THIS RESEARCH IS DESIGNED TO INCREASE THE INTENSITY AND EFFICIENCY OF IRRIGATED PRODUCTION. THE RESEARCH WILL BE SUPPORTED BY CONSTRUCTION OF 4 HOUSING UNITS, A GUEST HOUSE, AND A LIMITED AMOUNT OF LABORATORY/OFFICE SPACE AT THE AFGOI CARS RESEARCH STATION, AND A GUEST HOUSE AT THE EXTENSION TRAINING CENTER IN GENALE. THE PP WILL RECOMMEND A NEGATIVE DETERMINATION FOR THIS COMPONENT, SINCE ENVIRONMENTAL EFFECTS OF THIS LIMITED CONSTRUCTION WILL BE MINIMAL.

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(C) UPGRADING OF EXISTING INFRASTRUCTURE TO ADDRESS THE MOST PRESSING WATER CONTROL NEEDS IN THE SHALAMBOOD SUB-AREA. PROJECT-FUNDED A & E DESIGN AND CONSTRUCTION CONTRACTS WILL:

- (1) REPAIR INOPERABLE WATER CONTROL EQUIPMENT WHICH IS PART OF THE EXISTING GENALE BARRAGE;
- (2) REPAIR OR REPLACE HEAD REGULATORS AND GATES AND DESILT PORTIONS OF:
- (A) THE DHAMME YASSIN PRIMARY CANAL,
- (B) THE FEEDER REACH WHICH CONNECTS THIS CANAL TO THE BARRAGE, AND
- (C) THE FOURTH SECONDARIO CANAL (A SECONDARY CANAL WHICH PREDOMINANTLY SERVES SMALLHOLDERS WITH POOR ACCESS TO IRRIGATION WATER).
- THIS PACKAGE OF REHABILITATION ACTIVITIES WILL ALLOW THE PROJECT TO IMPROVE WATER DELIVERY TO A PILOT GROUP OF SMALLHOLDERS DURING THE SECOND HALF OF PHASE 1, TO TEST USERS' WILLINGNESS TO INVEST IN RECURRENT COSTS THROUGH USER FEES, WILLINGNESS TO ADOPT IMPROVED
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ADAPTIVE RESEARCH, AND MULTIPLIER EFFECTS GENERATED BY SMALLHOLDER INVESTMENT.

- A POSITIVE THRESHOLD DETERMINATION IS RECOMMENDED FOR THIS COMPONENT, WITH ENVIRONMENTAL ASSESSMENT RECOMMENDED.

(3) ENVIRONMENTAL CONCERNS. THE MAJOR PROJECT-RELATED ENVIRONMENTAL CONCERNS ARE: (1) SALINITY PROBLEMS ASSOCIATED WITH WATER AND SOIL MANAGEMENT; (2) ENVIRONMENTAL HEALTH PROBLEMS ASSOCIATED WITH IRRIGATION PRACTICE; AND (3) POLLUTION OF LOCAL AND DOWNSTREAM WATERS ASSOCIATED WITH FERTILIZER AND PESTICIDE USE. ENVIRONMENTAL ASSESSMENT WILL BE AN ON-GOING ACTIVITY WITHIN SWMP. IT WILL BE PHASED SO AS TO CONTRIBUTE ANY INFORMATION NEEDED DURING THE PREPARATION OF DESIGN

- STANDARDS FOR REHABILITATION OF THE CONTROL STRUCTURES EARLY IN THE PROJECT, AND WILL CONTINUE DURING THE PREPARATION OF BASINWIDE WATER MANAGEMENT, OPERATIONS AND MAINTENANCE PROGRAMS. IT WILL ALSO BE AN INTEGRAL PART OF THE MONITORING AND RESEARCH COMPONENTS OF THE PROJECT, AND WILL BE ORGANIZED SO AS TO CONTRIBUTE AN EA FOR THE DESIGN OF PHASE 2.

4. ENVIRONMENTAL ISSUES TO BE OMITTED:

(A) LAND CLEARING (PRESENT SCHEME ALREADY LAID OUT; LAND ALREADY CLEARED; ONLY MINOR EARTH MOVING NEEDED TO REFINE EXISTING PLOT LEVELS).

