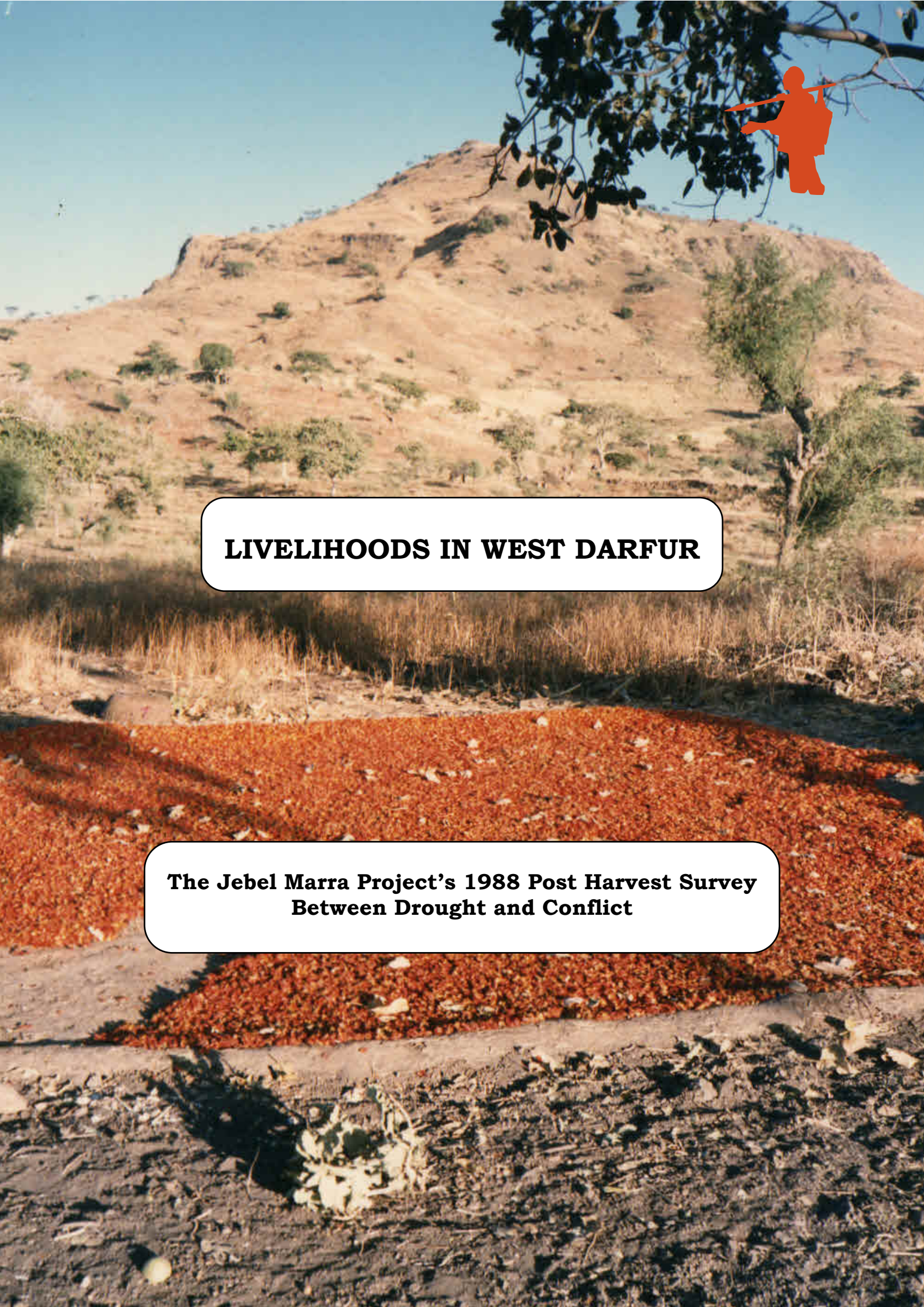

LIVELIHOODS IN WEST DARFUR

The Jebel Marra Project's 1988 Post Harvest Survey
Between Drought and Conflict

INTRODUCTION

The Jebel Marra Rural Development Project was a major programme of rural development in Jebel, Zalingei and Wadi Salih Districts of what is now West Darfur: an area of some 90,000 sq km. Between 1981 and 1992, Government of Sudan and the European Union funded the project to carry out agricultural research, build rural infrastructure and provide extension and community development services. With over 40 extension stations, it had a level of direct contact with the rural community which Darfur had never seen before. Throughout its life, the project's Monitoring and Evaluation Department carried out wide ranging surveys of rural livelihoods to guide the work and assess its impact. With over 900 households interviewed, the 1988 Post Harvest Survey Report presented here is typical of the breadth and depth of survey coverage. The report is technical, with a focus on the complex strategies Darfur farmers use to mitigate drought and flooding and fend off the many pests that attack their crops, and on the performance of the Jebel Marra Project Extension Service. Nevertheless, it covers much more than that:

