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INTSORMIL

Farming Systems Research in North Kordofan, Sudan

Report No. 1

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SOCIO-ECONOMIC CONSTRAINTS TO THE PRODUCTION, DISTRIBUTION, AND CONSUMPTION OF MILLET, SORGHUM, AND CASH CROPS IN NORTH KORDOFAN, SUDAN

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EXECUTIVE SUMMARY

This preliminary report from the University of Kentucky International Sorghum and Millet (INTSORMIL) socioeconomic project in the el-Obeid region of Northern Kordofan, Sudan is a report of work in progress. The major findings of the project to date include the following:

1. The farmers of this region are involved in a complex mixed subsistence/cash economy. They are producing primarily millet and sorghum for home consumption and sesame and groundnuts for sale. In addition, a variety of other wild and cultivated crops are also being consumed and/or sold by households.

2. There is an integration of crop and livestock production among these farmers. Livestock such as camels, cattle, donkeys, goats, and sheep are an important aspect of household economy.

3. Wage labor is also quite important with many families hiring workers for their own fields as well as selling their own labor to others. Seasonal migration to work in cities and on mechanized farming schemes is becoming increasingly prominent.

4. Farmers have been quite innovative in searching for new economic opportunities and technological assistance. Sesame and groundnuts are increasingly being grown as cash crops, insecticides are widely used to control pests, and extraordinarily diversified strategies are used to survive in an extremely harsh and risky environmental setting. Farmers recognize and attempt to manipulate the extraordinary diversity of the principal crops in order to maximize production and to reduce risk.

5. Village merchants are an important link between farmers and the larger market system. Merchants provide credit and consumption goods, purchase agricultural products, and arrange transportation of goods to and from larger market centers.

6. Water is the principal constraint. People often have to travel long distances and/or spend scarce cash resources to get access to water for their needs and the needs of livestock. Crop production depends on the vicissitudes of the rains.

7. Given the harsh and risky environment, farmers frequently find it necessary to plant and re-plant their crops several times in order to ensure that their land resources are fully utilized. Early-maturing varieties of millet, sorghum, and sesame are recognized and appreciated in situations when re-planting is necessary, but often farmers cannot secure sufficient quantities of these seed varieties.

8. The most important pests affecting millet and sorghum production are a beetle called sinta (Cyrtocamenta spp.), the quelea birds, the larva of naffasha (Eublemma brachygonia), buda (striga), ants and termites, long smut, and downy mildew.

I. Introduction

The University of Kentucky INTSORMIL project in Sudan has both a broad and a narrow focus. The broad focus in to formulate a systematic understanding of the prospects for and constraints to traditional agriculture in Northern Kordofan, Sudan. To this end we are providing support in the form of baseline research and recommendations to the Western Sudan Agricultural Research Project, which is in the process of establishing in the area an integrated livestock and crop program--one that will preserve the delicate balance of the Sahelian environment. As a general guide for our study we have been strongly influenced by the farming systems approach. The experience of the last several decades has shown that the problems of agriculture in the developing countries cannot be solved simplistically or in a piecemeal manner. The farming systems approach recommends itself as a problem-solving tool because it encourages the researcher to take all pertinent variables into account in order to investigate the performance of agricultural production. Thus, opportunities for off-farm employment, investment in non-farm businesses, ritual and consumption expenditures, and the gathering of wild plant foods are some of the factors that may be included in a farming systems study because they affect farming inputs and outputs directly.

The narrow focus of our study is to identify socioeconomic constraints that work against the production, distribution and consumption of millet and sorghum in North Kordofan. Although agriculture is the Sudan's primary asset, the country is not self-sufficient in food. Any recommendation that will lead to a more efficient production and utilization of millet and sorghum for food are steps in the right direction, provided that due consideration is given to maintaining soil fertility in this semi-arid region. A farming system model that defines the farming household as the basic unit of production, consumption, and economic decision-making seems well designed to identify the socioeconomic constraints related to millet and sorghum production and use.

The present study is being carried out by two economic anthropologists from the University of Kentucky--Ed Reeves and Tim Frankenberger--with the assistance of two Sudanese graduate students from Khartoum University--Ibrahim K. M. Zurgan and Muhammed Majzoub Fideil. Both graduate students have had prior fieldwork experiences in several localities in the Sudan. During the time that they are participating in this project they will be collecting data for their master's theses. Although there is a large amount of sharing and overlap in the work that we all do, the responsibility for overseeing the collecting of data in two broad areas has been divided. Frankenberger and Ibrahim are responsible for collecting materials related specifically to the farming household economy and agricultural production. Of direct interest to them is the modeling of the knowledge system and decision-making of farmers. In addition, they are attempting to develop reliable measures of input and output for the farming household, since an input-output analysis will provide an objective standard against which to appraise farmer's decisions. Reeves and Muhammed are concerned with the institutional context of traditional farming, particularly the organization of rural markets. Another institutional matter of leading importance concerns land tenure practices and the changes they are undergoing as a result of rural population growth.

The report that follows begins by outlining the main research operations of the study showing the need for a major revision of the originally planned schedule, the problems encountered in the research, and the collaborative links we have established with other development projects. Those who are primarily interested in the substantive findings of the work to date may turn directly to Chapters 2-5.

A. Schedule of Research Operations

Table 1 shows a schedule of research operations. It includes completed portions of the project, research in progress, and activities planned for the future. It will be seen that we have completed the Initial Village Survey and are currently engrossed in two major endeavors: the Ethnographic Study of Agricultural Production and the Household Economy and the Ethnographic and Documentary Study of Rural Markets. The components of both major research thrusts are described below in sections III and IV. The fieldwork will continue to have an ethnographic emphasis until April 1982 in order to ensure that we have acquired a sufficiently good understanding of the material to be able to design a survey questionnaire to elicit all the salient variables in local farming systems. This survey instrument will be constructed, pretested, and revised in April. The survey will begin in May with farmers who have remained in their villages and will continue in June picking up farmers who have returned from labor migration during the dry season. The objective is to sample about 300 farming households by the end of September,* at which time the fieldwork phase of the project will end.

This plan for the study differs from what was originally conceived regarding the schedule of research operations. Originally, it was planned to conduct the survey of farmers starting in February, as the season for crop marketing was ending. This plan appeared reasonable before we arrived in the study area and learned how extensive the labor migration away from the villages in the dry season is. In some villages virtually all the able-bodied men migrate and many are accompanied by their families. To carry out the survey in this season according to the original plan would lead to a severely skewed sample. The only adequate way to sample the population of farmers, therefore, is to put off making the survey until the end of the migration period. This option brings additional benefits. It allows us to extend the period of ethnographic research through the dry period. We are certain that this will result in a better-designed Farming Systems Survey. Furthermore, the dry season will be an opportune time to interview the older men left in the village about family histories, land tenure, and political alignments. At the same time, women can be interviewed about food preparation, nutrition, the household budget, and women's economic roles.

This revision in the schedule of the research operations is urged as the only means to accomplish the project's aims while maintaining good standards of scientific procedure. It will entail that

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*The survey will span the rainy season. Some delays can be expected due to impassable roads.

Table I

SCHEDULE OF RESEARCH OPERATIONS

	1981						1982								
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
I. Initial Village Survey	X	X													
II. Ethnographic Study of Agricultural Production & the Household Economy															
A. Ethnography of Three Villages		X	X	X	X	X	X	X	X	X					
B. Agricultural Decision-Making		X	X	X	X	X	X	X	X	X					
C. Farm Practices, Folk Taxonomies		X	X	X	X	X	X	X	X	X					
D. Cultivated Landholdings in Three Villages			X	X											
E. Fifteen Farm Families in Three Villages															
1. Household material goods inventory					X	X	X								
2. Household characteristics and census					X	X	X	X	X	X	X				
3. Input-output analysis					X	X	X	X	X	X	X				
III. Ethnographic & Documentary Study of Rural Markets															
A. Ethnography of Rural Markets			X	X	X	X	X	X	X	X					
B. Recovery of Information From Government Records				X	X				X	X	X	X			
C. Marketing System Survey						X	X	X							
IV. Farming Systems Survey											X	X	X	X	X

one American researcher and the two Sudanese researchers remain in the field until the end of September 1982, which is an addition of three months to the original schedule.

B. Problems Doing Research

Those who know research conditions in the rural Sudan will smile knowingly if we mention infrastructural constraints as the leading problem. Precisely, this has to do with transportation. The success of our research effort is largely dependent on a rented, somewhat the worse-for-wear Land Rover which carries us to the villages we are studying. The driving conditions are never good. Sometimes they are atrocious and breakdowns occur frequently. Gasoline, which we get from the government supply is unavailable from time to time for several days or longer. But local travel is a piece of cake compared to getting from El Obeid to Khartoum and back. Our experience is that it is virtually impossible to fly to Khartoum and return in the same week. Currently, Sudan Airlines requires passengers to purchase their tickets at the same time that the reservation is made and to show a passport or some other identification. Reservations have to be made from the city of departure. Thus, it is impossible to book a return ticket from Khartoum to El Obeid until after arriving in Khartoum, and in October reservations in Khartoum for El Obeid were being booked two and one-half weeks in advance. As a consequence, we cannot go to Khartoum without expecting to spend several weeks there. Communications between El Obeid and Khartoum are uncertain. The phone service shuts down every few days. More disturbing still, our mail has been coming very infrequently due to the lack of carriers. We hope that the difficulties of flying between El Obeid and Khartoum and mail delivery will be greatly rectified now that the WSARP aircraft is in service.

Another major problem has been staying healthy. Ed Reeves and Janet Frankenberger have had malaria. Tim and Janet Frankenberger have had dysentery. Alexandra Reeves had diarrhoea and heat rash for more than a month. Recently, everyone's health has been quite good.

C. Collaboration With Other Projects and Organizations

Because ours is a small project it was thought that we could have the greatest impact and the most benefit through direct and continuous collaboration with agricultural development programs in the Sudan which have a larger budget and a longer life-span than ours. This was a primary motivation behind our establishing collaborative ties with the Western Sudan Agricultural Research Project. Since arriving in the Sudan we have made contacts with many other projects and Sudanese government organizations, with which we are pledged to cooperate. Below is a summary of these agreements:

1. WSARP - Dr. Dafallah A. Dafallah, Director, WSARP is providing us with logistic and moral support. By means of informal discussions and formal seminars and by providing copies of our research reports and recommendations, we are making the results of our investigations into the farming systems of the hinterland of El Obeid available. El Obeid is the site of the WSARP headquarters, now under construction.

2. Regional Ministry of Agriculture, Kordofan Province - Dr. El Taj Fadlallah, Minister. The Ministry's staff of agricultural specialists has kindly provided us with information and advice. The Extension Service is sharing their instructional materials and the results of a survey they made of farmers. We are providing copies of our reports to the Minister and his staff. We also are carrying extension specialists to the villages to make talks about improved farming operations. (The Extension Service is hamstrung by a lack of vehicles.)

3. Sudan Agricultural Bank, El Obeid - Abdel Majid Khogari, Director. The Agricultural Bank Office at El Obeid is in the second year of an ambitious and important experiment to alter the structure of rural marketing. The program thus far is designed to create cooperative societies in the villages through which credit for farming inputs can be channeled and transportation and storage of crops can be provided during the marketing season. We are working with the Director to look for ways to make their program more effective. In this connection we are helping to establish new credit and marketing cooperatives in three of the villages in our sample.

4. ICRISAT Millet Breeding Program - Dr. R. P. Jain, Director. We have collected samples of about 400 millet heads from the fields in our study area. This is the first time a millet germ plasm collection has been made in the Northern Kordofan area.

5. ICRISAT Sorghum Breeding Program - Dr. Gebisa Ejeta, Sorghum Breeder. We have also collected samples of approximately 100 sorghum heads from the fields in our study area. This too is one of the only sorghum germ plasm collections that has been made in this area of Northern Kordofan.

6. CARE Renewable Energy Resources Project - Stanley Dunn, Director. As part of the Farming System Survey several questions are to be incorporated dealing with consumption of wood as fuel. This information will benefit this CARE project which is concerned with introducing an energy efficient stove for use in areas where trees are being decimated for fuel.

7. Project to map the Sahelian zone for purposes of developing a desertification control policy - Prof. Fu'ad Ibrahim, Beyreuth University (Germany); Farouk H. Ahmed, Coordinator, Desertification Control Coordination and Monitoring Unit. We have an agreement to assist each other through the exchange of research findings.

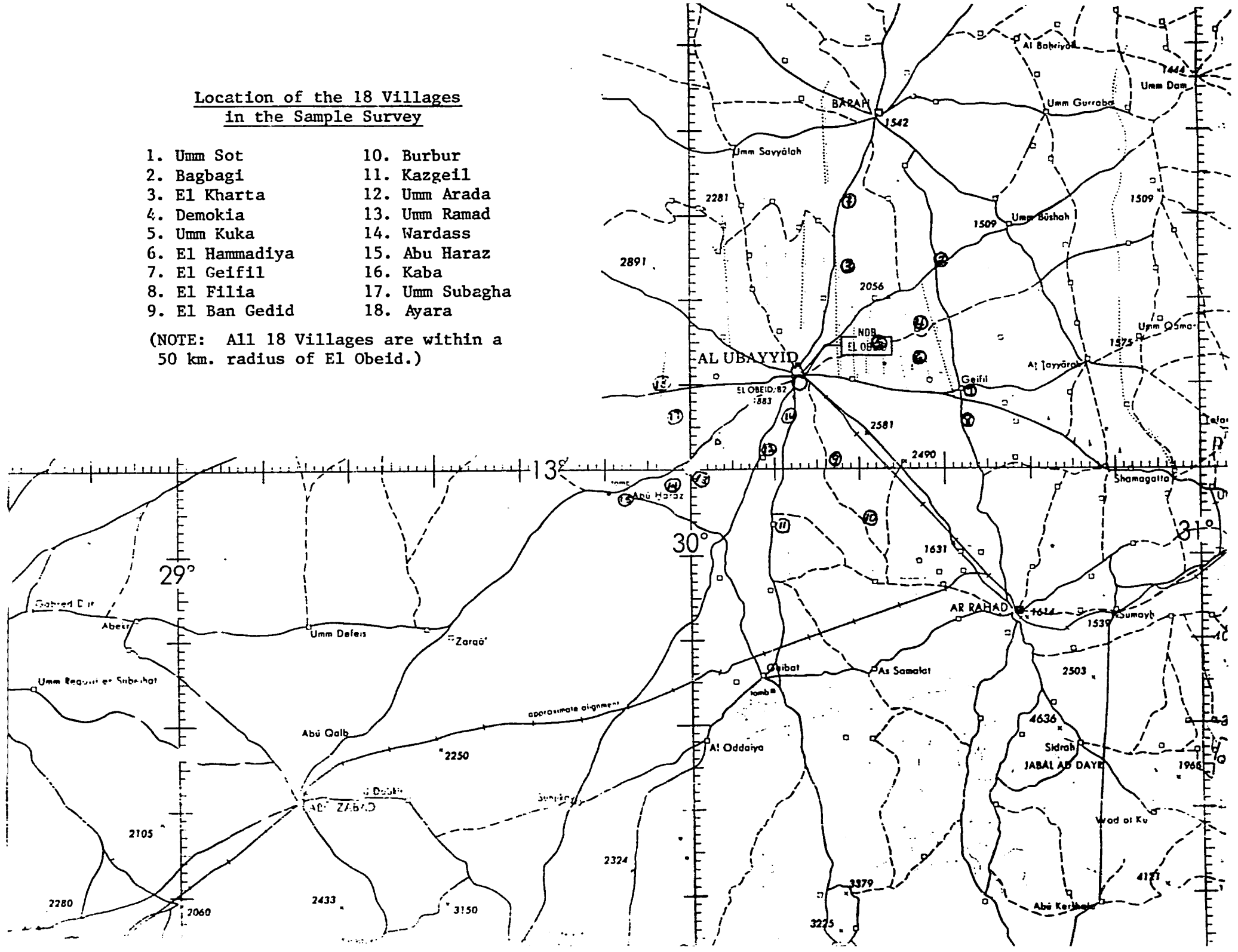
II. The Initial Village Survey

Our first objective after setting up house in El Obeid was to obtain a comprehensive picture of the rural society and economy. Eighteen villages (see map) were selected for study with an aim to include as much heterogeneity

Location of the 18 Villages in the Sample Survey

1. Umm Sot
2. Bagbagi
3. El Kharta
4. Demokia
5. Umm Kuka
6. El Hammadiya
7. El Geifil
8. El Filia
9. El Ban Gedid
10. Burbur
11. Kazgeil
12. Umm Arada
13. Umm Ramad
14. Wardass
15. Abu Haraz
16. Kaba
17. Umm Subagha
18. Ayara

(NOTE: All 18 Villages are within a 50 km. radius of El Obeid.)



as possible.* We visited each of these villages in turn carrying out an interview that lasted four to five hours. The interview was conducted with a group of people rather than a single individual. Typically, six to ten individuals were active participants, including the village's headman and a cross-section of the farmers. A structured interview format was not employed since we wanted to discover the socioeconomic patterns and constraints that operate in the villages. We did not wish to impose our own biases a priori. Therefore, in making the interviews we relied on an outline of topics that was purposefully broad and open-ended (Appendix A). By this, we arrived at more than comprehensiveness; we were trying to develop a preliminary understanding of how the villagers express themselves on a variety of issues and what kinds of priorities they set and decisions they make to deal with these issues. A benefit of conducting the interview with a group rather than a single individual was that a variety of viewpoints often surfaced in the discussion. Thus, even when conducting the initial village survey our methodology made us sensitive to the complexities of agricultural decision-making. We were laying the groundwork for the transition in our research to a more intensive examination of farming strategies.

In the Initial Village Survey we collected a large, diverse quantity of data. Most of it is of very high quality. That we worked from a broad topical outline rather than a structured interview format did cause some problems, however. Occasionally, we neglected to collect some specific items of data in one village that were collected elsewhere. But this oversight does not seriously impair the overall usefulness of this material. Moreover, the problem will be remedied when the Farming Systems Survey is carried out by conducting a brief survey of village characteristics simultaneously with the larger survey. By this means the gaps will be filled and a check on the reliability of the data we now have will be provided.

Some of the data gathered in the Initial Village Survey can be organized in a tabular form. Table II presents a liberal sampling of these data. Before discussing the material shown in this table, it may be helpful to provide a general portrait of villages in the study area.

The soils in the study area are of two basic types. North and east of El Obeid are found stabilized dunes--the famous qoz soils of this region. This is an area where sesame and millet are the leading crops and gum arabic continues to be harvested in some quantity. South and southwest of El Obeid are found clayey sand and sandy clays soils; both types of soil are called gardud. Here groundnuts assume an importance nearly equivalent to sesame, millet continues to be important for household consumption, but gum harvesting has a negligible importance. The

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*The villages were selected on the basis of differing soil types, access to water, market facilities, and institutional complexity. The selection was made with the consultation of Dr. El Taj Fadlallah, Regional Minister of Agriculture, Kordofan. As seen on the map, villages in the northwest sector from El-Obeid were not selected for inclusion in the sample. Dr. El-Taj felt that they were not sufficiently different from villages in the northeast sector to warrant inclusion in the sample.

qoz soils are very loose and accept water readily, but some of the gardud soils form a hard pan which causes the water to run off rather than soak in. In the rainy season, therefore, the roads in the qoz area are usually reliable, but in the gardud area they can be treacherous because of the many depressions and watercourses that cannot be crossed after a heavy rain. Aside from the road which the Dutch government is building to connect El Obeid with Debaibat to the south, all travel beyond El Obeid's urban boundaries is by unimproved dirt tracks.