(B) FLOODING (CONTROL FEATURES ALREADY IN PLACE ARE ADEQUATE ACCORDING TO 1986 GSDR/TAMS STUDY.

(C) ENDANGERED SPECIES (AREA HAS BEEN UNDER INTENSIVE CULTIVATION SINCE 1930; ONLY NATURAL AREAS LEFT ARE WAYSIDE SUMPS).

(D) AQUATIC WEEDS (WEED FLORA ALREADY IN EXISTENCE FOR 50 YEARS; MECHANICAL CONTROL IS THE ONLY CONTROL METHOD PRESENTLY USED).

5. ENVIRONMENTAL ASSESSMENT STAFFING AND OVERVIEW OF EA ACTIVITIES:
ENVIRONMENTAL ASSESSMENT ACTIVITIES WILL BE INTEGRATED INTO THE WORK PLANS OF LT AND ST TECHNICAL ADVISORS FUNDED BY THE PROJECT, ESPECIALLY: THE ENGINEERING DESIGN FIRM HIRED TO PREPARE THE IEE FOR THE PHASE 1 SHALAMBOOD REHABILITATION CONTRACT; THE FOUR LT ADVISORS BASED AT DILU IN THE MOA TO DEVELOP BASINWIDE WATER MANAGEMENT GUIDELINES, PLANS, AND POLICIES; AND THE LT RESEARCH ADVISORS BASED AT CARS IN AFGOI TO DEVELOP TECH

- PARS FOR IMPROVED SOIL MANAGEMENT, CROP YIELDS AND CROP ROTATIONS. ST TA (6 PERSON MONTHS) BY A WATER BORNE DISEASE SPECIALIST WILL BE FUNDED OVER THE FIRST 3 YEARS

OF PHASE 1, TO STRUCTURE INPUTS TO THE BASELINE STUDY AND MONITORING AND EVALUATION PLANS THAT WILL TRACK THE IMPACT OF ENGINEERING DESIGN PLANNED TO MITIGATE THIS ENVIRONMENTAL PROBLEM. FINALLY, THE MS DEGREE IN IRRIGATION'S CURRICULUM (PLANNED FOR DELIVERY BY A U.S. UNIVERSITY IN COLLABORATION WITH THE SOMALI NATIONAL UNIVERSITY'S FACULTY OF AGRICULTURE) WILL INCLUDE A REQUIRED COURSE ON ENVIRONMENTAL IMPACTS OF IRRIGATION AND THEIR MITIGATION, TO SENSITIZE SOMALIA'S FUTURE IRRIGATION DESIGNERS AND MANAGERS TO THESE ENVIRONMENTAL ISSUES.

6. SPECIFIC ENVIRONMENTAL ASSESSMENT ACTIVITIES:

(A) THE CHIEF OF PARTY OF THE LT TA CONTRACT FUNDED BY SWMP1 WILL COORDINATE EA ACTIVITIES AS FOLLOWS:

- (1) HE/SHE WILL COORDINATE ALL SHORT-TERM TECHNICAL ASSISTANCE, COUNTERPART STAFF AND TECHNICAL SERVICES IN A TEAM EFFORT TO ADDRESS THE ENVIRONMENTAL CONCERNS IN PARA 3 ABOVE.

- (2) HE/SHE WILL INSURE THAT THE EA COMPONENTS, AS

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OUTLINED BELOW ARE KEPT ON TRACK.

(B) SPECIFIC SURVEYS, REVIEWS AND MONITORING:

- (1) A BASELINE STUDY AND MONITORING PROGRAM WILL BE SET UP TO SAMPLE, ANALYZE AND RECORD ALL MAJOR QUALITATIVE AND QUANTITATIVE PARAMETERS IN REGARD TO WATER, SOIL, DISEASE INCIDENCE AND DISEASE VECTORS.