Agriculture - A very detailed picture of the skill with which Darfur farmers manage different soils, crops and varieties to make the maximum benefit from the rains and their own labour. A key lesson is the need to look beyond drought and food security. In some years, pests are a bigger threat and cash crops are a major element in most livelihoods. Darfur livelihoods depend on making the maximum out of a good year more than on defending against a bad one. Varieties that yield a large crop when there is a lot of rain are at least as important as varieties that can survive a drought.

Gender - How land-holdings, farming and grain consumption differ between male-headed and female-headed households.

Education - The contrast between sparse primary education and the 'strong popular tradition' of Islamic Khalwa education.

Water Supply - The dominance of seasonal water sources: watercourses during the rains and temporary wells in the dry season.

Inmigration - How, in earlier years, communities had welcomed migrants from drought stricken areas to the north, and allocated them farm land without charge; and how the flow slackened after a better harvest in 1986.

Food Security - Grain production and stocks relative to household consumption needs.

Cash Incomes - Over half of households sell crops, over 80% in some areas, and just under half sell livestock. Groundnuts, Tomatoes, Onions and Oranges were all more important than grain crops for cash income.

Land Tenure - The vast majority of cropped land is owned by the farmer and the rest is borrowed without charge. Renting is almost non-existent. More than half the farmers had fallow land - equivalent to more than 50% of their cropped land. The main reason for not cropping fallow was lack of labour and cash to hire labour.

For those seeking to understand and help Darfur in 2008, this report from 20 years earlier offers an insight into how Darfur livelihoods might look during more normal times; especially so as it fell in the relatively short window between the drought and famine of 1984/85 and the first outbreak of serious conflict in 1989.

GOVERNMENT OF SUDAN

JEBEL MARRA RURAL DEVELOPMENT PROJECT

Post Harvest Survey 1988

Monitoring and Evaluation Department
March 1988

Zalingei
SOUTH DARFUR
SUDAN

CONTENTS

TABLES

1 INTRODUCTION

This report presents the main findings of a sample survey conducted by the Monitoring and Evaluation Department in March 1988, that is to say at the end of the 1987/88 crop year. Survey data was collected in all nine rural councils within the project area. The number of villages in each council was approximately proportional to the population. The villages within each council were randomly selected with probability proportional to size. 16 households within each village were then also chosen randomly. There were a few cases were the full 16 respondents could not be located, especially in one quarter of Zalingei town so a total of 954 households participated in the survey. Table 1.1 shows the number of villages selected and households interviewed by Rural Council.

Table 1.1 Household Selection by Rural Council

Rural Council	Villages Selected	Households Selected
Nyertete	6	96
Golo	4	64
Rokirroh	5	79
Zalingei	10	160
Garsila	11	176
Zami Baya	5	80
Mukjar	9	144
Azum	8	128
Zalingei town	2	27
Project Area	60	954

During the preliminary collection of lists of households for the selection, village leaders were interviewed about the facilities available in the village and the degree of in-migration in the last year or so.

Emphasis in the survey was given to the collection of recall data on cropped areas, production levels, input costs and management practices for the preceding crop year. Additional information about crop and livestock sales and extension contacts made during the same period was also collected.

Since 1984/85, the Monitoring and Evaluation Department's main efforts have been divided between intensive surveys of a relatively small number of villages and single visit surveys of a larger number covering the whole area. This survey is the latest in the series of wider ranging surveys that began in 1985. In the 1988 survey, particular attention has been paid to identifying factors that mark the divisions between the different farming systems in the area: ecological differences such as soils and the degree of flooding, differences in technique, especially varieties and cultivation methods used, differences in the cropping patterns and differences in social patterns such as land tenure. Particular attention is also paid to differences between households headed by a man and those headed by a woman.

The survey was conducted at the end of a year in which rainfall in all centres fell below the 10 year average and yields in most areas were affected accordingly. The data should therefore be interpreted with this in mind.