The villagers recognize three seasons: kharif, the season of rain and of growing crops (July through October); shita, cool and dry, the season of harvesting and selling crops (November through February); seif, the season for harvesting new gum arabic trees and out-migration (March through June). June and October are transitional months at the start and end of the rainy season. The weather tends to be hot with sporadic rainfall during these two months.

The density of settlements in the study area depends on access to water as well as soil fertility. With respect to the latter, for example, the density of settlements between El Obeid and Abu Haraz to the southwest is less than what is found to the east or directly south of El Obeid. This is because the soil along the road to Abu Haraz consists of a heavy sandy clay which cannot be worked easily using the traditional hoe and which tends to dry out forming a hard pan during drought. As a result, little cultivation is practiced in this area. Instead, it has become an important rainy-season pasture for nomads' livestock. The area is made more attractive to nomads by the proximity of the markets at Abu Haraz and El Obeid.

The physical layout of a village is not complicated. It consists of the loose aggregation of compounds, each one separated from its neighbors by an encircling millet stalk fence. The narrow lanes that pass between the fences of neighboring compounds make you think of a maze, but you cannot wander in the lanes long before coming upon an open area where an oil press or a shade tree is located. Within each compound's enclosure there are typically between two and five circular huts with the walls built of millet stalks and the conical roof thatched with stalks or wild grasses. These houses are intended as sleeping quarters or storage rooms for the nuclear family or polygynous family that occupies the compound.* The compound will also have a smaller hut used as the kitchen, and a latrine is located along the compound's outer wall. Millet stalks, which are a main ingredient in the construction of houses and fences, only last about three years after which they must be replaced. Villagers perform this maintenance regularly at the end of the rainy season. The guiding principle seems to be to replace all material which will not last another year.

The headman's compound is often identified by a large shade tree located at the front and also by the presence of a large rakouba (millet stalk shed with flat roof) where visitors are received and where meetings of the village council are held. The village is surrounded by its

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*As a rule, extended families do not live in the same compound.

lands on all sides. The cluster of compounds which is the village proper, is surrounded by a zone called khatwat el-hilla (the village's step), an area denuded of vegetation due to overgrazing. The villagers never attempt to cultivate this area, which may extend away from the village for several hundred meters. The thin forage cover in this zone is used to graze donkeys, goats and camels which are kept near the village for daily use. Large herds of animals are restricted from occupying this area and must be sent to graze in areas beyond the cultivated zone. Outside khatwat el-hilla are the cultivated fields (zira'a) belonging to the villagers. Here too are fallow lands that have reverted to bush and Acacia senegal (gum arabic trees).

As far as we are able to determine there has never been a cadastral survey in the area of our study. The official, legal position is that the Government of Sudan is the ultimate owner of all unregistered lands in the country, but Sudanese citizens enjoy usufruct of the land according to their traditions of land tenure. The tradition in the area that we are studying is that all land is individually owned and heritable. In the past each village possessed a reserve of fallow land (the remnant of a land grant to a tribal section) called gifaar, which was at the headman's disposal. The headman could make grants of land to his own villagers as well as to new-comers. Sometimes--perhaps this was the rule rather than the exception--the beneficiary paid the headman a fee for this service. In any event, in none of the villages that we are now studying is the granting of gifaar considered an important means to expand the base of cultivation. This suggests that population growth has overtaken the availability of agricultural land near to water sources. If this is indeed the case in the future we may expect rent and sharecropping to assume a greater prominence in the farming systems of the area.

Table II reveals many differences and similarities between the villages in the sample. The process of sample selection and the constraints posed by problems related to travel led us to choose the villages between 10 km and 47 km distance from El Obeid. The distances were taken from the Sudan 1:250,000 map series and are "as the crow flies" estimates. On the ground the distance would be somewhat greater in each case. Moreover, distances in this terrain are deceiving. The journey from El Obeid to Geifil, shown on the Table to be 33 km, takes about 1 ½ hours by Land Rover under optimum conditions. The same journey, if attempted after a heavy rain may be delayed hours or even several days because the route is cross-cut by large water courses that are hazardous to ford.

Population size is a sensitive barometer of water supply, the carrying capacity of the agricultural land, and the appearance of market places and other services. In our sample the range of population sizes is from 110 for Kaba to as many as 10,000 for Abu Haraz. The points intermediate between these extremes seem well represented in the sample.

Access to water is an overriding concern in many of the villages that we are studying. The data collected on this topic are especially good, although much is not suited to a tabular presentation. Appendix B is a descriptive summary of the data about water. It should be noted that two types of cost are clearly involved in obtaining water. One is the price of the water itself; the other is the cost in terms of human and

Table II
INITIAL VILLAGE SURVEY
Part 1 (p. 1)

	Umm Sot	el-Kharta	Demokia	Umm Kuka	el-Hammadiya	Geifil	el-Filia	Burbur	El-Ban Jedid
1. Distance from el-Obeid (in km)	40	23	25	20	22	33	40	40	23
2. Population (rough estimate)	700	2000	750	400	1200	600	500	500	8000
3. Water sources, no. of cisterns	0	6	4	2	4	3	0	0	0
Distance to water point, rainy season	beside village	>3 hrs.	½-1 hr.	10-15 min.	1½-2 hrs.	10-15 min.	10 min.	15 min.	nearby
Distance to water point, dry season	beside village	3 hrs.	4½ hrs.	3 hrs.	cisterns	near village	7 hrs.	15 min.	nearby
Price of water, rainy season	0.02/day	0.01/tin	free	0.02/tin	0.50/season	free	free	free	0.01/tin
Price of water, dry season	0.02/day	0.05/tin	-	0.15-0.20/ tin	0.10-0.15/ tin	0.07-0.20/ tin	6.00-10.00/ season	free	0.01/tin
Price of water, delivered to HH	-	1.50-1.80/ barrel	0.16/tin	-	-	-	-	-	0.04/tin
4. Price of truck-ride to nearby town									
Rainy season	1.00 el-Obeid, Bara	0.75 el-Obeid	0.50 el-Obeid	0.75 el-Obeid	0.50 el-Obeid	1.00 el-Obeid 1.00 Rahad	1.00 el-Obeid 1.00 Rahad	1.00 el-Obeid	0.25 el-Obeid
Dry season	1.00 el-Obeid, Bara	0.50 el-Obeid	0.50 el-Obeid	0.75 el-Obeid	0.50 el-Obeid	1.00 el-Obeid 1.00 Rahad	1.00 el-Obeid 1.00 Eim	1.00 el-Obeid	0.25 el-Obeid
5. Govt. crop market used most often by villagers	el-Eidat el-Obeid	el-Obeid Umm Tugur	Umm Kuka el-Obeid	Umm Kuka el-Obeid	Umm Kuka	Geifil	Geifil	el-Obeid Aradeib Suweilib	El-Ban Jedid el-Obeid
6. Price to transport crops to market									
Heavy (sesame)	0.50/sack	1.00/sack el-Obeid 0.25/sack Umm Tugur	0.25/sack Umm Kuka 0.50/sack el-Obeid	0.50/sack el-Obeid	?	-	0.50/sack Geifil	0.50-0.75/sack Suweilib, Aradeib	0.30/sack el-Obeid
Light (groundnuts, karkaday)	-	-	-	-	?	-	0.20-0.30/sack Geifil	0.30-0.40/sack Suweilib, Aradeib	0.25/sack el-Obeid

Table II
INITIAL VILLAGE SURVEY
Part 1 (p. 2)

	Kazgeil	Umm 'Arada	Kaba	Umm Ramad	Abu Haraz	Wardass	Umm Subagha	'Ayara	Bajbaje
1. Distance from el-Obeid (in km)	43	25	10	30	47	37	23	24	42
2. Population (rough estimate)	5000	1000	110	3700	5000-10,000	400	140	800	200
3. Water sources, no. of cisterns	?	0	0	0	?	?	0	1	0
Distance to water point, rainy season	nearby	10 min.	nearby	nearby	nearby	5-30 min.	nearby	nearby	nearby
Distance to water point, dry season	½ hr.	10 min.	½ hr.	nearby	nearby	45 min.	5 hrs.	el-Obeid	1 hr.
Price of water, rainy season	free	free	free	free	free	free	free	0.08/tin	free
Price of water, dry season	0.08/tin	free	0.02/tin	free	0.01/tin	free	free	see below	0.01/tin
Price of water, delivered to HH	0.08/tin	-	-	0.05/tin	0.06/tin	0.10/tin	-	0.20/tin	-
4. Price of truck-ride to nearby town									
Rainy season	0.75 el-Obeid	0.40 el-Obeid	0.25-0.30 el-Obeid	0.50 el-Obeid	1.00 el-Obeid	1.00 el-Obeid	isolated	1.00 el-Obeid	1.50 el-Obeid
Dry season	0.75 el-Obeid	0.40 el-Obied	0.25-0.30 el-Obeid	0.40 el-Obeid	0.75 el-Obeid	0.50 el-Obeid	0.50 el-Obeid	0.50 el-Obeid	1.00 el-Obeid
5. Govt. crop market used most often by villagers	Kazgeil	el-Obeid	el-Obeid	Umm Ramad el-Obeid	Abu Haraz el-Obeid	Umm Ramad Abu Haraz el-Obeid	el-Obeid 'Ayara	'Ayara el-Obeid	el-Obeid Umm Tugur
6. Price to transport crops to market									
Heavy (sesame)	-	0.40/sack el-Obeid	0.50/sack el-Obeid	0.50/sack el-Obeid	0.50-0.60/sack el-Obeid	0.50/sack Umm Ramad	0.75/sack el-Obeid		1.00/sack el-Obeid 0.25/sack Umm Tugur
Light (groundnuts, karkaday)	-	0.20/sack el-Obeid	0.50/sack el-Obeid	0.40/sack el-Obeid	0.20-0.25/sack	0.40/sack Umm Ramad	0.40/sack el-Obeid		

Table II
INITIAL VILLAGE SURVEY
Part 2 (p. 1)

	Umm Sot	el-Kharta	Demokia	Umm Kuka	el-Hammadiya	Geifil	el-Filia	Burbur	El-Ban Jedid
7. Principal market(s) for manufactured goods	el-Obeid el-Eidat	el-Obeid	el-Obeid	el-Obeid	el-Obeid	el-Obeid Rahad	Geifil el-Obeid	el-Obeid Kazgeil El-Ban Jedid	el-Obeid
8. No. of shops in village	2	7	4	4	6	4	0	2	14
9. Ranking of crops by importance									
Millet	1	2	1	1	1	2	2	1	2
Sorghum		3	3	2	2	4	4	2	1
Sesame	2	1	2	3	3	1	1	3	3
Groundnuts		4	5	4	4	5	5	4	4
Karkaday			4	5	5	3	3	5	5
10. Presence of truck gardens	no	no	no	no	no	no	no	no	yes
11. Gum arabic is important	yes	yes	yes	yes	yes	yes	yes	no	no
12. Landholding (estimates of avg. size in makhammas)									
Poor farmer		<10	3-5	7-8	4-5	2-6	7-8	5	2
Average farmer	10	15-20	20	20-25	10	20-30	15	10	15
Rich farmer		40-70	50	50	40-50	60	30	20	20-25
13. Most important livestock	goats	goats	goats	cattle	goats	goats	sheep	cattle	cattle
14. Within-village hired labor is more important than labor hired from outside?	no	yes	no	no	?	no	yes	no	yes
15. Wages paid for 1st weeding of millet, by makhammas	5.00-10.00	5.00-15.00	8.00-15.00	6.00-10.00	6.00-12.00	5.00-10.00	4.00-10.00	7.00-10.00	6.00-7.00
by dahwa (morning work period)	-	-	-	1.00	1.00	-	1.00	-	1.50

Table II
INITIAL VILLAGE SURVEY
Part 2 (p. 2)

	Kazgeil	Umm 'Arada	Kaba	Umm Ramad	Abu Haraz	Wardass	Umm Subagha	'Ayara	Bajbaje
7. Principal market(s) for manufactured goods	el-Obeid	el-Obeid	el-Obeid	el-Obeid	Abu Haraz el-Obeid	Umm Ramad Abu Haraz el-Obeid	'Ayara el-Obeid	'Ayara el-Obeid	el-Obeid
8. No. of shops in village	20	20	0	13	>30	2	1	8	2
9. Ranking of crops by importance									
Millet	1	1	1	1	1	3	1	1	1
Sorghum	2	2	2	2	2	4	3	4	3
Sesame	3	3	3	4	3	1	2	2	2
Groundnuts	3	3	4	3	4	2	4	3	
Karkaday	4		5	5	5	5	5		4
10. Presence of truck gardens	?	no	no	no	no	no	no	no	no
11. Gum arabic is important	no	no	no	yes	yes	yes	yes	yes	yes
12. Landholding (estimates of avg. size in makhammas)									
Poor farmer	5	3-6	5	4-5	5-6	3-4	<8	4-7	10
Average farmer	10-15	10-15	10	10-15	20	10-15	8-9	10-15	25
Rich farmer	30-40	20-40	20	20-30	40-50	30	30	30-60	50
13. Most important livestock	cattle	sheep	goats	goats	goats	sheep	goats	goats	goats
14. Within-village hired labor is more important than labor hired from outside?	no	yes	?	yes	no	no	yes	yes	yes
15. Wages paid for 1st weeding of millet, by makhammas	8.00	6.00-10.00	2.00-6.00	3.00-12.00	10.00	10.00-14.00	5.00-6.00	5.00-10.00	3.00-5.00
by dahwa (morning work period)	-	-	-	1.00	1.00	-	1.00	-	-

Table II
INITIAL VILLAGE SURVEY
Part 3 (p. 1)

	Umm Sot	el-Kharta	Demokia	Umm Kuka	el-Hammadiya	Geifil	el-Kilia	Burbur	El-Ban Jedid
16. Seasonal out-migration of labor for wages - where?	Khartoum/ el-Obeid P. Sudan/ Gezira	el-Obeid Khartoum/ Kosti W. Medani/ P. Sudan	el-Obeid Khartoum	el-Obeid Khartoum	el-Obeid Khartoum	Khartoum/ Habila Rahad el-Obeid	Habila/ Khartoum Gezira	no out-migration	Habila Khartoum Gezira
17. Village institutions and services									
Cooperative	1 (mill, pump)	0	0	0	0	1 (mill)	0	0	1 (pump, store, bakery)
Mosque	1	2	1	1	1	1	0	0	5
Flour mill	1	1	0	1	1	1	0	0	1
Oil press	?	0	3	0	?	2	0	0	6
Health dispensary	0	1	1	1	1	1	0	0	1
Primary school	0	0	0	0	0	1	0	0	3
Intermediate school	0	0	0	0	0	0	0	0	2
Police station	0	0	0	0	0	1	0	0	1
Cheese factory	0	0	0	0	0	0	0	0	1
Generator for electric power	0	0	0	0	0	0	0	0	1
18. Indicators of wealth									
No. of motor vehicles	0	1	5	0	6	0	0	0	11
No. of radio/recorders	4	"many"	7	10	40-50	15	4	10	"many" 8 TV's
Zinc or concrete buildings	mill pump station	3	5	?	several	2 (bakery, mill)	no	no	numerous
All dwellings are thatch?	yes	no	no	no	?	no	yes	yes	no

Table II
INITIAL VILLAGE SURVEY
Part 3 (p. 2)

	Kazgeil	Umm 'Arada	Kaba	Umm Ramad	Abu Haraz	Wardass	Umm Subagha	'Ayara	Bajbaje
16. Seasonal out-migration of labor for wages - where?	Habila Gezira Khartoum	Khartoum Habila/ Gezira el-Obeid	el-Obeid	?	el-Obeid Khartoum Gezira	Khartoum Gezira	el-Obeid Gezira	el-Obeid Nyala Umm Durman	Umm Durman
17. Village institutions and services									
Cooperative	1 (mill, store, bakery)	2 (mill, shop)	0	1 (mill)	1 (mill)	0	0	0	0
Mosque	6	2	0	1	3	1	0	1	0
Flour mill	1	2	0	1	2	0	0	1	0
Oil press	3	6	0	3	?	?	0	?	1
Health dispensary	1	1	0	1	1	0	0	1	0
Primary school	2	1	0	2	3	0	0	1	0
Intermediate school	2	0	0	0	2	0	0	0	0
Police station	1	0	0	0	1	0	0	0	0
Cheese factory	1	0	0	0	2	0	0	0	0
Generator for electric power	1	0	0	0	1	0	0	0	0
18. Indicators of wealth									
No. of motor vehicles	7	3	0	2	4	0	0	1	0
No. of radio/recorders	>200 2 TV's	6	4	50-60	several hundred, 1 TV	3	5	10-12	8
Zinc or concrete buildings	numerous	3-5	no	?	many	1	no	several	no
All dwellings are thatch?	no	no	yes	no	no	yes	no	?	yes

Table II
INITIAL VILLAGE SURVEY
Part 4 (p. 1)

	Umm Sot	el-Kharta	Demokia	Umm Kuka	el-Hammadiya	Ǧeifil	el-Filia	Burbur	El-Ban Jedid
19. Village professions									
Carpenter		5	0	0		0	0	0	2
Tailor			2	0		3	0	3	10
Shoemaker/repairer			0	1	1	0	0	0	7
Govt. midwife				0		0	0	0	1
Butcher			1	2		0	0	0	2
Mason/builder			0	0		0	0	0	2
Cart driver	0	0	0	0	0	0	0	0	15
20. No. of ethnic groups	1	1	1	1	2	1	1	1	7
21. Dominant ethnic group	Jawam'a	Jawam'a	Menasir	Menasir	Menasir	Jawam'a	Jawam'a	Fellata	?
22. Period of first settlement	After Mahdiya	1920	After Mahdiya	c. 1940	?	Before Mahdiya	After Mahdiya	c. 1914	c. 1920

Table II
INITIAL VILLAGE SURVEY
Part 4 (p. 2)

	Kazgeil	Umm 'Arada	Kaba	Umm Ramad	Abu Haraz	Wardass	Umm Subagha	'Ayara	Bajbaje
19. Village professions									
Carpenter	2	3	1	0	4-5		0	1	
Tailor	27	3	0	5	15-20	0	0	2	2
Shoemaker/repairer	6	2		1	10-20		0	3	1
Govt. midwife	?	1		1	?		0	1	0
Butcher	7	1		4	?	0	0	5	
Mason/builder	?	0		0	?		0	0	
Cart driver	30-40	?		2	20	1	0	0	
20. No. of ethnic groups	6	6	6	1	5	1	1	4	1
21. Dominant ethnic group	Tumam	Bideiriya	Berti	Bideiriya	Bideiriya	Bideiriya	Bideiriya	Bideiriya	Jawam'a
22. Period of first settlement	?	Before Mahdiya	1927	?	?	Before Mahdiya	1916	1940	Before 1910

animal labor to transport the water from its source to the household. Another observation worthy of mention is that these costs rarely remain constant throughout the year; generally, the price of water as well as the labor involved in transporting it is highest in the summer (seif) and lowest in the rainy season (kharif). This high cost of water during the seif contributes directly to the out-migration of villagers to the cities and large agricultural schemes where the cost of water is compensated by the wages earned.