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- (2) DURING THE BASELINE STUDY, FARMS IN THE PROJECT AREA AND SURROUNDING MARKET TOWN SUPPLY CENTERS WILL BE SURVEYED TO IDENTIFY AGRO-CHEMICALS, EQUIPMENT AND APPLICATION TECHNIQUES NOW IN USE.

- (3) A SOIL MANAGEMENT AND CROP ROTATION RESEARCH PROGRAM WILL BE ESTABLISHED TO INCLUDE RESEARCH INTO LOCAL SALINITY PROBLEMS AND SALINITY REVERSAL. ONCE RESEARCH RESULTS ARE AVAILABLE, SMALL SCALE PILOT DEMONSTRATIONS WILL BE SET UP ON FARMERS' FIELDS IN SHALAMBOOD.

- (4) A TRAINING PROGRAM WILL BE ESTABLISHED IN COOPERATION WITH AFMET AND SHALAMBOOD WATER USERS' ASSOCIATIONS TO PROVIDE TRAINING FOR FARMERS AND EXTENSION AGENTS IN PUBLIC HEALTH, PESTICIDES AND ENVIRONMENTALLY SAFE IRRIGATION PRACTICES AT ETC GENALE.

(C) MITIGATION OF IMPACTS:

- (1) DURING A AND E DESIGN, A DETAILED SET OF MITIGATION MEASURES WILL BE PREPARED FOR APPLICATION TO THE SWMP IRRIGATION REHABILITATION/CONSTRUCTION ACTIVITIES PLANNED FOR SHALAMBOOD. THESE MITIGATION MEASURES WILL BE INCORPORATED INTO AID'S IFB FOR FIXED PRICE CONSTRUCTION SERVICES.

- (2) IN PHASE 1 YEAR 3, THE EFFECTIVENESS OF THE ABOVE MITIGATION MEASURES WILL BE EVALUATED.

- (3) IN YEAR 4 (SECOND EVALUATION), A DETAILED SET OF MITIGATION MEASURES WILL BE DEVELOPED FOR USE IN THE DESIGN OF PHASE 2 PROJECT ACTIVITIES (CONSTRUCTION, RESEARCH, AND TRAINING).

- (4) PESTICIDES PROCURED UNDER SWMP WILL BE SELECTED IN ACCORDANCE WITH USAID/SOMALIA PEST MANAGEMENT GUIDELINES.

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- (5) MISSION PEST MANAGEMENT GUIDELINES WILL BE BROUGHT UP TO DATE, AND AID/W (ST/AGR/AP) WILL BE KEPT INFORMED OF THE KIND AND QUANTITY OF PESTICIDES BEING USED IN THE TARGET AREA.

- (6) LT RESEARCHERS WILL CONFER PERIODICALLY WITH THE MISSION AND REGIONAL ENVIRONMENTAL OFFICER TO INSURE THAT REG16 PROCEDURES ARE BEING FOLLOWED.

(D) LT SWMP TA - SPECIAL DUTIES:

- (1) EARLY IN PROJECT IMPLEMENTATION, LT RESEARCHERS WILL PROVIDE A PLAN FOR COLLABORATION WITH GSER COUNTERPARTS ON THE MONITORING, EVALUATION AND RESEARCH ACTIVITIES NEEDED TO COMPLETE THE TASKS IN B AND C ABOVE.

- (2) THE SHALAMBOOD A & E DESIGN FIRM AND LT RESEARCHERS WILL OUTLINE AND INITIATE A SMALL RESEARCH PROGRAM TO DETERMINE THE EFFECT OF DIFFERENCES IN WATER TURBIDITY (AND/OR SILT LOAD) AND WATER VELOCITY ON DISEASE VECTORS IN LOCAL CANALS AT THE PRIMARY, SECONDARY, TERTIARY AND QUARTERNARY LEVEL. BASED IN THE FINDINGS, THEY WILL THEN DEVELOP A SIMPLE MODEL TO DEMONSTRATE HOW THE DESIGN FEATURES OF THE PROJECT CANALS CAN BE MODIFIED TO ELIMINATE DISEASE VECTORS SUCH AS BILHARZIA SNAILS AND MALARIAL MOSQUITOES.