The questionnaires used are shown at appendix I while a list of the villages visited is at appendix II.

2 INFRASTRUCTURE AND SERVICES

Village leaders in the 58 rural villages in the survey were interviewed about the facilities available in the village. The two quarters of Zalingei town were not included in this and one form was lost so the sample in the end was 57.

Table 2.1 summarises the responses on health, education and milling facilities. The table also shows the proportion of villages in the survey which were within the coverage of a JMRDP Extension Assistant. The low figure for extension for Rokirroh should in fact be even lower as the only extension station in the whole council happened to fall in the survey sample. The other low figure, for Mukjar, is roughly correct as the large southern section of the council has no extension stations in it.

Table 2.1 Infrastructure by Rural Council

Rural Council	No of Villages	% Villages With School	Disp'y	Mill	Ext'n
Nyertete	6	50	66	50	50
Golo	4	0	0	75	75
Rokirro	5	0	40	40	20
Jebel District	15	20	40	53	53
Zalingei	10	30	10	50	70
Azum	7	43	14	43	50
Zalingei Dist	17	35	12	47	59
Garsila	11	27	18	36	64
Zamibaya	5	40	40	60	60
Mukjar	9	44	33	67	44
Wadi Salih Dist	25	36	28	52	48
All Project	57	32	26	51	55

2.1 Milling Services

The diesel driven mechanical flour mill is one of the most frequently found public services in the Project area. Most of them are run as commercial enterprises although there are a few cooperative mills. The mill is often an important feature of the many small markets in the area and they are also found in villages without a market. Even if there is no mill in the village, people will take a week's supply of grain with them to have it milled on market day. Approximately half of the surveyed villages had their own mills.

At villages without their own mill, the average time required to reach a nearby mill was 0.50, 0.76 and 1.53 hours walking for the Jebel, Zalingei and Wadi Salih districts respectively. The shorter time required to walk to a mill in the Jebel district appears to reflect the closer spatial distribution of the villages rather than a greater number of mills.

Interviewees were also asked how many of the villagers did their milling by hand instead of at a commercial mill. Table 2.2 summarises the responses. It was found that 65% of the villages reported 'few to none' of their residents milled by hand. At only 12% did 'most' of the residents depend on hand milling. Naturally, there is a relationship between hand milling and the lack of a mill in the village or nearby. In Rokirroh, for example, 60% of the villages had no

mills and at the same time 80% reported that many of their residents were hand milling.

Table 2.2 Extent of Dependence on Hand Milling

	Distribution of Villages by Proportion of Households Milling by Hand			
Council	MOST %	MANY %	FEW %	NONE %
Nyertete	0	33.3	16.7	50.0
Golo	0	00.0	33.3	66.7
Rokirroh	0	80.0	20.0	0
Jebel District	0	40.0	20.0	20.0
Zalingei	10.0	20.0	50.0	20.0
Azum	14.3	00.0	57.1	28.6
Zalingei Dist	11.8	11.8	52.1	23.5
Garsila	18.2	27.7	45.5	9.1
Zamibaya	20.0	20.0	40.0	20.0
Mukjar	22.2	11.1	44.4	22.2
W. Salih Dist	20.0	20.0	44.0	16.0
All Project	12.3	22.1	40.4	24.6

2.2 Education

The majority of the villages surveyed had no primary school. The Jebel district had the least education facilities: 80% of villages without primary schools, although a distinction must be drawn between Nyertete, which is relatively well served, and Golo and Rokirroh councils where none of the surveyed villages had a school.

If there is no school in the village it is common for children to walk to school if there is one nearby. The average number of students from villages without a school who did this was 26. These students need to walk for an average of 1.6 hrs to reach the school.

The Khalwa or Quranic school, also known as Masid, is by far the main educational institution in the project area. An average of 71 students per village attend a Khalwa. This high incidence of Khalwa education is not necessarily a reflection of the lack of primary schools, to which the Khalwa remains the only alternative. A Khalwa education is a strong popular tradition in Sudan whereby students learn the principles of the Holy Quran. Even primary school boys usually attend a Khalwa during the evenings. Young boys and girls who are below school age also attend the Khalwa.

2.3 Health Services

As the table shows, almost three quarters of the villages lack dispensaries. Even within those villages which do have one, 20% were reported as not working at the time of the survey.