Villagers differ greatly from one individual to the next with regard to the number of times per year they visit a nearby town, such as El Obeid or El Rahad. The cost of travelling from a remote village like El Filia to El Obeid is one Sudanese pound. Rainy season rates are sometimes higher than during the dry season because the amount of traffic is less. Travel is typically by suq lorry. There are no buses operating in the area. The lorry driver makes his departure from the village early in the morning and usually returns the evening of the same day. This is true of the trucks that are locally owned. Other drivers are hauling long distance but will pick up riders and their baggage for the going rate.

In recent years the government has established a number of crop and livestock markets in the rural areas in order to facilitate the marketing of farm produce and to collect sales taxes. Such rural government markets are found in six of the sample villages. A significant cost to the farmer is the transport of his produce to a nearby market. Some farmers feel that they have the option of selling at a nearby rural market or of transporting their crop to El Obeid where they expect to get a higher price. Merchants have been candid about price collusion and have indicated that they attempt to shave the margin between the price of the crop in El Obeid, less the added transport cost, and the price in the rural market so that farmers will not be inclined to accept the greater trouble and risk of marketing at El Obeid. Note in Table II that heavy crops such as sesame cost more to transport than light crops such as groundnuts or karkide (hibiscus).

El Obeid is the primary market for all kinds of manufactured goods for the entire area covered in the study. Many items of daily household consumption, however, can be bought in the village. Most villages have several merchant shops which stock food, kerosene, matches, flashlight batteries, and medicines. These shopkeepers are an important source of credit for the families of the village (see section IV below).

Millet is the first or second crop in all the villages. Sorghum and sesame also assume a great importance; groundnuts (peanuts) are most important in the south and southwest parts of the study area. The presence of a huge aquifer makes truck gardening of fruits and vegetables possible at El Ban Jedid but this is not found in any of the other villages. Gum arabic for the most part is important in the northern and eastern parts of the study area but not in the south and southwest. The estimates in Table II that informants gave us of landholdings of poor, average, and rich farmers are being confirmed by the censuses of landholdings that we are making in the three villages where we are carrying out intensive ethnographic studies. (See Appendix C.) The quality of information collected on livestock is rather suspect, but the data in the table does indicate a real difference among villages based on what kind of livestock is most important (i.e., numerous). We are not yet prepared to explain these differences.

The eighteen villages are rather evenly divided according to whether within-village hired labor is more important than labor hired from outside. At this time we are unable to explain this pattern, if indeed it is a valid one. The agricultural season presents a number of opportunities for hiring-in (and hiring-out) labor. The village survey collected wage data for all agricultural operations: planting, weeding, harvesting, and threshing. Wage rates vary for each operation and for the crop involved. There is also a tendency for the wages to go up or to come down depending on the availability of labor. Table II only shows the wage rates paid this year for the first weeding of millet, first by makhammas, a unit of land measurement, and then by dahwa (the morning work period that extends from 7 to 11 o'clock). Paying labor by makhammas is a kind of piece work. It brings a higher wage because the worker is encouraged to stay in the field and finish the job. (One makhammas can be weeded in 1 ½ days).* The seasonal out-migration of labor for wages is another matter. In villages which suffer from a severe water deficit in the hot, dry season, the proportion of adult male villagers who migrate may approach 75%, but the pattern appears in nearly all villages.

Under the general category of village institutions and services it should be noted that six of the villages in our sample have cooperative societies that operate a consumers' facility for the benefit of the village. As expected, village services are strongly associated with population size. The same relation holds concerning population size, indicators of wealth, and the number of village professions.

The last three categories of data recorded on Table II are of sociological and historical interest. All the people in the villages are of tribal origin, and the tribe still is used for demarcating political boundaries and for determining political representation in the local and regional councils. The role that such ethnic groups may play as foci for political interests at the village level deserves further study. The effort to learn about the origin of the villages in our study was often disappointing. Occasionally informants were precise about the date that a village was founded. More often the response to our question was "before the Mahdiya" (1885) or "after the Mahdiya" (1898).

III. Ethnographic Study of Agricultural Production and the Household Economy

A. Methods and Types of Data Being Collected

As mentioned earlier, we are presently conducting intensive ethnographies in three villages of our village sample, El Kharta, El Geifil, and Umm Ramad. These villages were selected on the basis of variability in soil types, principal crop mix, access to markets, and locality in relation to El Obeid. (See Initial Village Survey, Table II.) The primary purpose of focusing on three diverse villages is to gain a detailed understanding of the various farming systems that

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*Labor hired-in from outside the village is in nearly all cases, paid by the makhammas; within-village labor may be hired by the makhammas but dahwa is very common.

characterize this area of Northern Kordofan so that a survey instrument can be designed which elicits relevant information regarding farming operations in this area. This survey instrument will be used to collect information from a sample of farmers in each of the 18 villages that were originally selected (see map), beginning sometime in May or June, 1982 (see Schedule of Research Operations, Table I).

Several types of data are being collected in the three villages. First, we are obtaining detailed descriptions of farming practices as well as the local names of such practices and the tools involved. Second, we are collecting information regarding the growth cycles of crops and the various stages of growth the farmer recognizes as important to the cropping decisions that he makes. The local names for these stages are being collected as well. Third, we are attempting to elicit the important environmental factors that impact production as they are perceived by the farmers themselves. We are collecting data on folk taxonomies of crop pests (insects, plant diseases, birds, etc.), soil types, and rainfall patterns. Fourth, we are attempting to construct decision models that predict cropping patterns which farmers follow. Such models take into consideration the constraints and incentives under which the farmer is operating. Fifth, we are using the farming systems model that was developed by David Norman and associates as a basic framework for data collection regarding the inputs and outputs of farm production for the farmers in these villages. The types of data that will be collected from several households will include the farmer's access to land, labor, and capital and how he manages these resources, as well as how such resources are channeled into cropping systems, animal husbandry, and off-farm economic activities. In addition, we will observe and record how the output gained from such pursuits is channeled into consumption, savings, and working capital for increasing farm production. At the same time, we will attempt to understand how community socio-cultural norms and beliefs influence these activities as well as how external institutions such as markets and government policies impact these farming systems. Finally, to understand how farming is integrated into a system of economic pursuits aimed at sustaining the livelihood of the farm family, we will be investigating off-farm migration. We will be inquiring about where farmers migrate, whether any family members accompany them, in which wage activities they are engaged when they migrate, and when they return.

Due to the detail that is inherent in the data categories previously described, it is impossible to collect such information from all the farmers in all 18 villages. Likewise, it is equally impossible given our project time constraints to collect all of this information from all of the farmers in the three villages that are under intensive investigation. For this reason, we decided to focus our inquiries on 15 carefully selected farm families. In other words, 5 families from each of the three villages will be intensively studied. The major assumption guiding our selection is not that these families are representative of the whole village, but rather that they are representative of diverse types of farm households with regard to a number of variables. These variables are cropping patterns, size of landholding, size of household, tendency to migrate and off-farm economic activities. Once these families are selected they will be intensively studied for a period of 6 months.

To aid in this selection process, we decided to obtain a 100 percent sample of all cultivated landholdings of farmers residing in the three intensively studied villages. This was accomplished through two kinds oftechniques. First, we had one locally prominent and respected political leader accompany us to two of the villages and request the farmers' cooperation in our study. Second, we provided films and slide-show presentations in one of the villages so that data could be obtained from farmers at the same time that they were being entertained. Both techniquesproved very successful. The types of data collected from each farmer included: (1) total size of household; (2) total size of landholding; (3) area cultivated in millet; (4) area cultivated in sesame; and (5) area cultivated in groundnuts. (See Appendix C for kind of data collected.)

From these 100 percent samples, 15 farm families will be selected from each of the three villages on the basis of household size, landholding size and millet/sesame and/or groundnuts mix. From these 15 farm families in each of the three villages, 5 families will be selected on the basis of the three previously mentioned criteria in addition to the tendency to migrate and off-farm economic activities.

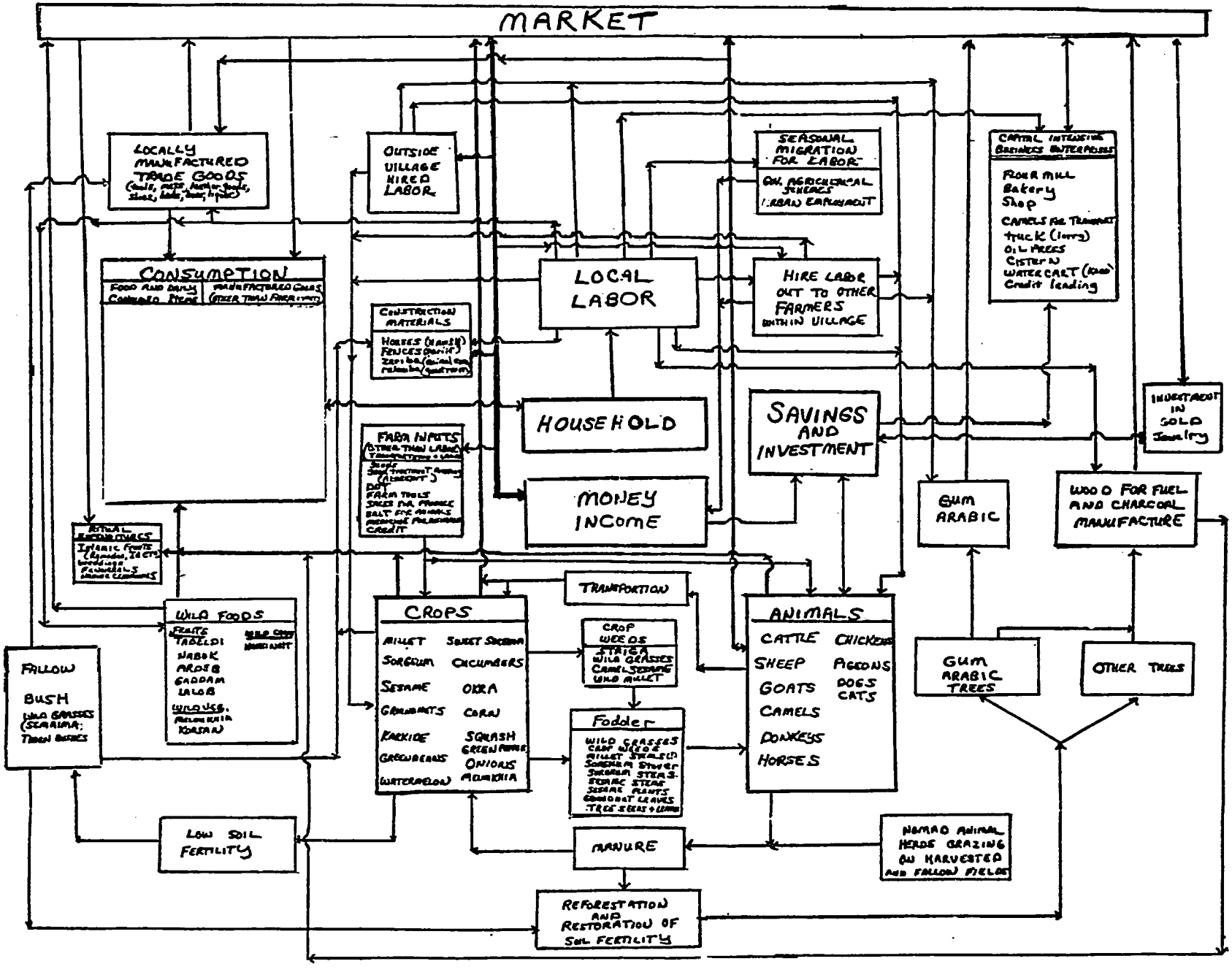
Although no attempt will be made here to review all the data that has been collected thus far, some examples will be provided of the types of data we are obtaining. However, before discussing these data, a general overview of the farming system in the area will be provided as we understand it at this time. This will be followed by a discussion of the farming practices in the area.

B. General Overview of the Farming System for the South Central Part of North Kordofan

1. Farming System Model

For the purposes of this report, we have attempted to model the farming system for the south central part of N. Kordofan. (See Farming System Model.) The components of this model are derived from four months of ethnographic interviews with farmers and merchants as well as our initial village survey. The model represents our cumulative understanding of the farming situation in this area at this time. We anticipate that revisions will have to be made in the model in the future as more data becomes available. No attempt has been made to quantify the model's components. Eventually, we hope to quantify these components by using the data obtained in the farming systems survey to be conducted beginning in May 1982. The model strives to be comprehensive in showing all the components and their interrelations, all of which impact the farming household. However, it is simplistic because it implies that a single farming system model can be applied to all farmers in the region. We have sound evidence to the contrary. In all probability, several types of farming systems can be found in areas differing in soil types and access to water. There may even be several types coexisting in the same villages. At a minimum, we anticipate identifying 5-10 alternative types of farming systems.

PROPOSED FARMING SYSTEM MODEL FOR SOUTH CENTRAL PART OF N. KORDOFAN



Regarding the interpretation of the model, some clarification is necessary. First, we are treating the household in our model primarily as a consumption unit which provides local labor. We have separated out the components of consumption, money income, and savings and investment in order to show how these act upon the system. This is different from other farming systems models that do not separate these components from the household component. Second, another convention used in farming systems modelling is to use solid lines to denote major relationships. We did not follow this convention because we do not know at this time what weights should be given to some of the relationships. Third, the system was diagrammed with the following scheme in mind:

1) All products (i.e., crops, animals, etc.) that are sold in the market are designated by an arrow leading to the market. Income obtained from such sales is then channelled through the thick dark line leading to money income.

2) Expenses for such things as hiring local or outside labor, constructing housing structures, or obtaining farm inputs are taken directly from the money income line.

3) Items for consumption or ritual expenditures not directly obtained from the farm are purchased from the market so money income is rechannelled back to the market (thick dark line from money income-arrows on both ends) and transformed into market goods which are consumed (arrows from market to consumption and ritual expenditures).

4) Money income that is not used for consumption, ritual expenditures, farm inputs (including transportation), construction materials or hiring labor (inside or outside) is channelled into savings and investment. Savings and investment is channelled into animals, gold jewelry, or capital intensive business enterprises. Money is released from savings and investment in each of these areas by selling in the market (arrows leading to market).

5) Animals, crops, and wild foods not sold in the market (or animals retained as savings) are consumed directly as consumption items or ritual expenditures (arrows from crops, animals, and wild food leading to consumption and ritual expenditures).

6) All arrows going into components such as crops, animals, wild foods, gum arabic, wood collection, and charcoal manufacture, represent inputs into those components The rest of the model should be self-explanatory.

Although the model strives to be comprehensive, certain crucial factors are only superficially addressed, or are absorbed in other more general components in the system. These are access to water, credit, and communal labor. Our findings indicate that access to water is one of the most important variables in the farming system of the region. Aside from being critical to the sustenance of

crops and animals, water access is in many cases the key variable in determining whether farmers migrate for seasonal labor (see Appendix C). For this reason, it is important to understand how access to water impacts the farming system as a whole. Although water has been placed at the top of the consumption list in the model, we were not schematically able to represent its importance to the system. Bearing this in mind, it is our intention to give this component proper emphasis in future revisions of the model.

Likewise, credit is another variable that our model under-represents in importance. Credit is a vital cog in the maintenance of the farming system for many farmers, and represents one of the major expenditures borne by them on a yearly basis (see Section IV). Numerous types of credit exist in this area ranging from in-kind or commodity exchange credit to money lending. Although the model identifies credit lending as an activity pursued by those who are investing in capital intensive business enterprises. It inadequately demonstrates the integration of credit in all major inputs in the farming system. This is especially true regarding the interrelationship between consumption and credit. It is our intention to integrate credit more fully in the system in future revisions of the model.

Finally, the model does not distinguish communal labor such as nafiirs or serbas from local labor. The primary reason for doing this was because our data indicate that communal work arrangements have lost importance in recent years due to the prevalence of wage labor opportunities. The only occasions that such communal labor activities do occur are in times of need, such as providing aid to a family following the death or illness of the head of the household, or to a poor farmer whose crops matured too quickly and would be lost if they were harvested by the poor farmer himself. Although we recognize the importance of such communal aid to the maintenance of the social fabric of the community, we do not feel it is warranted to separate this type of labor from other types of local labor in our model due to its low frequency of occurrence.

2. General Description of Farming Practices

In general, the average size cultivated holding in the region of N. Kordofan is between 10 and 15 makhamas (1 makhamas = 1.8 acres = 1.73 Feddans). The crops grown on these holdings can be divided into three groups: 1) A cereal crop intended primarily for subsistence (millet in most cases and/or sorghum); 2) a cash crop (sesame and/or groundnuts); and 3) miscellaneous crops that can be consumed in the home or sold in the market: hibiscus (karkide), cow peas (luba), watermelon (battikh), sweet sorghum (ankoleb), cucumbers (tibish), okra (waika), maize (aisarif), squash (garaa), green peppers (filfil akdar), onions (basul), and greens (meloukia). In addition to these three crop groups, a fourth group of relative importance consists of wild foods which are primarily collected by women and children for home consumption and sale (a partial list includes tabeldi, nabak, ardeb, haskineit, gaddam, meloukhia, lalob and korsan). Most farmers tend to grow both a subsistence crop and a cash crop on their holdings, with the cash crop

occupying a greater proportion of the total cultivated area (see Appendix C - El Kharta Data).*

Intercropping is widely practiced in this area, although rarely are any other crops intercropped with millet (watermelon occasionally). Farmers say that the millet crop is too "hot" for other crops to survive in the same field. Sesame, on the other hand, is often intercropped with several other types of crops. In fact, sorghum (a crooked neck variety called zunari or mareg) is often planted with sesame in the same hole on sandy soils. Some farmers have stated that this practice is done primarily because the sorghum tends to stabilize the soil so that sesame is less susceptible to wind damage (especially on previously cultivated soil). Other farmers point out that sorghum (zunari or mareg) is a drought resistant crop, and given the uncertainty of rainfall, it is grown with sesame in order to insure that some crop produces in their fields. For this reason, the importance of sorghum (zunari or mareg) as a food crop in this area should not be underestimated. Occasionally sorghum is planted in a separate stand in a field, but this is more common to the south of el-Obeid than it is to the north or east. In addition to sorghum, sesame is also planted with watermelon seeds, cow peas and karkide. These various seeds, along with sorghum seeds, are often mixed together with sesame seeds prior to planting and then planted together in a random fashion in the same holes, usually with no more than two different crops per hole. Alternatively, sesame may be planted alone on soil that was fallow the year before (boor). Two different reasons are given by farmers for this practice: 1) the fallow land is "hot" and only a crop like sesame (simsim herehri) will successfully grow on it; and 2) the boor land is more stable than previously cultivated land and sesame plants are less likely to be damaged by the wind. Farmers in the area also rarely intercrop groundnuts with other crops, except to the southwest of El-Obeid. There we observed farmers planting 1 row of sorghum (zunari) between every 5 rows of groundnuts. After several inquiries, we found that this practice was quite common in that area. Besides sorghum, sometimes watermelon will be planted between the rows of groundnuts just prior to harvesting. This practice was observed in other areas as well, though on an infrequent basis. Farmers may also intercrop okra with sorghum, but in most cases it is grown separately in small plots on the farm.