- (3) LT RESEARCHERS WILL UNDERTAKE A DETAILED CRITICAL REVIEW OF SWMP RESEARCH DESIGNS AND ANY RECOMMENDED AGRICULTURAL PACKAGES CONTAINING FERTILIZER
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IMPROVED SEED, INSECTICIDES AND HERBICIDES WHICH RESULT FROM THIS RESEARCH. SUCH PACKAGES WILL BE COMPARED TO THOSE RECOMMENDED IN THE USAID PEST MANAGEMENT GUIDELINES FOR SOMALIA.

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- (4) LT ADVISORS TO DILU WILL REVIEW ALL OF THE SWMP PROJECT DESIGNS AND RECOMMEND BASINWIDE DESIGN, OPERATION, AND MAINTENANCE PLANS FOR DRAINAGE AND STORAGE THAT ENSURE THAT ANY PROJECT INTERVENTION INVOLVING STANDING WATER INCLUDES SOME FEATURE TO PREVENT DISEASE VECTOR BUILD-UP.

- (5) DURING PHASE 1, LT ADVISORS WILL ORGANIZE A POLICY-LEVEL, SEMINAR-WORKSHOP WHICH BRINGS TOGETHER GSDR ENTITIES AND DONORS INVOLVED IN SHEBELLI PROJECTS, AS A FORUM TO PRESENT PRELIMINARY DATA AND FINDINGS OF THE EA ACTIVITIES (E.G. PRESENTATION TO THE SHEBELLI DONORS' COORDINATION COMMITTEE).

7. THE PP IS NOW BEING FINALIZED, THEREFORE MISSION WOULD APPRECIATE ACTION, ASAP. WE RECEIVED NO RESPONSE TO THE REDSO/ESA PRELIMINARY SCOPING STATEMENT (REFTEL), THOUGH MORE THAN SIX WEEKS HAVE ELAPSED SINCE ITS SUBMISSION TO AID/W. PLEASE COPY RESPONSE TO REDSO/ESA REGIONAL ENVIRONMENTAL OFFICER. PFEIFFER
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ANNEX Q

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ANNEX Q: BIBLIOGRAPHY

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ANNEX R

DRAFT PROJECT AUTHORIZATION

DRAFT PROJECT AUTHORIZATION

Name of Country: Somali Democratic Republic

Name of Project: Shebelli Water Management

Number of Project: 649-0129

1. Pursuant to section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Shebelli Water Management Project (The "Project") for the Somali Democratic Republic (The "Cooperating Country") involving obligations not to exceed twenty two million six hundred thousand dollars ($22.6 million) in grant funds over a four year period, subject to the availability of funds in accordance with the AID OYB allotment process, to help in the financing of foreign exchange and local currency costs required for the Project. The planned life of the Project is approximately five years from the date of initial obligation (actual PACD September 30, 1992).

2. The Project will consist of development of a basinwide water management system, adaptive irrigated agricultural research, and rehabilitation of a portion of the Shalambood irrigation system on the Shebelli River, to assist the Cooperating Country to increase its food production and manage its water resources more effectively for irrigation. AID will finance technical assistance, training, commodities (including vehicles), design and construction, operational support, audits and evaluation.

3. The Project Agreement, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with AID regulations and delegations of authority, shall be subject to the following essential terms, covenants and major conditions, together with such other terms and conditions as AID may deem appropriate.

4. a. Source and Origin of Commodities, Nationality of Services:

Commodities financed by AID under the Project shall have their source and origin in the Cooperating Country or in countries included in AID Geographic Code 941, except as AID may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have the Cooperating Country or countries included in AID Geographic Code 941 as their place of nationality, except as AID may otherwise agree in writing. Ocean shipping financed by AID under the Project shall, except as AID may otherwise agree in writing, be financed on flag vessels of the United States, other countries included in Code 941, and the Cooperating Country.