For villages without a dispensary, the residents need to walk for an average of 1.29, 1.36 and 1.96 hrs in the Jebel, Zalingei and Wadi Salih districts respec-

tively, to reach the nearest place in which they can have access to health services.

Zalingei district has the least villages with dispensaries, only 17.6%. This may be because the district has the main hospital in the project area, located in Zalingei town, so less attention has been paid by the local authorities to constructing more dispensaries in this district, despite the fact that some parts of the district are a long way from the town and even inaccessible during the rains.

2.4 Water Supplies

Table 2.3 shows the distribution of villages according to their source of water in the rainy season and in the dry season. The table shows that a majority of the villages in the survey have no permanent wells. In fact there were none at all recorded in either the Jebel or Zalingei districts. Most villages in the project area, therefore, depend either on temporary wells or on shallow pits which are dug in the wadi bed. Temporary wells are usually flooded during the rainy season and covered with sand and clay. They have to be dug again at the end of the rainy season. They provide the main source of domestic water in the dry season. The shallow pits are the main source of water in the rainy season (63.2% of the villages).

Other less important sources include perennial streams, in the jebel area (20% dry season and 6.6% wet season), and ponds of standing water during the rains. There were no villages in the survey that used ponds during the dry season although there may be one or two in the far south of the Project area that can use the bigger lakes in that area right through the dry months.

It is worth mentioning that a number of villages used two different types of water source at the same time, most notably in Wadi Salih district where about six villages which had a permanent well also used temporary wells or the wadi bed.

Table 2.3 Water Sources by Season - % of Villages

	No of	<	WET SEASON				><	DRY SEASON			>
Council	Villages	PW	TW	WB	SPRING	POND	PW	TW	WB	SPRING
Nyertete	6	0	16.7	83.3	0	0	0	50.0	33.3	16.7
Golo	4	0	0	75.0	25.0	0	0	0	75.0	25.0
Rokirro	5	0	0	100.0	0	0	0	80.0	0	20.0
Jebel District	15	0	6.6	86.7	6.6	0	0	46.7	33.3	20.0
Zalingei	10	0	0	95.0	0	5.0	0	55.0	40.0	5.0
Azum	7	0	0	78.6	0	21.4	0	21.4	78.6	0
Zalingei Dist	17	0	0	88.2	0	11.8	0	38.2	55.9	2.9
Garsila	11	54.6	0	40.9	0	4.6	80.0	10.0	10.0	0
Zami Baya	5	40.0	50.0	10.0	0	0	40.0	50.0	10.0	0
Mukjar	9	0	0	72.2	5.6	22.2	11.1	88.9	0	0
W. Salih Dist	25	32.0	10.0	46.0	2.0	10.0	45.8	47.9	6.0	0
All Project	57	14.0	6.1	69.3	2.6	7.9	19.6	45.5	28.6	6.2

NOTE: PW = Permanent Well, TW = Temporary Well, WB = Wadi Bed.

Permanent wells were only found in Wadi Salih district, mainly in Garsila and Zami Baya rural councils. Table 2.4 shows the distribution of permanent wells by type in the Wadi Salih councils. Those villages which have permanent wells usually have more than one. The wells are either wood lined or brick lined.

Wells lined with concrete rings are rare. These are built by the Community Development Department of JMRDP. One third of the brick wells were also constructed by the project before it changed to the concrete ring technique.

Table 2.4 Permanent Wells in the JMRDP Area

Council	No of Villages	Villages With Wells	Av Wells Per Village	Type of Lining - % Brick	Wood	Cement
Garsila	11	8	1.37	63.6	27.3	9.1
Zami Baya	5	4	3.25	38.5	61.5	0
Mukjar	9	2	2.50	0	80.0	20.0
All	25	14	2.07	41.4	51.7	6.9

The average amount of time required to reach a well was low for the brick lined and the concrete rings wells indicating that they are usually located almost at the village centre. The wood lined wells are further away, half an hour's walk or more. This difference may be explained by the fact that, building a concrete ring or brick lined well is rather expensive. The people need to share its cost and hence its services, so it is normally located in a suitable place where most of them can have easy access to it. For the wood lined wells they are built from locally available materials and do not need special skills for construction so they can be built in more scattered locations. The villages are usually built on higher ground so this may also mean that it is imposible to dig wood lined wells deep enough in a central location.