Farmers in this area regularly use DDT to protect post-harvest storage of sesame. To protect them from ants, DDT is placed around sesame piles left in the field to dry. Every farmer with whom we talked engages in this practice. In addition, some farmers are

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*In addition to the land holdings under cultivation, villages to the south of El Obeid have small gardens planted near their houses called gebracka. These gardens are usually planted by women and consist of sorghum, maize and a large variety of vegetables for home consumption.

using a seed treatment dressing called Aldrex T (a locally-manufactured substitute is dawa suweit) to help protect seeds from pests during planting. Currently, it is primarily groundnuts and sesame seeds being subjected to this treatment, despite the fact that it can be used on other seeds as well. Although many farmers have heard of this seed treatment dressing, few are actually using it. This is primarily because they lack adquate information regarding its use. This is an area where extension could make a significant impact.

Ants and termites are the major pests that eat the newly-planted seed. The most important pest, however, in the el-Obeid region is a beetle called simta (Cyrtocamenta Spp.) which attacks the millet during flowering and seed formation. To lessen the risk of simta attack, farmers often plant their millet crop early (May-June) to avoid this pest's peak season in late September and October. Simta attacks the millet only at night which makes it hard for farmers to spot and control.

The second most important pest in millet are the quelea birds. This pest is most prevalent at the same time that the simta is active and is a further reason why farmers plant millet early. Farmers lack any truly effective means for combatting these birds. Their methods are mostly noise makers carried by children and "scare quelea birds." Farmers recognize that certain varieties of millet and sorghum with bristles on the head next to the seed are resistant to bird attack, however such varieties of sorghum and millet are also recognized to be lower yielding. Some farmers make a point of reserving a few heads of a bird-resistant variety for planting in the next season.

Perhaps the third most important pest on millet is naffasha (Eublemma brachygonia). The larva feeds on millet heads at the milky stage. It eats its way at the base of the seed starting from the lower part of the head and working upwards in a spiral form. As a result, the seeds are separated from the cob and are usually blown by the wind leaving a bald headed millet plant. Farmers lack any means of controlling this pest.

The most important diseases of millet and sorghum are long smut and downy mildew. These diseases appear to be more prevalent in the case of millet than of sorghum. Some farmers recognize that long smut is controlled by locally available seed treatment dressings, Aldrex T and dawa suweit, but their use does not seem to be widespread.

Buda (Striga) is a serious problem on qoz (sandy) soils which have been cultivated in millet for 4-5 years. The appearance of buda is a signal to the farmer to rotate his crops or to let the land go fallow. The major rotation in this region to control buda is to alternate millet seasons with seasons of growing cash crops--e.g., sesame and groundnuts.

As for the rotation of crops, this practice is widespread in this area, although farmers are not very systematic in the sequencing of planting alternative crops. Usually a different crop is planted in the same field in each successive year, alternating between the cash crop and the cereal crop (e.g. millet, then sesame or groundnuts, then millet again). However, sometimes the same crop may be grown in the same field in consecutive years, because the crop continues to bring a high market price. Farmers will usually plant in the same field anywhere from 6 to 10 years, depending on the fertility of the field and the farmers' access to other cropland. The appearance of striga (buda) is recognized as a sign by most farmers that the field should be allowed to go fallow. Fallow periods last anywhere from 3 to 4 years to 10 to 15 years, depending on whether the farmer has access to other farmland elsewhere. If enough farmland exists elsewhere, the farmer will allow the gum arabic trees in his fallow field to grow and will begin tapping them after 3 to 4 years. Tapping of gum may continue for as much as 10 more years, but frequently farmers return these fields to cultivation after a shorter time period (the whole system of gum production in previously cultivated land is called the tonja system). The old gum arabic trees are usually tapped in October and gum collection usually begins 40 days later. Following this 40-day period, gum is collected every 15 days, up to six times, so collection of gum will continue through February. New trees are tapped in March and gum is collected after 20 days. After this 20-day period, gum is collected every 10 to 12 days for up to 3 times. The older trees yield more gum than the new trees. Gum arabic has decreased in importance in this area in recent years primarily because the return to labor is lower and slower than it is to other cash crops, and because the tapping of gum trees is hard, nasty work. Gum harvesting is more widely practiced in the area east of el-Obeid than to the south or southwest. The women, children and older men who do not migrate from the village during the dry season are usually the ones who collect the gum.

In many of the villages under study, there is a tendency for farmers to migrate to large urban centers or large agricultural schemes during the dry season following the harvesting of their crops. In most cases, these migrants are young farmers, but we have found evidence that some older farmers with families may migrate as well, either taking the whole family along or migrating by themselves. Farmers begin to migrate sometime in late December of early January, and do not return to their farms until May or June. Usually those who are migrating to urban areas attempt to secure wages as construction laborers, while those who are migrating to the large agricultural schemes such as Habila or the Gezira are either involved with sorghum or cotton harvesting. Migration of farmers seems to be closely tied to water availability in many of these villages. (See Appendix B on water data obtained from Initial Village Survey.) Because water is in short supply and can become quite costly during the dry season, many farmers migrate out. In some villages, more than 75% of the adult males migrate. For this reason, migration and its relationship to water availability will receive greater attention as the study continues.

As for the allocation of labor, farmers--especially the poor farmers--are hiring their labor out to other farmers within the village. This activity is quite common in many of these villages because poor farmers do not have enough food supplies to get them through the cropping season and are forced to work for wages to purchase food. This necessity draws their labor away from their own fields during critical time periods in the crop production cycle, and probably results in lower productivity for their own farms. Also, farmers tend to hire labor (both outside and inside) for the cultivation of their cash crops but usually work on their millet fields by themselves or with their families (however rich farmers do hire labor for millet cultivation). This tendency to allocate hired labor to cash crops rather than subsistence crops might be explained by the fact that farmers are well integrated into the cash economy, and place a higher value on cash generating crops that allow them to purchase commodities from the market that are not locally produced. Such commodities include food items as well as manufactured goods. Our material goods inventories of both shops as well as households in these villages indicate a shift in this direction. (See Farming Systems Model.) Allocating hired labor to subsistence crops such as millet would not generate the same amount of income to purchase such items. This labor allocation question bears further investigation.

The purchase of livestock seems to be the main form of savings and investment for farmers in the region. Small amounts of surplus cash are often invested in goats and sheep, while larger amounts are invested in cattle and camels. One of the main reasons cited for why livestock are the preferred form of savings is that whenever the farmer is in need of ready cash he can just sell an animal. Other forms of savings include gold jewelry, crops, and investment in capital intensive business enterprises. Such forms of savings and investment are usually for the richer farmers in the village and are not generally pursued by poorer farmers. (See Farming System Model. Also see the market section of the report.)

Farmers in this region have also had a long history of contact with nomads. In many cases, this long contact has resulted in the development of a symbiotic relationship between the two groups. Nomads are often allowed to graze their animals on the stubble left in the field after harvest, which enhances the fertility of the farmers' field because of the manure deposited by the animals. (See Farming System Model.) Also, farmers purchase milk and meat from the nomads as well. Despite these positive relations, some friction has been detected between these groups. Some farmers complain about the damage these grazing animals cause to their crops and gum trees, and several court cases have been brought against the nomads. However, this friction is not widespread and is found in only a few of the villages under investigation.

C. Some Examples of the Types of Data Being Collected.

Although we are still in the preliminary stages of our village ethnographies, we feel that the data we have collected thus far are

nevertheless quite revealing. To give the reader some idea of the specific kinds of data already collected, some examples will be provided below.

As stated earlier, we are collecting detailed descriptions of farming practices, such as the methods and techniques involved in the cultivation of millet, sesame, and groundnuts. For instance, we have identified 9 distinct tasks that farmers perform in the process of harvesting millet, and have recorded the local names for each of these. Although all of these tasks are in some way agronomically significant, one in particular seems to be extremely important regarding seed selection. After millet heads are cut from their stalks, farmers gather them into piles--first many small piles (called khulba or kom), then later into a number of larger piles (called sott), and finally into a single pile which contains all the millet heads harvested in one field (called jeruun). The reason for this three step procedure in accumulating millet heads into larger size piles is to minimize the risk of damage due to late rains or pest attack (termites in particular). The millet heads are gathered into one large pile so that one large threshing area (tugah) is all that the farmer needs to prepare for processing the millet. The millet is then threshed (dugg), winnowed (mudraa), sacked, and taken to a storage pit (matmura) which has been dug beside the farmer's house. Several sacks may be retained for immediate consumption, while the rest is dumped out of the sacks into a storage pit lined by millet chaff. Aside from threshing the jeruun, farmers also select seed heads from the pile for next year's planting. Selecting next year's seed from the jeruun rather than from the millet stalks themselves could have negative consequences. Farmers, in their cutting of millet (gata), will gather millet heads which appear of high quality from "bunches" of stalks* that may contain mostly inferior seed heads. Because of the high cross-fertilization tendencies of millet, a strong possibility exists that inferior genotypes are being passed on to next year's seeds through the selection of such superior seed heads from a "bunch" of inferior heads. As a result, farmers may be retaining inferior types of millet in their fields from one year to the next. This seed selection problem may be one area where agricultural scientists can provide direct input as to when and how this process should be done.

We have also collected data on the various distinct growth stages of millet that farmers recognize, and have obtained the names of these stages. They recognize 12 stages in all. It is our hypothesis that some of these various stages have something to do with the decisions that farmers make regarding replanting practices or estimates of crop failure or success. Such estimates may determine whether a farmer will migrate to work for wage labor in another region or remain on his farm. Also, we hypothesize that some of these growth stages may represent stages at which particular types of pests such as insects, birds or disease may be most prevalent. For instance, we already know

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*Farmers will plant anywhere from 10-20 millet seeds per hole. As a result, the millet plants grow in bunches or bushes. Farmers have stated that anywhere from 10-50 heads may be present in one of these bunches. Because the seed heads are in close proximity in these bunches, cross-fertilization is quite frequent.

that birds are a significant problem when the millet reaches the milky stage (leboni). We plan on investigating more thoroughly the relationship between these stages and their corresponding pests.

In addition, we have found that the feriik stage (see below) of millet growth is one of the most critical stages in millet production. It is at this stage that the millet can first be consumed. Millet reaches the feriik stage when the seeds on the heads begin to get semi-hard. Through our investigations, we discovered that nearly all of the villagers collect feriik out of the field when it first appears, and rely on it heavily as a food source throughout the remaining part of the rainy season (khariif) until the rest of the millet is harvested. For the short maturing varieties of millet (dukn herehri), feriik can be collected after 60-65 days, whereas it takes at least 80-85 days to appear in the longer maturing varieties (dukn beledi or dembi, and aish bornu). This 20-25 days can be very critical to the small farmer, because it is during this time of the rainy season that the poor farmer usually runs out of food. As a result, he may be forced to work as a wage laborer on someone else's farm to obtain funds to purchase food supplies. This has the adverse affect of drawing the farmer's labor away from his own field during a critical time period in the crop production cycle, and could result in lowering the productivity of his own farm. If the poor farmer is growing the short maturing variety of millet rather than the long maturing one, he is better able to secure a food supply sooner, reducing the pressure on him to work for wages to obtain food. This would allow him to devote more of his labor to his own field. Farmers themselves recognize this and many poor farmers we have interviewed have emphasized the benefits of growing the quicker maturing variety of millet. However, because they cannot afford to pay for the seed, many poor farmers are forced to plant the only variety of millet at their disposal. In many cases, this is the longer maturing variety.

From these findings, it appears that some type of seed distribution program which provides quicker maturing varieties of millet to small farmers would have a significant positive impact on those farmers who rely on feriik as a food source. Access to such seeds would have the dual effect of providing an earlier food source as well as allowing the poor farmer to allocate his labor to his own productive enterprise.

An additional type of data that we obtained that we consider significant entails the practice that most farmers follow with regard to supplementing their millet food supplies with purchased sorghum (feterita). Through numerous interviews, we have found that most farmers do not grow enough millet to meet their consumption needs (except for the rich). They often do this intentionally, allocating a bigger portion of their farmland and meager resources to cash crops rather than millet production. The strategy that is normally followed is that farmers begin consuming their millet while it is in the feriik stage (late dough stage) and continue to do so until the millet is threshed and brought back to their compound for storage. Farmers then keep a couple of sacks of millet out for immediate consumption and store the rest in an underground storage pit located

outside their house.* After storing the rest of the millet, the farmer then purchases a sack or two of sorghum (feterita) from either a local merchant or a large city market nearby (El Obeid or Rahad). This sorghum most likely originates from the big mechanized farming schemes to the south or east of El Obeid (Habila, Rahad, or Gedaref). The farmer then combines 1 measure of millet to every 2-3 measures of sorghum. Farmers say they mix millet and sorghum because they believe the millet tastes better and is more nutritious than the sorghum. This purchasing of sorghum and mixing it with millet continues until the following rainy season. When the rains come, farmers dig up their millet in the storage pits and consume this throughout the rainy season.

Several farmers reported that one reason they try to save their millet until the rainy season is because they feel stronger when they are eating millet. Farmers say that the Nuba wrestlers are so strong because they eat millet. Farmers like to be eating millet rather than sorghum when they are engaged in the onerous tasks of planting, re-planting, and weeding their fields. Some farmers also say that the millet is "hot" (harr) and they do not want to eat it during the hot, dry season (seif) of the year.

This strategy also makes sense when one considers the market price of sorghum and millet at various times of the year. Sorghum and millet prices are at their lowest in late December and January because the supply of these crops is high due to the marketing of sorghum and some millet from the large agricultural schemes. It is at this time that farmers start purchasing millet and sorghum with cash obtained from the sale of part of their cash crops (sesame and groundnuts)*. They continue to buy sorghum until the rainy season begins, at which time the price of sorghum and millet start reaching their peak prices. At that time, farmers start consuming their own millet supplies until they can eat millet from their fields again.

Ideally this is how the strategy works. In reality, poorer farmers open their storage pits before the rainy seasons to obtain more of their own millet supplies. As a result, farmers often run out of their own millet before they can eat from their own fields again, so they are forced to purchase sorghum at its highest price. To obtain cash for such purposes, farmers may be forced to work for wage labor.

We are also collecting considerable data on the types of decisions that farmers make with regard to cropping patterns. Our findings indicate that farmers' behavior with regard to planting practices may be logically patterned, and that decisions are made in systematic ways. We refer to these patterned decisions as decision models, and hypothesize that the models with which rich farmers operate are

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*The millet is stored in storage pits outside the house primarily to protect it from fire.

*Farmers will often put a major portion of their sesame crop in a storage pit and hold it till one or two months before the rainy season. They then sell it at this time to have cash on hand to pay for planting and other agricultural operations.

different from those of poor farmers. From the data collected so far, it appears that poor farmers desire to plant short maturing varieties of millet and sesame in order to obtain a quick return on their farming efforts. This might be explained by the fact that poor farmers find themselves year after year in a position where they are in need of food and cash at the time when the harvest season approaches. Thus, quick maturing varieties are considered more desirable to grow because they help alleviate this yearly crisis more quickly. Although this is the ideal, in reality most poor farmers do not possess the quick maturing seeds of both millet and sesame, nor can they afford to purchase them, so they are often forced to plant the longer maturing variety of one or both of these crops. As stated earlier, this puts the poor farmer in a critical position and may influence how he allocates his labor (either to his own production or to wage labor in someone else's field).

The rich farmer, on the other hand, operates with a much more complicated decision model. His first priority regarding his cropping decisions is to plant crops which will bring about the greatest return given the current environmental conditions. Ideally, such farmers will attempt to grow longer maturing varieties of millet and sesame because they are higher producers than the shorter maturing varieties. Unlike poor farmers, rich farmers are usually not in need of food or money during the harvest season, and can afford to wait to sell their crops until the prices reach their peak. This is another reason why longer maturing varieties are preferred. Usually, the only times that rich farmers will grow shorter maturing varieties is when environmental conditions are such that longer maturing varieties will not produce well. Because the rich farmer is in a position to purchase all of the needed inputs he requires, he is better able to pursue alternative cropping strategies. For instance, the rich farmer may decide that the rains will be good this year, so he plants a long maturing variety of millet. If by chance he miscalculated on the rains, he can return to the field and replant in a shorter growing variety of millet or sorghum or even sesame. Because he can afford the short maturing seed and the labor necessary for a quick replanting, he is less likely to suffer from his previous miscalculation and is still able to obtain a good return from his field. In fact, because he can afford to purchase alternative seeds, he can replant in any crop which he estimates is more likely to be successful and give him the greatest return. Poor farmers, on the other hand, do not have such latitude available to them when it comes to replanting.

Our findings indicate that replanting is a common phenomenon in farming in this area and that access to appropriate seed for replanting may be one of the most serious constraints to production. We hypothesize that one of the major reasons why replanting is so common in this area is because of the preferred practice among farmers to plant their crops prior to the rains (the practice is called <u>remail</u>). Because the rains do not come in any consistent fashion from year to year, farmers often miscalculate on this early planting and plant too early. As a result, much of the planted crop does not germinate, and large tracts of the field have to be replanted.

Farmers cite three reasons why they plant prior to the rains. First, they point out that crops that are planted early (May) avoid the peak seasons of pests, and so have a higher output. Second, food is retrievable earlier from the field the earlier it is planted. Third, labor is cheaper to hire the earlier one plants because the soil is easier to work (very sandy--loose) and because the demand for labor is not as high (not all farmers plant remail). Another adaptive advantage we see for planting earlier is that crops that are planted before the rains are able to take advantage of all the moisture that falls during the season. This is critical in this area because some years the total amount of rainfall just barely meets the minimum requirements of the crops grown. Missing one or two rains could mean the difference between success or failure for a farmer's crop. In the long run, planting early before the rains may be an adaptive approach to farming in th this region.

Despite the possible long-run advantages of planting before the rains, the subsequent need for replanting does pose serious problems for poor farmers in this region. Although rich farmers, through their marketing channels, are able to obtain short maturing seeds for replanting, poor farmers are usually unable to obtain the desired seeds. As a consequence, they tend to replant with whatever seeds are available, and these are often inappropriate in view of the lateness of their planting and decreasing availability of adequate rainfall. For this reason, we feel that a seed distribution program should be started in this area which can provide short maturing seed varieties to poor farmers for replanting purposes.

The types of data just described are a few examples of the kinds of information we are collecting. The collection of such data is essential if a thorough understanding of the farming systems in this region is to be obtained. It is our hope that these kinds of data will enable us to construct a data collection instrument which elicits the relevant information about farming practices in this area of N. Kordofan, and that this information will be of use to any agricultural programs impacting this area.

IV. Ethnographic and Documentary Study of the Rural Marketing System.

While the main focus of this study is on farming systems in North Kordofan, with the farm household considered to be the basic unit of production, consumption, and economic decision-making, considerable attention is also being given to the marketing system which services the rural economy. The significance of the marketing system in the aims of the present study lies in its complex relationship to the farming system. This relationship may be broadly characterized as follows: (a) the marketing system provisions the farm household with most of the consumption requirements as well as with farm inputs such as seed, seed dressing, and agricultural implements; (b) the prices, or anticipated prices, of agricultural produce have far-reaching effects on the selection of crops which farmers plant; (c) the marketing sector is the main source of credit to farm families, local merchants are accustomed to making loans in cash and in kind, and market forces determine the terms of repayment and the interest rate; and (d) the marketing system is partly responsible for the development of different kinds of farming systems that are based in the economic inequality evident among farmers in our sample of villages. The capital-intensive business of the

wealthy farmer allows him to purchase inputs and to adopt farming strategies that are beyond the capability of the poor farmer lacking non-farm business investments. The difference in farming systems carries over into differences between the means by which the poor and the rich farmer market their crops. The poor farmer may have mortgaged his crop to a shopkeeper in order to obtain a consumption loan during the month before harvest. Another eventuality is that the poor farmer will be compelled to sell his crop early and at a low price because he lacks the capital to overcome the two bottlenecks of marketing in the area--transportation and storage. The capitalistic farmer can afford to lease transportation and storage if he does not in fact own these facilities already.