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b. Conditions Precedent to Disbursement:

First Disbursement:

Prior to the first disbursement under the Grant, or to the issuance by AID of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

1) A statement of the name of the person holding or acting in the office of the Grantee specified in Section 8.3 of the Grant Agreement, and of any additional representatives, together with a specific signature of each person specified in such statement.

2) A letter from the Ministry of Finance which indicates that the Ministry of Finance has reviewed the annual local currency requirements for the Project and that such requirements will be included in the Annual Budget Programming Document.

3) A letter from the Ministry of Agriculture which confirms that the Shebelli Steering Committee and the Shebelli Donors' Coordinating Committee have been established along with names, titles, and functions of the persons who will serve on each of these Committees.

4) A letter from the Ministry of Finance confirming that personnel, construction and commodities financed by AID under the Grant shall be exempt from all GSDR taxes and duties.

Subsequent Disbursements:

1) As condition precedent to AID's signature of the Project's construction contract for rehabilitation of irrigation infrastructure, the Grantee agrees to elevate the Ministry of Agriculture's Department of Land and Water Resources (DLWR) to the level of a Directorate of Irrigation and Land Use (DILU). This Directorate will be headed by a Director General who will report directly to the Permanent Secretary of the Ministry of Agriculture. The Directorate will be vested with all functions, authorities and responsibilities currently under the jurisdiction of the DLWR, notably land registration, allocation of Shebelli River irrigation water, and operations and maintenance of all irrigation canals and water control structures along the Shebelli River, as well as direct pumping from the river (except for the Balad and Kurtenwaare Barrages, if these have not yet been transferred to DLWR control). In addition the Grantee confirms that, consonant with its status, the MOA Directorate of Irrigation and Land Use will be empowered to provide renumeration levels acceptable to AID for DILU staff.

2) As a condition precedent to AID's signature of a construction contract for rehabilitation of irrigation infrastructure under this project, the Grantee agrees to transfer responsibilities for all control, operations and maintenance of the Balad and Kurtenwaare Barrages to the MOA Directorate of Irrigation and Land Use, and to transfer any GSDR financial support for the operation, staffing, and maintenance of these barrages to this Directorate's budget allocation.

3) As a condition precedent to AID's signature of a construction contract for rehabilitation of irrigation infrastructure under this project, the Grantee agrees that an environmental review of the IFB must be completed, and satisfactory provision for any necessary environmental mitigation must be included in the final bid documents and ancillary engineering designs.

4) As a condition precendent to disbursement of M.S. training funds, the Grantee agrees that the Somali National University will award Master's degrees in Irrigation or Agronomy to trainees who successfully complete the long term in-country training program outlined in Annex N of the Project Paper.

c) Special Covenants:

1) The Grantee agrees to make appropriate staff available for training programs and to serve as counterparts for the long and short term technical assistance personnel funded by AID.

2) The Grantee agrees to retain project-funded participant trainees in its employ for at least four years after completion of their training, and at a pay schedule in keeping with such training.

3) The Grantee agrees to provide adequate office and classroom space and appropriate office and classroom furniture for Project-funded training and technical assistance.

4) The Grantee agrees to work closely with AID to reconsider and refine the draft National Water Law, especially provisions related to inter-sectoral priorities for water allocation, water pricing policies, administrative procedures for water control, and clarification of the legal status of water users' groups. The Grantee shall make every effort to pass a new National Water Law acceptable to AID before the end of Phase 1 of this Project, but after AID funded technical assistance personnel have reviewed the draft and recommended it to the GSDR as appropriate.

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5) The Grantee agrees to engage in dialogue with AID throughout Phase 1 on macro-economic and other institutional policy reforms which may be essential for achieving the project goal of increasing irrigated production in the Shebelli River basin. This dialogue will focus on the policies which are discussed in Annex H (Policy Annex) of the Project Paper, especially: covering the operational costs of public sector agricultural machinery services (ONAT) by increased fees; preparation of action plans for the most efficient use of State farms and lands held by special interest cooperatives in the Shebelli Basin, which will include study of returns from privatization or divestiture; the procedures which constrain private sector supply of and producer access to agricultural inputs; and maintenance of producer price incentives in domestic agricultural markets.