One of the interesting findings of the survey, which requires further investigation, is that 50% of the brick lined wells were reported as not giving enough water. For wood lined wells the figure is only 15.4%. This could be explained partly by the distance to the wells. People are likely to use a brick well close to the village much more than the wooden one further away. The quality of water from brick and cement lined wells was also rated lower, another indication possibly of the heavy use they receive.

The depth of both the brick and concrete lined wells is almost double the depth of a wood lined well. This means less effort is needed to extract water from the wooden well which may compensate for the longer walk.

At those villages which had no permanent well, the average amount of time required to reach a water source is 0.37 hrs. In this respect Rokirroh rural council is exceptionally high as the average time required is 1.22 hrs, indicating that fetching water is a significant burden in this area.

2.5 Migration into the Project Area

The second Post Harvest Survey carried out by the Department in early 1986, one year after the disastrous harvest of 1984, recorded a very high number of refugees who had entered the Project area from areas most affected by the drought, principally to the north. 53 out of 60 villages surveyed had migrants camped nearby and there were estimated to be around 200 per village. This was reported to be a reduction from the peak of 470 per village.

Similar questioning in the 1988 survey, two years later, revealed that the influx of migrants into the project area has virtually ceased. Only 9 out of 57 villages had received any new refugees in the last twelve months: an average of only 37 per village. They were found in both Jebel and Zalingei districts but only at one village in Wadi Salih. Clearly, the main reason for this reduction is the fact that two out of the three rainy seasons following the drought were good.

In an effort to assess whether the migrants are being absorbed, respondents were asked whether any had started farming in the area in the 1987 season. It was reported that 70 migrant households were being allocated land to cultivate in 1987/88 rainy season: an average of 2.42 mokhamas per household. This was divided between the different soil types as follows:

Soil type	Area (mk)	%
Tin	44.5	25.5
Tartura	11.0	6.3
Goz	59.0	33.8
Jogoloya	60.0	34.4
Total	174.5	100.0

It might be expected that migrant households would be given less land or poorer quality land than the inhabitants of the area. Although the areas per household are somewhat smaller than average this may well be because the families are relatively small and they cannot manage larger areas. As far as soils are concerned, the proportion of the poorer goz and jogoloya soils is certainly higher than is found among the resident population of most parts of the JMRDP area but there was still a substantial amount of good, tin land allocated to the refugees. (See Section 4.2.6 below)

2.6 Area Measurement

In order to investigate details of cropping activities with some degree of accuracy from interview surveys it is essential that units of measurement that are clearly understood by the farmers can be used. In the JMRDP region of Darfur, the unit of area measurement is the Mukhammas. This is described as being 30 'ropes' long by 20 'ropes' wide where the 'rope' (Ar. Habl) is five cubits (Ar. Dhira') long. In other parts of Darfur, the 'rope' may be six cubits long.

Officially, the Sudanese cubit is 58 centimetres and on that basis one JMRDP mukhammas would equal 5,046 square metres or 1.2014 feddans. However, farmers do not use a standard cubit to measure their land. Various local rules are described how it can be measured using the human arm adjusted by the addition of a given number of 'fists' or 'fingers' widths. Clearly this leaves room for considerable variation. In order to check on this the survey teams were asked to measure the locally accepted 'rope' in each village visited. Table 2.5 shows the results and the estimated size of the mukhammas.

Statistical tests did not show any significant difference between the rural councils despite the relatively large range between one council and the next. (Anova not significant at the 95% level).

Overall, however, the difference between this average and the 'official' mukhammas, ie that calculated using the standard cubit, is highly significant (at the 99.9% level). The confidence interval is as follows:

Average Mukhammas = 4,731 sq metres +/- 71 sq metres
(95% confidence)

This means that where areas have in the past been calculated from the farmers' estimate in mukhammas at 1 mk = 0.5046 hectare, the area has been overestimated by some 6.67%. Yields calculated by dividing the production by the area are correspondingly underestimated.

Table 2.5 Standard Unit Areas by Rural Council

Rural Council	n	Length of Rope - cm	Std Dev	Mukhammas Equivalent sq m
Nyertete	6	281.33	15.70	4748.79
Golo	4	291.75	9.40	5107.08
Rokirro	4	271.88	15.46	4434.79
Jebel Dist	14	281.60	15.22	4761.29
Zalingei	10	281.30	10.24	4747.78
Azum	7	289.07	6.65	5013.68
Zal. Dist	17	284.50	9.55	4880.34
Garsila	8	272.06	17.33	4440.99
Zamibaya	4	280.00	0.00	4704.00
Mukjar	9	278.39	7.02	4650.06
W.S. Dist	21	276.29	11.69	4730.92
All Project	52	280.40	12.42	4730.91

Note: Data was not recorded at five villages

3 POPULATION AND PRODUCTION

Survey respondents were asked to provide information about household characteristics, grain consumption, areas cropped and production levels. This data is used below to estimate project area demographic patterns and production for the 1987 crop year.