The sources of data for this part of the study are two: the documentary evidence afforded by government tax receipts for crop and livestock sales and the ethnographic material obtained through observation and interview. The government tax receipts contain a wealth of reasonably reliable information about agricultural produce sales in the study area. A major drawback is that we have not been able to locate the tax records for several of the markets in our samples of villages. A complete list of data is being collected from the tax records of Abu Haraz market. However, we should be able to gain access to the tax data for the current year. Each livestock tax receipt indicates the date of sale, kind and number of animals sold, the total price, and the tribe and residence of the seller and buyer. These materials about livestock sales are still being collected and no attempt to analyze them has yet been made. It is foreseen that the data can be used to estimate volumes of sales throughout the year and changes in prices. From the data about the tribe and residence of livestock buyers and sellers we may be able to map the social identities of participants in the livestock market.

The tax receipts having to do with crop sales do not contain as much information as those concerned with livestock. Nothing is recorded about the identity of the seller, except in instances where the seller pays the tax on his crop in order to transport it elsewhere (usually to el-Obeid) hoping to get a higher price for it. The name of the buyer is recorded, however, and by analyzing buyers' names on the tax receipts we are able to quantify the degree of imperfect competition that prevails in the market. The daily sales of crops in the Abu Haraz market, from March 15, 1980 to March 20, 1981, have been recorded and analyzed in a preliminary manner. These data will be referred to in order to illustrate some points when the government crop markets are described below.

Another approach to study the marketing system that is complementary to the gathering of documentary materials is the collection of data through direct observation in conjunction with open-ended interviews and survey interviewing. The end of October marks the start of the marketing season (concurrent with the harvesting of the principal cash crops, sesame and groundnuts). To prepare for studying the market, we were occupied during September and early October gathering data using open-ended interviews with merchants, itinerant vendors, clerks of government markets, and farmers. We have endeavored to get a general picture of the organization of marketing activities. Currently, we are preparing a survey interview instrument designed to gather comparable quantitative information about the marketing system. The survey is divided into five parts: (1) a checklist of characteristics of the marketplace; (2) an interview schedule addressed to fixed merchants (e.g., their social characteristic, career history,

description of their business, capital investment, credit lending, crop buying, farm holdings); (3) a similar interview schedule for livestock merchants; (4) another interview schedule addressed to itinerant vendors; and (5) an interview schedule addressed to visitors in the marketplace (e.g., frequency of visit to market, other markets visited social characteristics, occupation, residence, indebtedness, purchases, and buying strategy). This survey will be carried out in all six villages of the sample of eighteen that have a market. The prospects are good for our obtaining a nearly 100% sample of merchants and vendors in each marketplace; a random selection procedure will be devised for interviewing market visitors.

This Market System Survey will be carried out from November to January. As soon as the survey is completed we will go back to recording the data from government tax records on the current year's sales. From January to April we will also give our attention to gum harvesting and marketing. Charcoal production and marketing is a second activity deserving study at that time.

It would be premature in this report to offer an analysis of the rural marketing system. Instead, the pages that follow relate to two more limited topics. The first of these deals with the roles of the village shopkeepers.

A. The Village Shopkeeper

In the sample of eighteen villages only two--Kaba and el-Filia--lack a resident shopkeeper. At Kaba, the proximity to el-Obeid may be cited as the reason; at el-Filia it is extreme isolation and poverty. That the large majority of the villages in the sample have at least one, and usually several, shopkeepers is an indication of the importance of the shopkeeper's economic roles. Merchants other than shopkeepers--such as millers, well owners, oil press owners, bakers, and truck owners--are also encountered but not as frequently, and it is doubtful that they influence the farming household economy as broadly as the shopkeepers. Shopkeeping is an easier enterpriseprise to start than these other types of business concerns because the initial investment is comparatively low. A thatched hut will serve as the shop and it can be equipped with scales and measures, tables, shelves, gunny sacks and stocked with consumers goods for 500-1000 Sudanese pounds.

The economic roles of the village shopkeeper vis a vis farming household can be identified in these domains. First, the shopkeeper is responsible for the day-to-day provisioning of the household with many of its consumption requirements. Second, the shopkeeper is the first-line buyer of the products produced by the household. Third, the shopkeeper is the source of credit to households, particularly late in the cropping season before the grain can be harvested--a time when many farm families are without income and are unable to purchase their consumption needs.

A survey was made of the stock in trade of five village shops. Their inventories of goods were found to be remarkably similar. Some of the common commodities are: tea, coffee, sugar, salt, red and black pepper, a dozen or so kinds of spice, canned tomato paste and dried tomatoes, biscuits, sorghum (feterita), wheat flour, yeast, onion, dried okra, pasta, sesame oil, candy, chewing gum, matches, hand soap, laundry soap, bleach, razor blades, flashlight batteries, padlocks, henna (a dye applied to the hands and feet), kerosene, bicarbonate of soda, aspirin, chloroquine phosphate in ampules

(for malaria), and custard powder mix (for treating diarrhea in children). The availability of particular commodities varies with the season. For example, the shopkeeper will sell feterita sorghum, imported to the area from the mechanized farming schemes at Habila and Gedarif, during the rainy season when the farmer's stores of grain are exhausted. During the marketing season (November-January) when customers have cash to spend, the shopkeeper may stock cloth and inexpensive shoes.

In examining the inventories of these shops we are struck by the number of commodities that are ingredients in the daily needs of farming families. From this and other evidence we are led to the conclusion that farm families require continuous supply of cash in order to pay for consumption purchases at the village shop.

The importance of the shopkeeper does not end with providing fellow villagers with consumer goods. He is also the primary buyer of many products of the farming household. In fact we hypothesize that the sale of its products to the local shopkeeper is one of the chief reasons why the farming household is able to meet its consumption costs. To get a clearer picture of the shopkeeper's role as a buyer we may take the example of a shopkeeper at el-Kharta. He belongs to a prominent extended family in the village, which in addition to large land holdings also has several business interests, including the operations of a flour mill, two shops, and a truck. The table below lists the produce that the shopkeeper purchases from farming families and how he disposes of it:

Table III

Purchase and Disposal of Products by a Village Merchant.

Purchases	Disposal
millet	consumed by shopkeeper's household
sorghum	processed by mill owned by shopkeeper's father and resold to villagers
feriik (an immature sorghum favored for eating on festive occasions)	sent to el-Obeid in grandfather's trucks for sale*
watermelon seeds	same as above
gum arabic	same as above
charcoal	same as above
sesame	sent to el-Obeid in grandfather's truck for sale; small amount reserved for consumption by shopkeeper's household
groundnuts	same as above
karkide	same as above

*On such trips to el-Obeid, the shopkeeper can buy goods from wholesalers to replenish the inventory of his shop.

Purchases	Disposal
cucumber	resell to villagers
okra	resell to villagers
millet stalks	repair shopkeeper's structures, sell surplus to buyers from Bara or el-Obeid
wild fruits	sell at el-Obeid

This example is not atypical. It illustrates the prominent role of the shopkeeper as a first-line buyer of farming household products. The reasons that farmers sell their produce to shopkeepers rather than at a market where the prices may be higher are basically three: (1) Because the shopkeeper is near at hand and willing to purchase in small quantities, the farmer can obtain a sale without incurring storage and transportation costs. (2) The opportunity of going to the market and possibly getting a better price is outweighed when there is an urgent need for cash since the market can only be attended on the those days when it is operating and to go and return usually takes up the whole day. The simple convenience of trading with the local shopkeeper is also significant in this connection. (3) The farming household may be in debt to the shopkeeper in which event the sale of produce to the shopkeeper is usually part of the loan agreement.

Another factor which is pointedly illustrated in the above table is that from the standpoint of facilitating marketing, the shopkeeper is frequently able to mobilize social ties (notably kinship) to assist in transportation, processing and storing his purchases. Ordinary farmers do not do this.

Shopkeepers make loans to fellow villagers late in the cropping season, before harvest. This is generally a time when farming households are bereft of cash and are feeling a consumption squeeze. Sheil is the term used generally to refer to this sort of credit in the traditional farming sector, but credit arrangements are more complex than this term signifies. Strictly speaking, sheil refers to crop mortgaging. The farmer receives an amount of cash or consumption goods from the shopkeeper while promising to repay in a cash crop the equivalent value of the loan based on the crop's current market value. Such loans are usually made very near the harvest period when the merchant can observe the borrower's crop and assess if it is worth the risk to make the loan. The borrower is supposed to pay the merchant as soon as his crop is harvested. The shopkeeper then waits as much as two months before selling. Profit margins of 100% are not unheard of in these cases. A second reason for insisting that the loan be repaid immediately after the harvest--other than to keep the price of the mortgaged crop low--is to allow the shopkeeper to make direct purchases of crops while the prices are still low.

Another credit arrangement which, according to shopkeepers is more popular with farmers nowadays, who may refuse to borrow under terms of sheil, is a commodity loan with cash repayment. Here the customer buys commodities on credit from the shop and promises to repay in cash. Provided that the shopkeeper is confident that his customer will pay after the harvest, this form of loan generally carries no interest. It moves the shop's inventory and builds goodwill with customers. In actual loans

of money, interest is usually charged however. The rate varies between 25% and 50% depending on the length of time before repayment. Two months is considered the maximum limit of time for repayment.

Credit is a difficult subject to investigate because both shopkeepers and farmers are reluctant to speak about it in concrete terms. It is a subject of considerable importance to the farming systems analysis, nevertheless, since it is by means of credit that a sizable proportion of farming families are able to pay their consumption bill during the months of August through October. It is our hope that patient and persistent interviewing will bring to light the concrete data that we are seeking.

This section has focused on the role of the village shopkeeper vis a vis farming households. It will have achieved its purpose if it has shown how dependent the farming households are on the goods and services that the shopkeeper provides. Another economic role of the shopkeeper which is integral to this operation of the rural marketing system is the tendency for shopkeepers to serve as agents for big urban-based merchants and commercial firms. This aspect of marketing will await a future report for full treatment, but the next section touches on it briefly.

B. Government Crop Market

To illustrate the organization of a government crop market, the market at Abu Haraz is described below.

> The marketplace is open the year around, but crops are mainly sold in the period from October to April. The marketing of various crops depends on their times of harvesting. The volume of groundnuts sales show a sharp increase in October. Sesame, gum and karkide follow in November. Approximately 25 villages sell crops at Abu Haraz. There are 11 shopkeepers who regularly buy these crops; all of them live in Abu Haraz. They in turn are usually acting as the agents of firms or big merchants at el-Obeid. These firms or big merchants number about 15, but this figure is deceiving. In relation to the number of transactions, a very few buyers actually control the market. For example in November of last year one firm in el-Obeid bought 63% of the lots of groundnuts sold, 100% of the sesame, 50% of the gum arabic, and 100% of the karkide.

One of the purposes of the government crop markets was to instill greater competition in rural marketing by having crops sold at auction, but this objective has been circumvented by monopsonostic buyers who never bid at this auction themselves. Their agents bid in their stead after agreeing among themselves to set a ceiling for the bidding.

The following is an outline of sales procedures at the Abu Haraz crop market:*

1. The producer transports his crop to the zariiba (market enclosure at his own expense).

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*All government crop markets are supposed to follow these procedures, but at the small ones even the semblance of competition by means of a formal auction is dispensed with.

2. The crop is assigned to a numbered lot (called nimra).
3. Among the producers with crops on the same lot, one has been chosen to represent the group; he is called the khabiir. Selection of the producers' representative is not formalized, but sometimes the representative may be a village merchant who arranges to transport the crops. Otherwise, the representative may simply be a volunteer, while the position rotates among several farmers who usually market their produce together. The khabiir receives a ticket for his numbered lot on which is recorded his name, village, council, kind of crop and number of sacks.
4. At 11:00 a.m. the merchants are summoned to the auction (dalaala). The merchants' names have been selected at random to determine the order in which to make their bids. (The merchants sit in chairs lined up in this order.) The merchant whose name was drawn first begins the bidding. The other merchants in turn may increase the bid above the previous offer; each merchant may bid as many times as necessary until the bidding stops. The bids are stated as price per kantar (a unit of weight equal to 44.9 kg.). If there are no following bids after the first offer, the auctioneer (dallaal) asks the khabiir if he agrees to sell at the price quoted. If the khabiir refuses, bidding on the lot is postponed until later in the day, when another attempt will be made to auction it. The official procedure is to hold crop until the next day's auction, but because many producers are poor farmers who intend to return to their villages that same night, this procedure of offering the crop for sale twice in the same day has been instituted for their benefit. If the khabiir is still dissatisfied with the price offered after several attempts to auction the crop, he may pay the ushuur tax (a 15% government levy on market value) on the highest price bid and take his crop to the el-Obeid market, hoping for a better price there.
5. After a sale price has been determined in auction, the lot is weighed to determine its total value. The khabiir is then given a ticket stating the lot's weight and value. The khabiir takes a copy of this ticket to the buyer to receive payment. At the weighing station the crop is removed from the producer's sacks and put in the buyer's sacks.
6. Two other forms are filled out: a record of the merchant's purchases (daftaar mushtiraat at-taajir) indicates the weight and sale price; the other record shows the taxes--gibaana and ushuur--which must be paid. These taxes are assessed at constant rates, namely:

   gibaana is .15/kantar

   ushuur is .15 on each 1.00 L.S. of total price

   The seller pays ushuur and the merchant pays gibaana. If the merchant wants to remove his purchase from the market right away, he goes to the market office and pays the tax; otherwise, the market clerk may have to seek him out.
7. After paying the gibaana the merchant may remove his crop. The common practice is to transport the produce to el-Obeid immediately because storage facilities in Abu Haraz are limited*

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*This is one reason for the monopsony by the commercial firms and big merchants from el-Obeid in Abu Haraz market. They own or can rent storehouses. The second reason for their control of the market is that they often supply their agents, the shopkeepers of Abu Haraz who bid for crops at the auction, with cash advances so that they can purchase these crops in large quantities.

8. The truck driver who carries the purchased crop to el-Obeid must have three documents to get past the police checkpoints which are designed to discourage countraband: the bill of sale, the tax receipt, and a transport permit. All of these documents are provided by the market clerk (kaatib as-suuq).

The imperfect competition which is so evident in Abu Haraz market appears to be characteristic of the marketing system in the study area as a whole. This suggests that the income of farmers might be raised and their incentive to produce increased by a well-formulated program to by-pass the existing market structure. The Sudan Agricultural Bank has such a program, although it is still experimental. In the last two years the Bank has set up cooperative societies in eight villages. In addition to supplying cash loans to farmers for agricultural inputs, the program arranges for the transportation of participating farmers' crops to el-Obeid and storage there until a favorable price appears in the market.

V. Recommendations

Our intention in this and future interim research reports is to provide an extensive summary of our findings so that the agencies with which we are collaborating can use this information immediately rather than waiting for a final report a year or more hence. Likewise, we intend to make recommendations which according to our current knowledge are strongly indicated. The following recommendations are made at this time. A much longer list is anticipated when we are more sure of our findings.

1. Our research procedures may be generalized as a guide for rapidly collecting information about farming systems in an area. A complete analysis requires the quantitative backing of a large-sample survey, such as our Farming System Survey. But if the objective is to learn as much about the farming systems as possible in a short period of time, one cannot do better than using the village survey as a means of gathering a broad array of data about the village economy and then following it up with an intensive ethnographic study of two or three villages with an aim to joining farmers in their fields and seeking a comprehensive understanding of production decisions and constraints. By this method a single researcher may hope to "do" 8-12 villages in four months' time.

2. A seed propagation and distribution program is needed for millet, sorghum, sesame, and groundnuts. Special emphasis should be given to producing early maturing varieties of crops and making these available to poorer farmers for first planting as well as replanting.

3. The Agricultural Extension Office for North Kordofan needs vehicles, spare parts, and fuel in order to carry out its mission. Extension agents should be prepared to address farmers on the correct use of seed dressing with different crops.

4. An agricultural scientist should make close observations of seed selection practices in the area of the study to determine if improvements are necessary.

5. Entymologists should further study the life cycle of the sinta (Cyrtocamenta Spp.) beetle that is perhaps the most damaging insect to millet crops in the region. Farmers need some effective way to combat this pest.

6. Agricultural research should be directed toward investigating integrated crop and livestock production systems. Especially important is determining economically productive, risk-minimizing, ecologically sound crop rotation patterns for the region. Unless such systems are identified and developed desertification of this fragile region will not be long forestalled. We believe that systems that begin with the aim of improving existing practices in the area are likely to be more successful than those that depend on wholesale change.

A P P E N D I C E S

Appendix A.

INITIAL VILLAGE SURVEY: OUTLINE OF TOPICS

I. Number of Households (use informant's definition of household)
   A. Population size

II. Access to Water
   A. Water sources (locality)
      1) Cost of water
      2) Distance
      3) Seasonality

III. Access to Transport
   A. Motorized transport (types)
      1) Destination (amount of time required)
      2) Costs for passengers
      3) Costs for hauling crops
      4) Differences in seasonal access
      5) Differences in seasonal costs
      6) Ownership of vehicles
   B. Animal Transport (including cart transport)
      1) Destination (amount of time required)
      2) Costs for hauling crops (from field and/or to market)
      3) Differences in seasonal access
      4) Ownership of animals or carts
   C. Human Transport

IV. Access to Markets
   A. Place(s) where crops are sold (distance in time)
      1) Difference in price paid
      2) Amount sold of total output
   B. Place(s) where everyday commodities are bought (distance in time)
   C. Place(s) where farm equipment is bought (distance in time)
   D. Nearest Periodic Market
      1) Distance in time
      2) Market days
      3) Types of goods
      4) Number of shops
   E. Other Periodic Markets
      1) Distance in time
      2) Market days

3) Types of goods

4) Number of shops

F. Nearest Permanent Market

1) Distance in time

2) Types of Commodities

G. Other Permanent Markets Frequented

1) Distance in time

2) Types of Commodities

H. Shops in Village

1) Number

2) Types

3) Commodities sold

4) Times the shops are open during the day and during the week

I. Nearest Shops in Other Villages

1) Location

2) Distance in time

3) Types

4) Commodities sold

5) Times the shops are open during the day and during the week

V. Principal Crops Grown

A. Rank all crops grown in order of importance (Informant's perspective)

1) Crops marketed

2) Subsistence crops

B. Wild Foods (types marketed)

C. Delineate average size farm (in local land measurement unit)

1) Poor farmer

2) Rich farmer

3) Average farmer

D. Area cultivated for each crop on a typical farm

E. Rotation Practices

1) Cropping sequence

2) Number of consecutive years a plot of land is cultivated

3) Fallow periods

a) Signs farmers use to determine land should be fallowed

b) Length of fallow

c) Uses of fallow land

4) Crop selection by soil type or soil condition

F. Intercropping

1) Kinds of crops intercropped (limit on number cropped together)

2) Intercropping by row

3) Intercropping in the same hole

G. Five-year recall of harvests (good or bad)

H. Assessment of this year's crop

I. Major crop pests for each crop

1) Insects

2) Plant diseases

3) Vertebrates

VI. Livestock

A. Rank livestock in order of importance

B. Estimates of number of each type of livestock per household

1) Poor household

2) Rich household

3) Average household

C. Uses of Livestock

D. Marketing of livestock

*E. Major diseases and pests

*F. Kinds of fodder

*G. Use of Veterinary Services

*H. Use of grazing lands: seasonal migration

VII. Labor

A. Communal labor

1) Types

2) Occasions

3) Average number participants

4) Consumption of food, beverages, etc.