6) The Grantee agrees to establish a simplified, low cost, on-site land registration process, and to provide staff to undertake a mass land registration campaign which will be completed for the whole Shalambood target area early in Phase 1 implementation to protect the rights of smallholders. The Grantee also agrees to enforce the provisions of Land Law No. 73 of 1975, which state that the Government may nationalize registered and unregistered lands which are not cultivated over a two-year period, and agrees that any lands thus nationalized will be expeditiously transferred to other smallholders.

7) The Grantee agrees, under the auspices of the Inter-Governmental Authority Against Drought, to initiate discussions with Ethiopia concerning riparian rights on the Shebelli River.

_____
Assistant Administrator
Bureau for Africa

Date_____

ANNEX S

JUSTIFICATION AND USE OF AID DIRECT CONSTRUCTION CONTRACTING MODE

ACTION MEMORANDUM TO THE DIRECTOR

March 30, 1987

FROM : E. Bitgells, PROJ

SUBJ : Shebelli Water Management Project (649-0129)
Justification for Use Of AID Direct Construction
Contracting Mode

Issue

You are requested to approve direct AID contracting for construction under the subject project.

Discussion

USAID is now completing the development of a Project Paper for Phase 1 of the subject project. The project will fund the construction of Afgoi housing units, research laboratories and offices; guesthouses in Afgoi and Genale; and irrigation system rehabilitation in the Shalambood target area. The contracting mode is critical to the timely and successful completion of these Afgoi and Genale research facilities and Shalambood irrigation upgrading. The project paper envisions two direct AID contracts which will be awarded to firms selected by USAID with Ministry of Agriculture (MOA) concurrence. AID would first contract for Afgoi and Genale housing and research facilities, and later separately contract for Shalambood target area irrigation rehabilitation.

Historically AID has strongly discouraged the use of direct AID construction contracts because such contracts impose substantial legal liabilities on AID, permit AID to assume the full costs of construction which were not anticipated at the time of contract, and impose a heavy administrative burden on AID.

AID direct contracts will increase AID's legal liabilities. However, the Project Committee is not certain that these liabilities are effectively diminished by host country contracts, particularly if the

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MOA is not capable of administering significant construction contracts. The MOA has never contracted for construction projects of this magnitude, and thus does not have access to qualified personnel to adequately administer and implement host country contracts, or to interact effectively with contract personnel who could provide these services.

As regards the cost implications, the Project Paper will include adequate contingency funds in the construction budgets. In addition, the contracts will be fixed cost contracts. Furthermore, many of the U.S. dollar expenses anticipated can be funded with shillings if required. Finally, the Shalambood irrigation system construction will be phased and is of such a nature that the objectives of the Project can still be met, if for some unforeseen reason, adequate funds are not available to completely finish all irrigation facilities under Phase 1.

USAID's administrative burden will be increased. However, the Project Committee and particularly the Office of Engineering and the Contracting Office, where the burden will be the greatest, feel that the direct contracting mode is the only way to implement the construction of these research and irrigation facilities in a timely manner. To alleviate the engineering workload, the Project Paper will make provision for full time A/E support to supervise construction of Shalambood irrigation system improvements, and to administer the contract on USAID's behalf.

In conclusion, the Project Committee strongly recommends that the direct AID contract mode be utilized. The Project Committee strongly feels that the MOA does not possess the administrative and engineering skills to administer host country contracts of this magnitude. Given the high priority the GSDR gives the project in increasing Shebelli basin irrigated agricultural production, it is not felt that institutional capability for contracting can be built within the MOA while still completing the facilities in a reasonable time period.

Recommendation

Chapter 3A of Handbook 1B states that "Mission Directors are responsible for assuring that project design assigns procurement responsibility in a manner which best fits the particular circumstances and will result in the most effective implementation of AID-financed projects. There is no longer a stated agency preference between AID-direct and host country contracts." For the reasons stated above, the Project Committee recommends that you approve AID direct contracts for construction of the housing, research and irrigation facilities under the Shebelli River Management Project.

Approved _____

Disapproved _____

Date _____