3.1 Household Characteristics

For the area as a whole, the average household consisted of 6.07 (se = .108) persons. Table 3.1 shows the frequency distribution of households by size.

Table 3.1 Frequency Distribution of Household Size

Category	Households %	Cumulative %
1-2 persons	11.2	11.2
3-4 persons	26.1	37.3
5-6 persons	24.2	61.5
7-8 persons	18.8	80.3
9-10 persons	10.1	90.4
> 10 persons	9.6	100.0

16% of households were headed by females. The average size of these households (4.06 persons) was significantly less than for male headed households (6.48 persons). As shown in Table 3.2, there were significant differences in household size between the rural councils and especially the proportion of households headed by women. There were few female led households in the Jebel councils and in Zalingei rural council. Around one fifth of households in the other rural councils were female led and two fifths in Zalingei town.

The average number of farmers per household for the area as a whole was 2.29. Somewhat surprisingly, given the differences in household size, this was similar for all councils. Again, the average for female headed households (1.62 farmers) was less than for male (2.43 farmers).

Table 3.2 Household Size and Proportion of Female Households

Council	Av Household Size	Female Led HH %	Number of Farmers per HH
Nyertete	7.43	3	2.33
Golo	5.46	3	2.19
Rokirroh	6.66	5	2.27
Zalingei	6.38	6	2.36
Garsila	5.42	26	2.23
Zami Baya	5.90	19	2.53
Mukjar	5.55	31	2.20
Azum	5.76	23	2.38
Zalingei Town	8.44	41	2.15
Overall	6.07	17	2.29

Table 3.3 gives estimates of human population and the number of farmers by rural council for time of the survey, ie dry season 1988. The total number of households in each rural council has been derived from the 1983 census estimates. The census took place in the dry season and the 1988 figure is, therefore, calculated using a continuous growth rate of 2.5% over five years.

Two important qualifications must be borne in mind. First, all JMRDP surveys have found that the household is a very variable unit and the size can change quite rapidly between years and between seasons. This implies that the number of households is also likely to be very variable for the same population. Calculating the population through the number of households is, therefore, likely to be inaccurate. Second, the actual growth rate is not known. On the basis of the 1983 Census it has been estimated as well over 3% for Darfur. However, the Census came just before the 1984 famine and it is almost certain that this will have raised death rates and reduced fertility. At the same time population in the JMRDP area was first increased by in-migration from drier areas and then reduced again as at least some of the migrants returned to their homes. For all these reasons any growth rate used may be very wrong. 2.5% is taken as a reasonable compromise.

Table 3.3 Total Numbers of Households, Farmers and Population

Estimate for Dry Season 1988

Council	Households	Farmers	Population
Nyertete	9399	21901	69838
Golo	6067	13286	33125
Rokirroh	7329	16637	48812
Zalingei	15103	35642	96355
Garsila	18205	40598	98672
Zami Baya	8134	20578	47989
Mukjar	13746	30242	76292
Azum	13826	32905	79635
Zalingei Town	4240	9117	35788
Total	96049	220906	586506

3.2 Areas Cropped

Table 3.4 (next page) presents data on average dryland areas cropped per household for the different rural councils. Marked differences in cropping patterns reflect, in particular, ecological characteristics between lowland and upland areas within the project boundaries.

The following should be noted:

- In all rural councils, millet (the staple food) was the dominant crop in terms of both area and the number of households growing it. In all areas, the area allocated to millet was more than 40% of the total. In Nyertete and Zalingei town it was more than 70%.

- Sorghum was insignificant in the Jebel councils but quite important in the lowland areas, occupying more than 15% of the cropped area in Zalingei, Garsila, and Azum, more than 30% in Zami Baya.

- Millet and sorghum grown as a mixed grain crop, was found in all rural councils.

- Tomatoes are a major part of the farming system in both Golo and Rokirroh, where over 90% of households grow it. However, tomatoes were also grown in all other areas except Zalingei township.

- Potatoes are a major crop in Golo and to a much lesser extent in Rokirroh.