B. Hired Labor

1) Outside hired labor

2) Inside hired labor

3) Wage rates by agricultural operation for each crop

4) Differences in wage rates between piece work and internal work

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*Optional

C. Labor Migration

1) Rank migration destination in order of preference

2) Time period of migration

3) Characteristics of migrants

4) Types of employment sought in migration destinations

VIII. Village Institutions and Services

(e.g., flour mill, oil press, bakery, cooperative dispensary, school, police station, cheese factory, electric generator, mosque, rural council buildings) (Try to be exhaustive.)

IX. Non-farm Occupation

(e.g., tailors, butchers, carpenters, bedmakers, shoemakers, government midwives, nurses, policemen, mill workers, guards, barbers, cooks, women craft producers).

X. Overt, Observable Indication of Disparate Wealth

A. Housing materials

1) Types

2) Number of each type

B. Radio/tape recorders/TVs

C. Motorized vehicles

XI. Ethnic Diversity in Village Population

A. Tribal affiliations (or other ethnic classification)

B. Percentage of total population

C. Residence patterns (quarters vs. dispersed)

XII. History Village

A. Period when first settled (founding ethnic group)

B. Date of establishments of major institutions and public works

XIII. Land Tenure

A. Existence of communal land

B. Private ownership

C. Rental arrangements

D. Sharecropping

APPENDIX B. Access to water, from the Initial Village Survey.

The data below come from the initial survey that was made of 18 villages. As elsewhere in North Kordofan the scarcity and cost of water impose severe constraints on the farmers in the area of our study. The most obvious consequence of the shortage of water is the villagers' out-migration during the dry season to areas such as the cities and large agricultural schemes where the supply of water is more secure. Other factors related to the availability of water include the size of the village and the number of economic and social institutions it has. In the descriptions that follow it becomes evident that each village has met the problem of getting access to water in a unique way.

Glossary

donkay - diesel-powered water pump

girba - goatskin for hauling water

hafiir - large pond, usually dug and maintained with government assistance

khor - rainy season streambed

tamed - shallow well dug in a depression or the bank of a streambed

Umm Sot

Orientation from el-Obeid: 40km N
Population: 700
Access to water:

A diesel water pump station (donkay) is beside the village. Villagers are charged 2 piasters each time they draw water for their household. An additional 4 piasters is charged to water a camel; 2 piasters for a donkey. The average family pays 2-5 piasters each day for water. The pump was established by the government as a self-help program for the village. Other villages also draw water for the same fee. The money collected is used to buy diesel fuel for the pump. The man who collects the money is elected from among the villagers; in addition, there are 2 or 3 government workers who operate the pump and oversee the watering of livestock. The pump operates all the year long, and the fees are constant. If the pump breaks down, the villagers must go to the wells at ed Diriis, about one hour away by donkey. In an emergency when the pump is broken, water may be drawn free at these well.

El-Kharta

Orientation from el-Obeid: 23km N
Population: 2000
Access to water:

Water is obtained from the diesel pump at Khor Tagget and at el-Obeid. There is also a hafiir about one-half hour away by donkey, at Farajallah. In the rainy season about 2/3 of the families go there to get water for their household needs (the water is "dirty", meaning both muddy and unhealthful).

The trip by donkey to either el-Obeid or Khor Tagget takes about 3 hours. Men who sell charcoal after the rainy season transport their product to el-Obeid and return with water; those who have nothing to sell at el-Obeid usually go to Khor Tagget. In the dry season, Khor Tagget is often crowded with animals, and it is necessary to wait in line. In this case, the villagers may go to el-Ban Jedid which is 2 hours away by truck. During the dry season the villagers are not allowed to take water from el-Obeid.

During the rainy season only, water may be purchased from pumps at el-Obeid for 11 piasters/barrel, although the official price is only 3 piasters/barrel. The balance is a bribe because it is illegal to sell this water to villagers although the officials will do it during the rainy season. Last rainy season when the pumps at Khor Tagget and el-Ban Jedid were not operating, the headman at el-Kharta went to the rural council and obtained permission to draw water from el-Obeid for seven days at the official price. During the dry season it is possible to get water from private wells near el-Obeid at 5 piasters/tin.

At Khor Tagget water can be purchased for 12 piasters/barrel year-round (hauling by truck--see below). To fill two waterskins (girba) plus letting the donkey drink costs 3 piasters. To fill four waterskins and let the camel drink costs 9 piasters.

El-Ban Jedid and sometimes Bano are sources of water only when the pump at Khor Tagget is out of order. Informants were not sure of the price but said it would cost more at these places than at Khor Tagget because the pumps were private. The pump at Khor Tagget breaks down once or twice each year for several days each time.

There are six cisterns in el-Kharta that are owned by different families. Their capacities in barrels are: 1-60, 2-37, 3-50, 4-25, 5-60, 6-30. Water is hauled to fill these cisterns by a rural council truck, which comes according to request in the rainy season and weekly or bi-weekly during the dry season, and by 3 commercial trucks which come daily but only in the dry season. The government driver sells to the cistern owners at 100 piasters/barrel. The cistern owners sell the same water to the villagers at a rate around 150 piasters/barrel. The commercial truckers sell to the cistern owners for 150-160 piasters/barrel, and the cistern owners sell to the villagers at 180 piasters/barrel. The owners of the commercial trucks do not own any cisterns in el-Kharta.

Demokia

Orientation from el-Obeid: 25km ENE
Population: 750
Access to water:

In the rainy season water is collected from two rain ponds--one about ½ hour away by donkey the other 1 hour away. In a good year the ponds will yield water from July to October. Water is hauled by families as needed, the water is free, and no one hauls water for a fee.

In the dry season, water is brought for Khor Tagget and el-Obeid by two commercial trucks whose owners are residents of Demokia. The truck owners have permission to take water from the government pumps. They buy water at Khor Tagget for 10 piasters/barrel and sell to cistern owners in Demokia for 150 piasters/barrel. (Truck owners do not own cisterns). The cistern owners sell to their fellow villagers at 16 piasters/tin. The cisterns, which are owned by different persons, are four: 15 barrel, 18 barrel, 20 barrel, and 34 barrel. Sometimes, families haul their own water from Khor Tagget by camel or donkey, but it is a 9-hour round-trip.

Umm Kuka

Orientation from el-Obeid: 20km ENE
Population: 400
Access to water: (Continued on next page)

Access to water:

In the rainy season, the villagers drink from two rain pools, 10 and 15 minutes away by donkey. About 10 other villages also drink at the same pools; the water is free for all. Animals are barred from using the easternmost pool but are allowed to drink at the westernmost pool.

In the dry season, water is brought from Khor Tagget, which is 3 hours distance by donkey. Water costs 4 piasters for a donkey load (2 waterskins) and 8 piasters for a camel load (4 waterskins). Livestock may also water at Khor Tagget--e.g., 2 piasters/cow for each watering.

The village has 2 cement cisterns (18 barrels each) which are filled in the dry season with water trucked from Khor Tagget. The cistern owners are local shopkeepers. They do not own the trucks that haul the water. One of the trucks comes from Egeila and the other is from el-Hammadiya. The first of these comes once daily hauling water. (It actually makes two trips daily, one to Umm Kuka and one to Egeila). The truck from el-Hammadiya visits Umm Kuka every other day; alternating days it hauls water to el-Hammadiya. The cost of water to the cistern owners is 80-90 piasters/barrel when the supply is ample and 170-180 piasters/barrel when water is scarce (e.g., when the pump at Khor Tagget breaks down). Villagers buy water from the cistern owners at 15 piasters/tin at the end of the rainy season increasing to 20 piasters/tin in the height of the dry season. Three or four families in the village own water barrels and are able to buy water from the trucks at the same price as the cistern owners. The truck operators pay 30-40 piasters/barrel of water at Khor Tagget. If the pump at Khor Tagget breaks down, the same trucks will get water from Bano and el-Obeid.

El-Hammadiya

Orientation from el-Obeid: 22km E
Population: 1200
Access to water:

This village hasn't a hafiir, but in 1976 the residents applied to the rural council to have one built. 300 L.S. has been accumulated by the villages to help finance the project, which is currently underway.

During the rainy season, the villagers get water from hafiirs in Dajo (1½ - 2 hours away by donkey) and el Deilat (1½ hours away by donkey). The pond at el Deilat is the smaller of the two; when its water is finished the villagers go to Dajo. To use either hafiir costs 50 piasters per season.

During the dry season water is brought from el-Obeid to el-Hammadiya by commercial trucks. There are 2-5 trucks operating daily out of the village itself which haul water in barrels to fill the village's four cisterns. The cistern owner buys from the truck

owner for 140-150 piasters/barrel and then sells to the villagers at 10 piasters/tin in December and 15 piasters/tin in March-June. The cisterns are not used during the rainy season.

Geifil

Orientation from el-Obeid: 33km E
Population: 600
Access to water:

Depending on the supply of water in rain pools, the villagers will start using their hafiir between October and January. The hafiir is usually dried up in March, because the drainage system for collecting the water was poorly designed so that the hafiir does not fill sufficiently. More than 40 villagers drink from the same hafiir--all free of charge.

There are three cisterns in the village--one owned by the rural council and two that are privately owned. In the dry season the council truck delivers water every day to fill the council cistern. There is a charge of 7.5-8 piasters/tin for this water when it is drawn from the cistern. A villager (elected by his fellows) takes charge of these accounts and pays the rural council a 20 L.S. deposit for use of the cistern each season. He then buys each truck load of water (250 tins) for 16.80 L.S. and sells it to the villagers for 7.5-8 piasters/tin. When there is an acute water shortage, commercial trucks may be hired in el-Obeid to haul water to fill the two private cisterns. The owners of the private cisterns pay 1.70-2.00 L.S./barrel and sell to the villagers-15-20 piasters/tin. The commercial trucks and private cisterns are generally used only when the council truck is broken down or without fuel. Water may also be purchased in the surrounding villages--Karra (1 hour by donkey) and Umm Kiteira (45 minutes by donkey) for about 20 piasters/tin.

In the dry season, small animals--sheep, goats, donkeys--are watered in the village. Cattle are sent to the pump at el-Hamra (3 hours away walking) where the charge is 2 piasters/cow/day and 4 piasters/camel/day. Alternatively, the villagers may send their animals to Khor Tagget, but most prefer el Hamra because its residents are members of the same tribal segment.

Another source of water in the dry season consists in shallow wells that are dug in a depression about 1½ hours to the north of Geifil or in another area about 1 hour to the south. Usually two brothers or a father and son dig a well in partnership and pay the landowner 25-50 piasters/season. This type of water source may last until May or June before going dry.

In the rainy season, the villagers drink from 5 rain pools located within 15 minutes walk of the village.

El-Filia

Orientation from el-Obeid: 40km ESE
Population: 500
Access to water:

In the rainy season, the villagers rely on rain pools within 10 minutes walk from the village.

In the dry season (January to June), every family digs 5-6 shallow wells in khors and depressions. These shallow wells are all nearby the village. The wells go dry in April or May. From that time until the rains come, the villagers use the government hafiir at Wad el-Baga, which is 7 hours away by donkey. Each family sends a camel or donkey every day to fetch water, and no one hauls water for a fee.

Until about 3 years ago the people of el-Filia used to visit shallow wells at Ajari (3 hours away) where they could draw water during the dry season after paying a seasonal rent of 6-10 L.S. In recent years, however, these wells have dried up early in the dry season. So the villagers began making the long trek to Wad el-Baga.

Burbur

Orientation from el-Obeid: 40km SE
Population: 500
Access to water:

A government hafiir is only 15 minutes away by donkey. About 13 villages--besides Burbur--drink from it free of charge during the dry season. In the rainy season, the people of Burbur find water in the watercourse (khor) which is right beside the village. The khor usually has some standing pools so that shallow wells (tamad) are unnecessary. Water is taken from the khor from July until October and hauled to the village in waterskins or tins by both animals and humans.

In the dry season, the supply of water in the hafiir is usually insufficient for large herds, so livestock is taken to el-Ban Jedid or Sheikan, both about 3 hours walking. At Sheikan the animals drink free. There is a charge at el-Ban Jedid (government pump): 3 piasters/cow/day; 1 piaster/goat or sheep/day; 5 piasters/camel/day. Cattle are prohibited from using Burbur's hafiir after the rainy season and must go to either el-Ban Jedid or Sheikan (livestock accepted at Sheikan from April until July). From October until April, livestock have to be taken to el-Ban Jedid. The pump there makes drawing water easy; at Sheikan water must be drawn by hand.

El-Ban Jedid

Orientation from el-Obeid: 23km SSE
Population: about 8000
Access to water:

el-Ban Jedid has a huge acquifer which supplies plentiful water year-round. The village is flanked by several hundred truck farms where vegetables and fruits are grown for the el-Obeid market. In all there are 163 pumps in the vicinity of the village. Humans and animals mainly drink from the pump (donkay) operated by the government cooperative, but on occasion they may drink from other sources. The cost of drawing water at the cooperative pump is 1 piaster/tin. Animals are watered at the following rates: 20 piasters/cow/month; 10 piasters/sheep or goat/month; 5 piasters/camel/day; 2 piasters/donkey/day. If the cooperative pump is not working, water can be purchased from the private pumps for about 2 piasters/tin. There are four wells without pumps available to the villagers free of charge but these are rarely used because people prefer to pay and have their water drawn mechanically.

There are no cisterns in el-Ban Jedid but about 15 carts haul water daily from the cooperative pump to residences and sell it for 4 piasters/tin. Each cart is owned individually, and the cart owners are all part-time farmers.

Kazgeil

Orientation from el-Obeid: 43km S
Population: 5000
Access to water:

A half-hour walk from Kazgeil there are 5 privately-owned wells which are reliable the year around. In the dry season water is sold at the wells for 12.5 piasters/barrel. Cart drivers haul two barrels at a time to the village and sell the water for 8 piasters/tin. There are 30-40 such cart drivers operating in Kazgeil. Each one makes up to three trips to the wells and back each day. From July to October, water is obtained free from nearby rain pools and from pits dug in the banks of khors.

Umm Arada

Orientation from el-Obeid: 25km S
Population: about 1000
Access to water:

Two hafiirs were dug side by side by the government in 1966. Water is always available throughout the year. It is free for the residents as well as outsiders. Also, within 5 minutes walk from the village are two cement-lined wells that were also dug by the government (1950's).

They too supply water through the entire year, and it is free. Thirty-five villages get drinking water from these sources on a first-come, first-serve basis. Often, visitors to the resevoirs come at night. The hafiirs are surrounded by a fence to keep out the animals, and each resevoir has a guard.

Kaba

Orientation from el-Obeid: 10km S
Population: 110
Access to water:

From the beginning of July to the end of October water is taken from a nearby Khor. During the dry season water is obtained at the private pump at Khor el-Abyad. Water drawn for human consumption is free but there is a charge for animals: 1 piaster/goat/day; 2 piasters/cow/day; 5 piasters/camel/day. Every household fetches water about 2 times each day during the dry season. If the pump is not working at Khor el-Abyad due to a break-down or lack of diesel, the villagers travel 1½ hours to another government pump at Bano, which charges the same fees. Sometimes in the dry season when the villagers are going to el-Obeid shopping they will purchase water there at 2 piasters/tin.

Umm Ramad

Orientation from el-Obeid: 30 km SSW
Population: 3700
Access to water:

In the dry season water is drawn from two cement-lined wells (saniya), five minutes walk from the village. One of the wells was dug by the government; the other is owing to the collective sponsorship of the village. Both water sources are used free of charge. There is also a government hafiir near the wells which is also free of charge. Thirty villages drink here as well as nomadic pastoralists. In November and December, shallow wells (tamad) are dug in the nearby khor primarily for watering animals, and this is done largely because the other watering points are crowded. Shallow wells are dug by 100-150 persons each season, and each of these digs 3 or 4.

In the rainy season, the villagers continue to use the cement-lined wells and the hafiir, and they also use rain pools.

Two carts haul water to the village and sell it; about 5 donkeys also haul water in leather bags for sale. The price--rainy season or dry--is 5 piasters/tin. Most families depend on their women to carry water to the house on their heads.

Abu Haraz

Orientation from el-Obeid: 47km SW
Population: 5000-10,000
Access to water:

During the rainy season ample water for animals is provided by two large khors near the village. Humans drink from 8 privately owned wells where the water is during the rainy season and costs 1 piaster/tin in the dry season. In the dry season more than 50 shallow wells are dug in the beds and banks of khors; charge is also 1 piaster/tin. Also women dig shallow pits in the branches of the khor to find clear water.

A government pump is scheduled to go into operation in the coming year. Another pump that is privately owned and used for irrigating a farm also sells water for 60 to 100 piasters/barrel. Surrounding villages also buy from this pump which lies 1 km outside Abu Haraz.

Water is delivered to the village from the wells in carts, which carry 2 barrels each. The cart owner buys a barrelful of water for about 60 piasters in the dry season and sells at 6 piasters/tin. In the rainy season, the barrel costs him only 10 piasters, but he still sells at 6 piasters/tin.

Wardass

Orientation from el-Obeid: 37km SW
Population: 400
Access to water:

In the rainy season water is accessible in 3 khors (5-30 minutes away). During the dry season the villagers go to Umm Ramad (45 minute walk) for water. (Umm Ramad is also one of the main marketing centers for the inhabitants of Wardass). At Umm Ramad, the villagers from Wardass have access to a government hafiir, a government well, and a private well. The government facilities are free. The private well charges 25 piasters/cow but humans drink free; the price for sheep and goats is negotiable. Many people prefer to water their livestock at the private well because it is equipped with a crank making it easier to draw water.

The villagers also use shallow wells dug in the khors near Umm Ramad. These are owned by the people of Wardass. They are used principally in the first part of the dry season and are preferred to the deep wells because it is easier to draw water out of them.

Umm Subagha

Orientation from el-Obeid: 23km SW
Population: 140
Access to water:

July through October, there is water available in the pond next to the village. Other rain ponds can be reached within ½ hour walking.

When the rainy season ends, three groups--each composed of 3-4 families--dig about 15 shallow wells (tamad) each in the dry water-courses. The wells are between 3 and 8 meters deep. All the wells are in the same general area and the villagers have traditional proprietorship over that area. The nearest well is about 30 minutes away on foot; the farthest requires about 1½ hours to reach. The group of families digging the well is considered to own it, and outsiders are excluded from using it. Each year the well must be dug anew. The digging is carried out from November through January, depending on the supply of water in the rain ponds.

After April, the wells are usually exhausted. From May until July, water is purchased from Aiyara, Umm Arada, Umm Ramad and Khor el-Abyad. Trip by donkey to Umm Ramad or Umm Arada takes 5 hours and the water is free at the large government resevoir in each village. Trip to Aiyara by donkey is 45 minutes; water costs 20 piasters/tin. Khor el-Abyad is more than 7 hours away by donkey. Humans may drink there free. Charge for animals: 45 piasters/cow/month; 10 piasters/camel/day; 1 piaster/goat/day.

Most people go to Umm Ramad and Umm Arada to get water for household consumption because, although quite a bit farther away than Aiyara, the water is free. Each family is responsible for transporting its own water.

Aiyara

Orientation from el-Obeid: 24km W
Population: 800
Access to water:

From February until July water is hauled to Aiyara from el-Obeid by one commercial truck that makes the trip daily. The truck owner is a merchant from el-Obeid with business interests in Aiyara. He has permission from el-Obeid municipal council to take 27 barrels/day from the government pump. The cost for the 27 barrels of water is 2 L.S. If more water is needed, the truck owner sends the truck again and buys water on the black market, about 10 L.S. for 27 barrels. The merchant owns a cistern (81 barrels) in Aiyara which he fills with the water hauled by the truck. He then sells water to the villagers at about 20 piasters/tin.

The remainder of the year the people of Aiyara drink from the hafiir beside the village. November to January, a charge of 2 piasters per donkey load of water is levied by the guard in order to defray the cost of dredging and maintaining the hafiir.

Bagbagi

Orientation from el-Obeid: 42km NE
Population: 200
Access to water:

Major sources of water for this village are 3 locally dug wells--one of which is owned by the villagers and the other two owned by residents of neighboring villages. These wells are about 30 meters deep and are lined with tree branches to support the walls. There is also a government-built concrete well but its water supply is not dependable throughout the year. The local wells are sponsored by corporations of 9 to 16 farmers who assist in digging the well and who pay for the specialist who actually does the digging and for another specialist who seals the well's walls so that they will not leak. Such a corporation is formed whenever a new well has to be dug, and recruitment of members is informal. The advantage of being a well shareholder is that it permits free access to the water on the basis of a schedule, divided into 3-hour segments, which rotates around the clock. Non-shareholders may take water free but if one of the shareholders is present they have to provide labor by drawing the shareholder's water. (The non-shareholder must give the shareholder one bucket of water in every four buckets he draws up.)

In the dry season, water is also obtained from the government diesel pump at Umm Tugur, about 1 hour away by donkey. The cost is 2.5 piasters/waterskin (girba). There are no cisterns at Bagbagi.

Appendix C. Cultivated Landholding in el-Kharta

Charts 1-9 present an analysis of the data gathered for nearly 100% of the farmer household units in el-Kharta. These data reflect the situation in October 1981. It is from this 100 percent sample that we will eventually choose 5 households for intensive study. Although not presented here, we have also collected 100 percent samples of the farming household units Umm Ramad and el-Geifil. These data have yet to be fully analyzed and will be presented in a later report.

In collecting these data, some difficulty arose as to what kind of sample unit to use. From the perspective of the total farming system, the preferred unit of analysis might be the compound. Unlike many other parts of Africa, compounds in this area do not usually consist of extended family units. This is due to the cultural preference of having married sons establish their own compounds independently of their parents or their wives' parents. For this reason, compounds in this area usually consist of nuclear or polygynous family units and their dependents. Given this tendency, the compound residential unit in these villages might still be considered the ideal unit of analysis for it seems to be comparable to the unit of household. However, some difficulties still arise. From the villagers' perspective, land and the crops on it are perceived as being under the management of a single farmer, who typically supports a number of dependents. Given this perspective, in most cases the compound or household corresponds nicely with this farm unit. However, in many cases single farmers, such as unmarried men or wives who individually own tracts of cultivated land live in compounds or households which are supported by another farmer (their fathers or husbands respectively). In these cases, the compound or household does not correspond with the farm unit. Young unmarried men in particular are a sizable category of farmers in our sample who claim no dependents because of their co-residence with their natal compound. With no dependents to feed, they can specialize in cash cropping in order to accumulate money for bride payments. These young men cannot be considered a separate "household" from the perspective of residence, but they do count as a different sample unit for purposes of farm management and use of land. The same argument applies to married women who privately own land and manage it independently of their husbands. They too cannot be considered separate households although they are farm managers. For these reasons, neither compound nor household are completely adequate concepts that delineate the farming unit precisely in this situation.

With these problems in mind, we have decided to use the concept of "Farm Management Unit" (FMU) to delineate the sample unit in this analyses of the el-Kharta data. The FMU consists of the farmer who makes cropping decisions for a parcel of land and his/her dependents. Essentially, FMU and household delineate the same unit of analysis if unmarried men and married women who are private landholders are excluded. In fact, in most of this report, the concept of household is the preferred unit of reference because our findings so far indicate that it is around this unit that most economic decisions are centered. FMU is only used in this section to account for those farmers who do not represent separate households, yet still manage a parcel of cultivated land.

The charts that follow represent the results of the analyses that were conducted on the 100 percent sample of Farm Management Units (FMU) found in el-Kharta. Each chart will be discussed separately and major findings will be identified.

TABLE I

Table I is a frequency distribution of Farm Management Units (FMU) according to the number of members in the FMU. In total, our census identified 222 FMU's. The average size of these units (farmer + dependents) was 5 members, while the range was from 1 to 15 members, (If we had counted the number of members in households rather than in farming units the average size would have more nearly approximated the average estimated for the N. Kordofan region, which is 7.7 members). The largest percentage (23.0%) of FMU's is made up of single farmers without dependents (51). This group of farmers is mostly single unmarried men who are, in most cases, residing in their parents households. Because they are residing in their natal compound, they are able to pursue different farming strategies than most other farmers living in separate compounds. These differences will become apparent below. As for farmers with dependents, a large percentage (12.6 + 12.2 = 24.8%) appear to have 5 to 6 members. This corresponds closely with the mean size of FMU's. From this frequency distribution, the population of el-Kharta is estimated to be 1120.

TABLE II

Table II presents a frequency distribution of total land cultivated by each Farm Management Unit (FMU). The total land cultivated by all FMU's taken together is 3704 makhamas (1 makhamas = 1.78). The mean size FMU cultivated landholding is 16.7 makhamas, while the range is 1 to 72 makhamas. The most frequently mentioned size of cultivated landholding was 10 makhamas (mode). The table shows what percentage of the total village land under cultivation is accounted for by various sizes of FMU cultivated landholdings. The table indicates that 56 percent of the total village land under cultivation is accounted for by FMU cultivated landholdings of 20 makhamas or less. The table also shows the frequency and percentage of FMU's that are accounted for by various sizes of total cultivated landholdings. This table indicates that 61 percent of the FMU's are 15 makhamas or less in size. These data are comparable to those which were presented in the first table. When the information from the two tables is combined, we find that 61 percent of the farmers only have access to 35 percent of the total land cultivated. To determine whether inequality of access to land exists in this village, we compared the figure with that of the rich farmers with large cultivated landholdings. We found that 12 percent of the rich FMU's controlled 30 percent of the total cultivated village land. When these figures are compared, it demonstrates nicely that inequality of access to land does exist in this village. We hypothesize that this difference in access to land is not due to the rich farmers' ability to purchase land, but rather to his ability to mobilize labor for working on larger cultivated landholdings. This relationship between size of landholding and labor bears further investigation.

TABLE I

Frequency Distribution of Farm Management Units According to Number of Members, El-Kharta (October 1981).

Number of Members	Number of Households	Percent of Total
1	51	23.0
2	16	7.2
3	16	7.2
4	15	6.8
5	27	12.2
6	28	12.6
7	13	5.8
8	21	9.4
9	6	2.7
10	18	8.1
11	6	2.7
12	2	0.9
13	1	0.4
14	0	0.0
15	2	0.9

N.B. From the above distribution the population of El-Kharta is estimated to be 1120.

$N = 222$

$\overline{X} = 5.0$

$R = 1-15$

TABLE II

Frequency Distribution of Total Land
Cultivated by Farm Management Unit (FMU)

el-Kharta October, 1981

Percentage of Total Village Land Under Cultivation by Size of FMU Cultivated Landholding		Frequency and Percentage of FMU's by Size of Total Cultivated Landholding		
Number of Makh	% Village Land	Number of Makh	Number of FMU's	%
1-5	1.8	1-5	15	6.8%
6-10	16.2	6-10	68	30.6%
11-15	17.0	11-15	52	23.4%
16-20	20.5	16-20	41	18.5%
21-25	14.8	21-25	24	10.8%
26-30	7.2	26-30	9	4.1%
31-40	7.1	*31-40	7	3.2%
41-50	5.3	41-50	4	1.8%
51-60	6.3	51-60	4	1.8%
above 60	3.8	above 60	2	0.9%

FMU's = (N=22)

$\bar{X}$ = 16.7 makhamas per FMU's

Range = 1-72 makhamas

TABLE III

Table III actually consists of 2 tables, so each one will be dealt with separately. Table IIIA is a frequency distribution of land currently cultivated in sesame by each Farm Management Unit (FMU). 217 of the 222 FMU's grow sesame. The total land cultivation in sesame by all FMU's taken together is 2471 makhamas, which is 67 percent of the total land cultivated in el-Kharta. The mean size FMU cultivated landholding in sesame is 11.4 makhamas while the range is 2 to 70 makhamas. The most frequently mentioned cultivated holding size in sesame was 10 makhamas. The table shows the frequency and percentage of FMU's that are accounted for by various sizes of total cultivated holdings in sesame. This table indicates that 66 percent of the FMU's have sesame landholdings of 10 makhamas or less in size. Even more revealing is the fact that 50 percent of the farmers have between 6 and 10 makhamas in sesame. Although this figure is small, it is proportionately large when one considers the fact that 61 percent of the FMU's in the village have 15 makhamas or less in total land under cultivation. This finding in conjunction with the fact that 67 percent of the total cultivated land in the village is planted in sesame deomonstrates the importance of this cash crop in el-Kharta.

Table IIIB is a frequency distribution of land currently cultivated in millet by each Farm Management Unit (FMU). Only 158 of the 222 FMU's plant millet (71 percent). The total land cultivated in millet by these 158 FMU's is 1032 makhamas; which represents 28 percent of the total land cultivated in the village. The mean size cultivated landholding in millet is 6.5 makhamas, while the range is 1 to 30 makhamas. Five makhamas was the most frequently mentioned cultivated holding in millet. The table shows the frequency and percentage of FMU's accounted for by various sizes of cultivated landholdings in millet. The table indicates that 58 percent of the FMU's have cultivated landholdings in millet of 5 makhamas or less. In fact 93 percent of the FMU's have holdings in millet that are 10 makhamas or less. When one compares these findings with those presented for sesame, it is apparent that farmers in this village cultivate twice as much land in cash crops as subsistence crops. This is a fair indication that farmers in this village are well integrated into the cash economy, and probably depend heavily on purchasing food stuffs as well as manufactured items from the market place. In fact we hypothesize that FMU's in this village are less likely to produce enough millet to sustain themselves throughout the year because of their reliance on cash crops. This is one area in which we are continuing our investigations.

TABLE IV

Table IV presents a graph which represents the mean area cultivated in each crop and mean area in total cultivation for various sizes of Farm Management Units (FMU). In general, the graph illustrates that total crop area tends to increase as FMU size increases. Likewise, area cropped in sesame and millet tends to increase as FMU size increases. The exception to this trend is groundnuts. Here, no real pattern appears to be present. This can be explained by the fact that groundnuts were only introduced into el-Kharta this year,* and were adopted in a haphazard

*The Farmers' Union distributed groundnut seed to the village to whoever wanted to grow them. The only stipulation was that farmers had to return to the Farmers' Union an equal amount of seed after harvest. This program was sponsored by the Ministry of Agriculture and the Office of Extension for Kordofan Province.

TABLE III (A & B)

Frequency Distribution of Farm Management Units by Lands Cultivated in Millet and Sesame

el-Kharta October, 1981

A) Sesame (Simsim)

Frequency and Percentage of FMU's by Size of Current Cultivated Landholding in Sesame (N=217)

Number of Makh	Number of FMU's	%
1-5	34	15.7%
6-10	109	50.2%
11-15	40	18.4%
16-20	19	8.8%
21-25	5	2.3%
26-30	5	2.3%
above 30	3	1.4%

B) Millet (Dukhn)

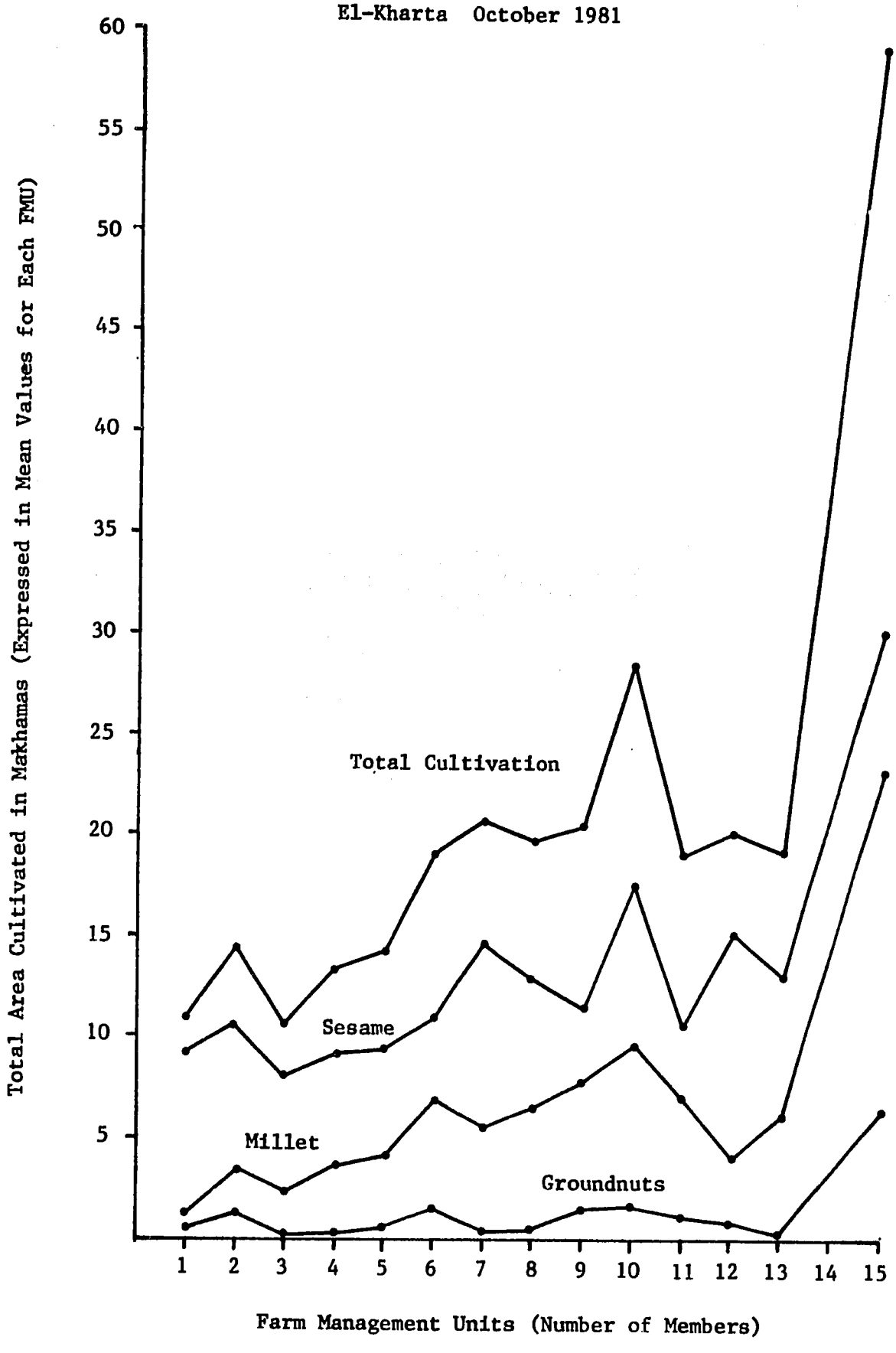
Frequency and Percentage of FMU's by Size of Current Cultivated Landholding in Millet (N=158)

Number of Makh	Number of FMU's	%
1-5	92	58.2%
6-10	58	34.8%
11-15	5	3.2%
16-20	4	2.5%
21-30	2	1.3%

TABLE IV

Mean Area Cultivated in Each Crop and Mean Area in Total Cultivation for Various Sizes of Farm Management Units (FMU)

El-Kharta October 1981



fashion by FMU's of various sizes. Groundnuts still only represent 5 percent of the total land cultivated in the village and 77.5 percent of all the FMU's do not grow groundnuts. For this reason no pattern in groundnut cultivation is expected.

TABLE V

Table V consists of 2 graphs, and each one will be discussed separately. Table VA presents a graph which represents the proportion of the total area cultivated which has been planted in sesame for various sizes of Farm Management Units (FMU). This proportion is expressed as the mean area cultivated in sesame for each category of FMU size divided by the mean total area cultivated for the same category of FMU size. After plotting these proportions, it appears that a pattern emerges in the data. As the FMU increases in size, the total proportion of cultivated land devoted to sesame decreases. This inverse relationship is even more pronounced if one excludes FMU's of greater than 10 members (the n above 10 members is 11). The meaning of this pattern will become more apparent after looking at Table VB.

Table VB presents a graph which represents the proportion of the total area cultivated which has been planted in millet for various sizes of Farm Management Units (FMU). These proportions were calculated in the same way as the sesame proportions. After plotting these proportions, another interesting pattern emerges. As the FMU increases in size, the total proportion of cultivated land devoted to millet increases. Similarly to the sesame data, this relationship becomes more pronounced if one excludes FMU's of greater than 10 members. When this millet pattern is compared to the sesame pattern, it is apparent that they are inversely proportional. This may be explained by the fact that as FMU's increase in size, they are in need of more millet to meet their consumption needs. This leads to a decrease in the proportion of the total cultivated land devoted to cash crops such as sesame, and to a corresponding increase in the proportion of land cultivated in millet.

TABLE VI

Table VI presents a graph which represents the proportion of total area cultivated which has been planted in groundnuts for various sizes of Farm Management Units (FMU). These proportions were calculated the same way as they were calculated for the sesame proportions in Table VA. After plotting these proportions, it is apparent that no pattern emerges.

TABLE VII

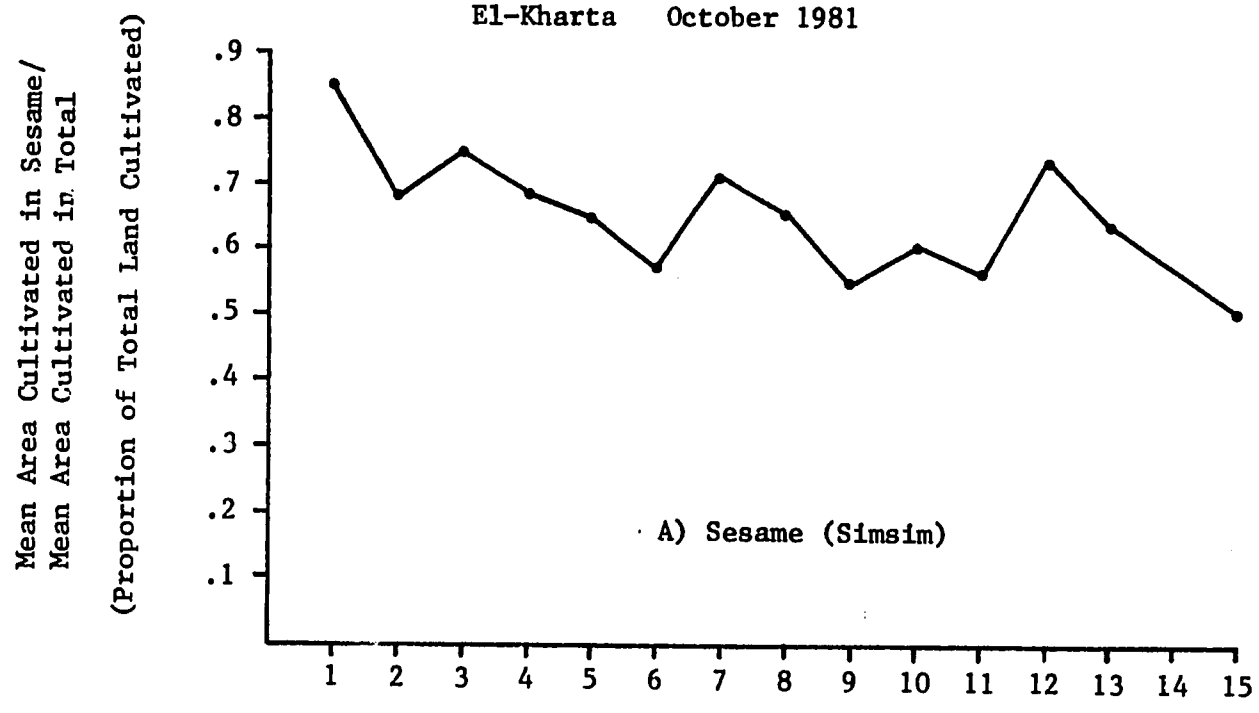
Table VII is a frequency distribution of land currently cultivated in groundnuts by each Farm Management Unit (FMU). Only 50 of the 222 FMU's plant groundnuts (22 percent). The total land cultivated in groundnuts is 182.25 makhamas which represents 5 percent of the total land cultivated in the village. The mean size cultivated landholding in groundnuts is 3.6 makhamas, while the range is .25 to 20 makhamas. Less than 1 makhamas was the most frequently mentioned cultivated holding in groundnuts. A table is presented in the Chart which shows the frequency and percentage of FMU's which are accounted for by various sizes of cultivated landholdings in groundnuts. The table indicates that 42 percent of the FMU's have cultivated landholdings in groundnuts of less than 1 makhamas, while 84

TABLE V (A & B)

Proportion of Total Area Cultivated Which Has Been Planted in Millet and Sesame by Number of FMU Members

(Expressed as the mean area cultivated in each crop for each category of FMU size divided by the mean total area cultivated for the same category of FMU size)

El-Kharta October 1981



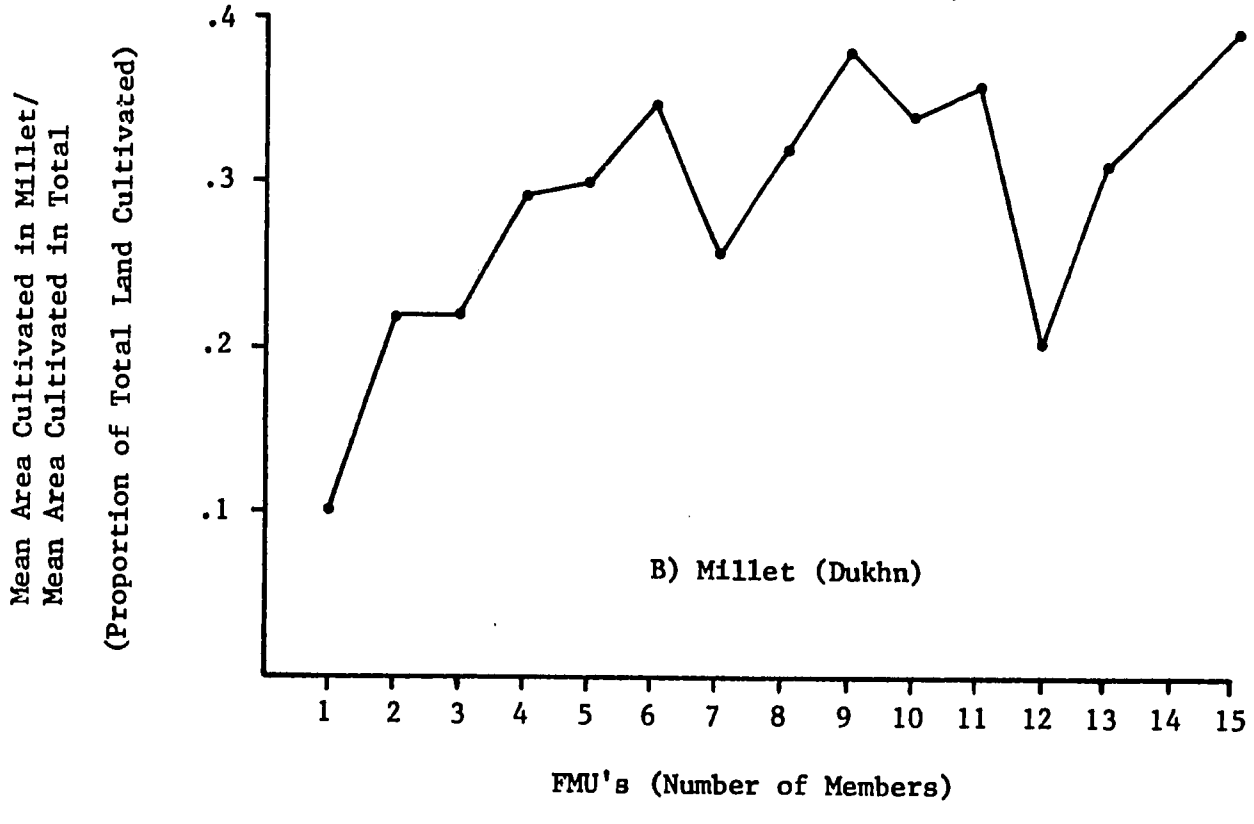
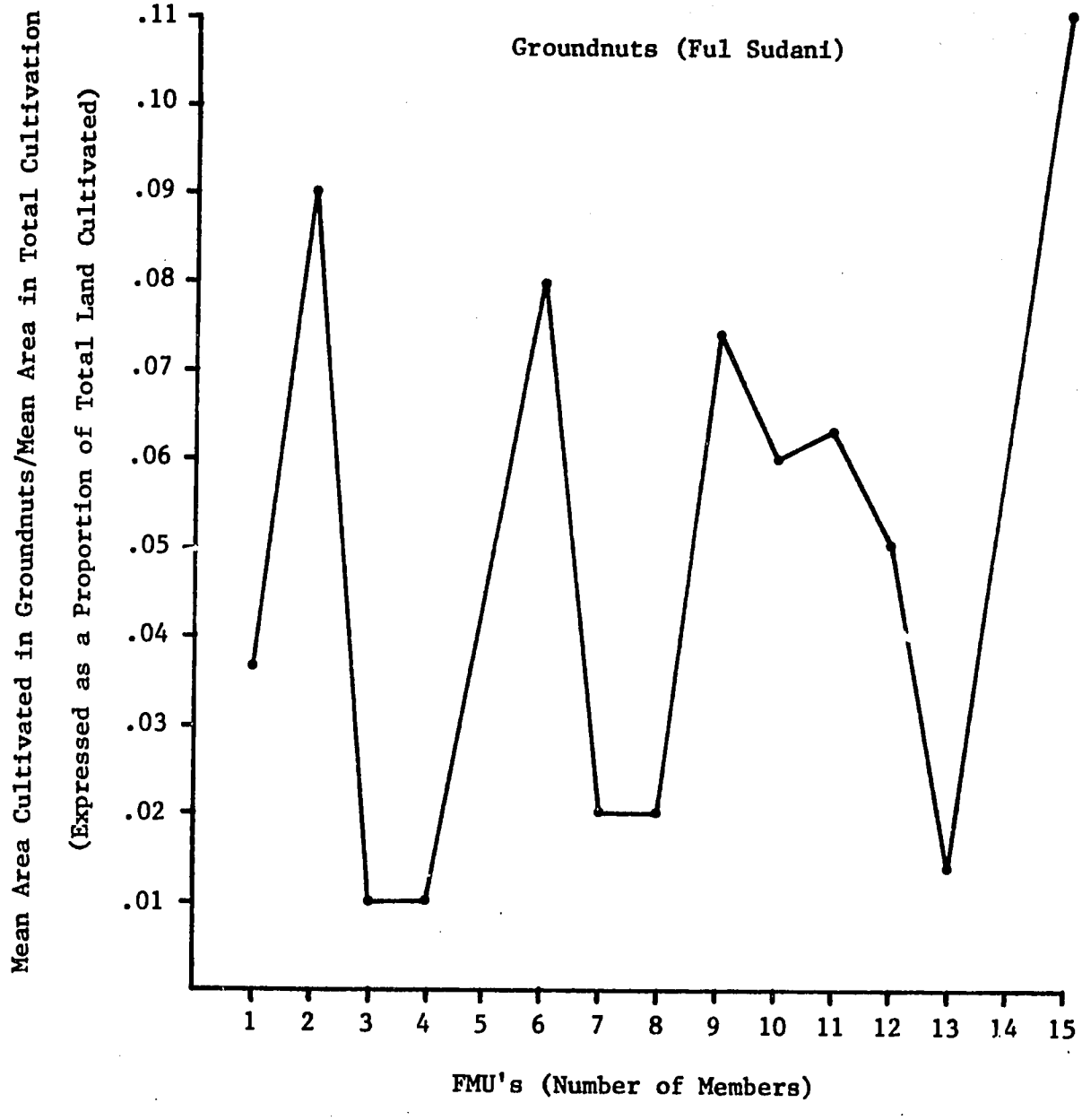


TABLE VI

Proportion of Total Area Cultivated Which Has Been Planted in Groundnuts by Number of FMU Members
(Expressed as X Area Planted in Groundnuts Divided by X Total Area Cultivated for Each FMU Category)

El-Kharta October 1981



percent have holdings of 5 makhamas or less. These findings indicate that groundnuts are not very prevalent in el-Kharta as a cash crop. This is primarily because of their recent introduction.

TABLE VIII

Table VIII is concerned with showing whether a preference is indicated by FMU's of different sizes for growing a kind of crop. The three graphs in the chart show the proportions of FMU's of various sizes which grow sesame, millet, and groundnuts. The proportion of FMU's growing sesame is never less that 0.93, and all FMU's of 7 or more members grow it. In el-Kharta one may conclude that most FMU's are disposed to grow sesame regardless of the number of members. Not so with millet. Generally speaking, the proportion of FMU's growing millet increases rapidly in relation to the increasing size of the FMU until the FMU of 8 members is reached. FMU's of this size and larger are all disposed to grow millet. Groundnuts present a highly erratic pattern which was mentioned earlier as probably being indicative of the fact that this crop has only recently been introduced at el-Kharta.

The difference between the pattern for sesame and the pattern for millet requires an explanation, although at present it must remain in the realm of the hypothetical. It suggests a difference in the consumption needs of FMU's of different sizes. Millet is less preferred by FMU's with small memberships. Perhaps this makes sense if we consider that these small FMU's are predominantly made up of bachelors and new families. In these cases not only is the FMU small but it has a high proportion of productive members and relatively few non-productive mouths to feed. Its cash needs may be high (a bachelor must collect his bride price; newlyweds need household furnishings). Another consideration is that young men, whether bachelors or newly married are the most likely to migrate during the dry season for wage labor. As long as the FMU contains only a few people, the entire group may accompany the farmer obviating the need to store millet to get the family through the dry season and wet season until the next harvest. Larger FMU's, it is hypothesized, do not have this option. The ratio of unproductive consumers (children, old people) to producers is likely to be higher than in the case with smaller FMU's. Food consumption requires a larger share of the budget; this can be offset by growing millet as a subsistence crop. Finally, the large FMU cannot easily follow the farmer during his labor migration, so that a store of millet must be left behind to feed his dependents during his absence.

TABLE IX

Table IX summarizes the data collected about women farm managers and the FMU's which they head.

The number of women's FMU's is 25, which is 11 percent of the total of 222 FMU's in el-Kharta. In other words, men farm managers outnumber the women by a ratio of nearly 8 to 1. The mean number of members in the women's FMU's is 2.2, and the range in size is from one to seven members. These figures are well below those shown in Chart I for el-Kharta as a whole. A large proportion of the women's FMU's (52 percent) have only one member. In all probability these are not single women living alone

TABLE VII

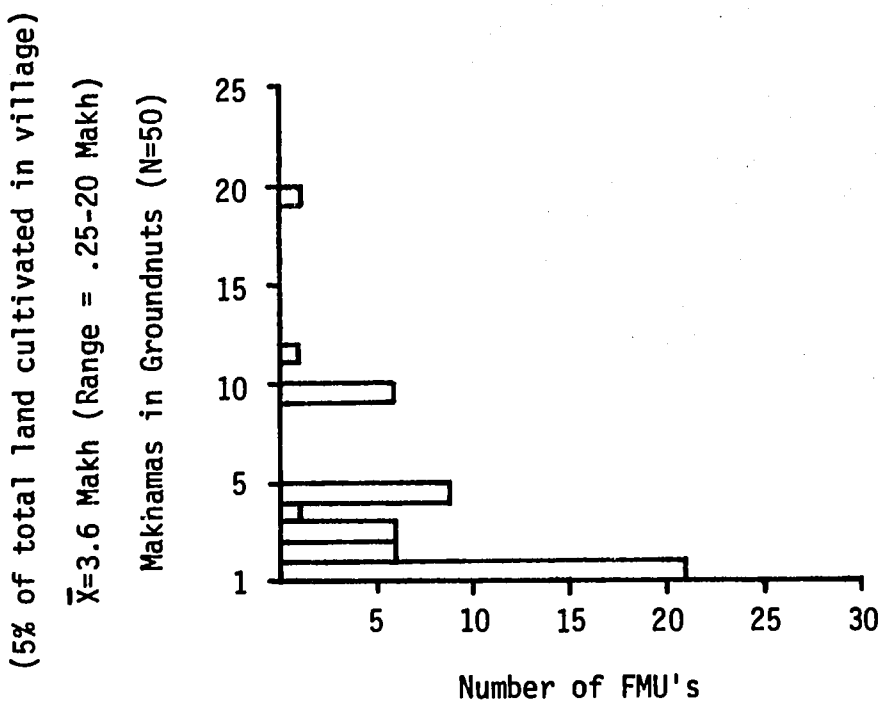
Frequency Distribution by FMU of Lands Cultivated in Groundnuts

el-Kharta October, 1981

Groundnuts (ful Sudani)

Frequency and Percentage of FMU's by Size of Current Cultivated Landholding in Groundnuts (N=50)

Number of Makh	Number of FMU's	%
1	21	42%
2-5	21	42%
6-10	6	12%
above 10	2	4%

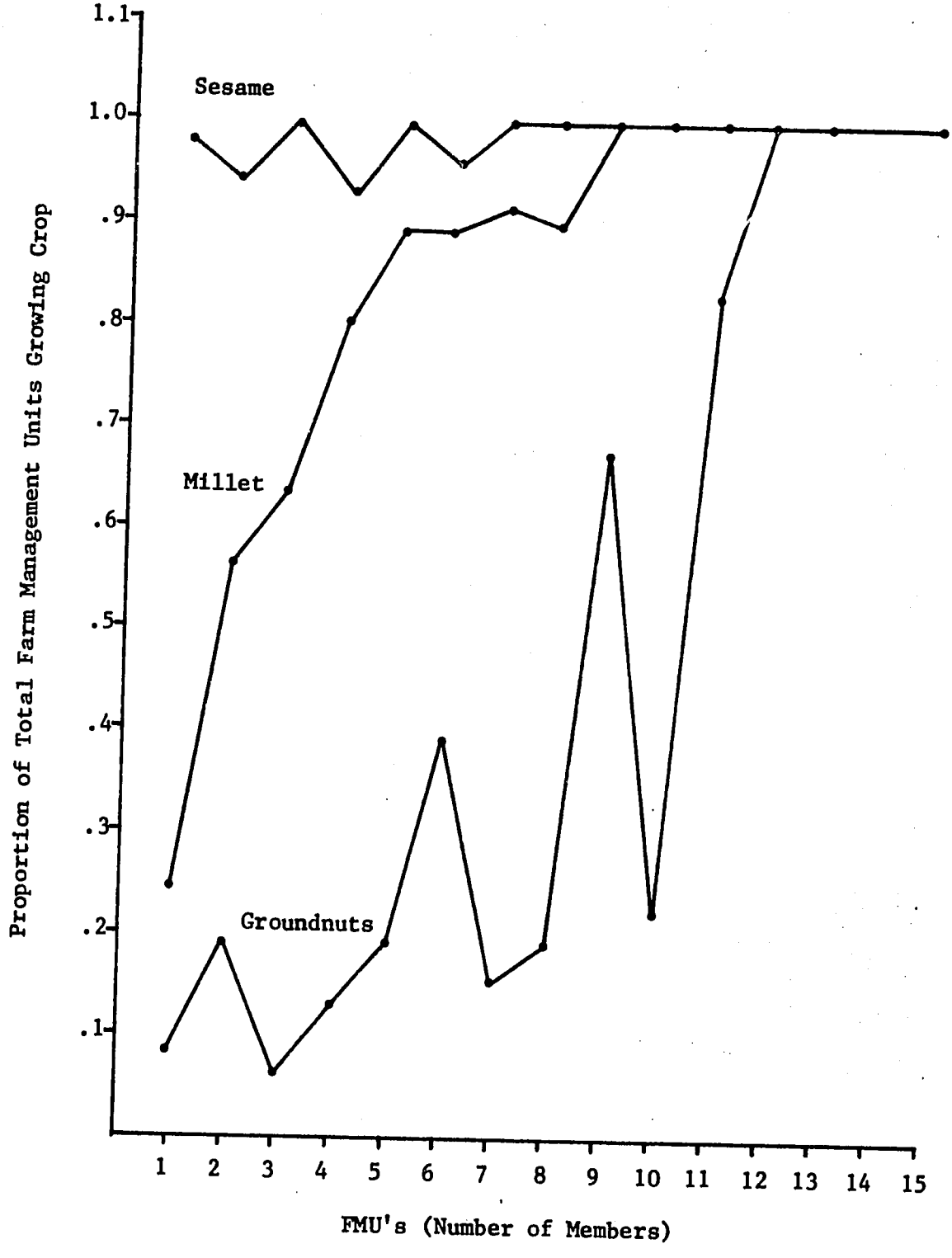


(172 farmers grow no groundnuts)
(77.5% grow no groundnuts)

TABLE VIII

Proportion of Farmers Growing Each Crop
By Number of FMU Members

El-Kharta October 1981



but members of farming compounds who have their own tract of land to manage. In many cases they are married women. For purposes of identifying FMU's, they must be counted separately from their husbands.

The total cropped land held by women's FMU's ranges from 1 to 17 makhamas, while the average holding is 7.8 makhamas--about half the average of all FMU's in el-Kharta. Because the laws of Islamic inheritance* are supposedly followed, it is expected that women would have smaller landholdings than men. Moreover, women are accustomed to handing over their landholdings to mature sons, because domestic tasks keep them from attending to their fields properly. Women are not regarded by the men to be good farmers.

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*A daughter inherits one-half the share of a son.

TABLE IX

Women's Farm Management Units, El Kharta

N = 25

FMU size: $\overline{X}$ = 2.2 Members

R = 1-7 Members

Total Cropped Land: $\overline{X}$ = 7.8 Makhamas

R = 1-17 Makhamas

Millet/Total Cropped Land: $\overline{X}$ = 34%

R = 0-100%

Frequency Distribution of Women's FMU's - According to Number of Members

Number of Members	Number of Households	Percent of Total
1	13	(52%)
2	5	(20%)
3	3	(12%)
4	0	(0%)
5	2	(8%)
6	1	(4%)
7	1	(4%)