- Groundnuts were insignificant in Golo and Rokirroh. In most lowland areas over half the households grew the crop.

Table 3.4 Cropping Patterns by Rural Council

Proportion of Households Growing Each Crop and the Area Per Household - Mk

Council	n	Millet %	Millet Mk	Sorg'm %	Sorg'm Mk	Mix Gn %	Mix Gn Mk	Gd'nut %	Gd'nut Mk	Okra %	Okra Mk	Chilli %	Chilli Mk	Tomato %	Tomato Mk	Potato %	Potato Mk	Other %	Other Mk	Total Mk
Nyertete	96	97	4.80	7	6.36	10	2.65	24	1.19	19	0.28	8	0.50	19	1.27	9	1.69	6	0.52	6.15
Golo	64	92	2.87	5	1.04	8	2.10	5	2.08	-	-	2	0.25	90	1.11	71	1.29	49	1.38	5.46
Rokirroh	79	90	4.43	5	1.38	13	6.65	1	1.50	23	0.52	1	0.13	94	2.06	23	0.90	37	1.21	7.56
Zalingei	160	88	2.67	54	1.74	18	2.64	59	1.02	49	0.32	31	0.52	7	0.37	1	2.00	21	0.94	4.87
Garsila	176	83	3.12	41	2.54	16	2.30	41	1.29	60	0.42	23	0.74	15	0.60	-	-	31	2.26	5.68
Z-Baya	80	70	2.86	70	2.36	11	1.72	50	1.01	82	0.49	14	0.53	11	0.75	-	-	25	1.64	5.40
Mukjar	144	76	3.47	42	2.33	13	1.73	64	1.82	43	0.28	21	0.61	15	0.98	-	-	51	2.04	6.42
Azum	128	84	2.52	47	2.06	16	1.93	54	1.07	55	0.38	12	0.37	5	0.98	-	-	25	0.93	4.47
Z-township	27	89	3.41	18	2.25	11	2.83	26	1.43	37	0.24	4	0.25	-	-	-	-	7	0.75	4.28
All	954	84	3.29	37	2.25	14	2.56	42	1.29	45	0.38	17	0.57	24	1.31	8	1.25	29	1.60	5.62
Male Hhds	791	87	3.49	39	2.36	14	2.70	41	1.42	42	0.41	18	0.57	26	1.37	9	1.25	29	1.57	6.11
Female Hhd	163	72	2.10	31	1.54	11	1.65	48	0.72	56	0.27	12	0.60	12	0.67	-	-	29	1.73	3.31
Overall Av Area	2.76		0.83		0.36		0.54		0.17		0.10		0.31		0.10		0.47		5.62	
Total Area '000 Mk			258.6		77.8		33.7		50.6		15.9		9.4		29.0		9.4		44.0	526.5

Note 1. The area per household is the average area grown by those households which grew each crop. To calculate the overall average for all households, growers and non-growers, calculate area x proportion growing.

2. The total area is calculated using the estimate of population for the 1987 dry season, ie just before the cropping season started, rather than that for the 1988 dry season shown in Table 3.3.

- Although they are grown in smaller areas, chilli and especially okra are grown by many households except in the Jebel councils.

- There were over ten other crops reported. Some of them were locally important and this category took significant areas in all councils except Nyertete and Zalingei Town. By council the important other crops, in order of importance, were:

Golo	Wheat, Garlic, Coriander
Rokirroh	Coriander, Wheat
Zalingei	Sweet potato, Cowpea, Maize
Garsila	Sesame, Sorghum intercrop (probably with sesame), Cowpea
Zami Baya	Sesame
Mukjar	Cowpea, Sesame, Sorghum intercrop
Azum	Cowpea, Millet intercrop (possibly with water melon), Sesame

- Kerkade, snuff tobacco, chickpeas and cotton were also reported but infrequently.

The average area cropped per household, 5.62 mukhammas, is substantially larger than that recorded in previous surveys. It is necessary to analyse why this should be so. These results, which are for the 1987 season, may be compared with those from the 1988 Pre-Harvest Survey as follows:

	Average Area Per Household - Mk				
Season	Millet	Sorghum	Mixed Grain	Other Crops	Total
1987	2.76	0.83	0.35	1.69	5.62
1988	1.93	1.03	0.40	0.68	4.04

The difference in the total area for the two years is large, around 30%. It is believed that there are two possible reasons:

- The sample for this, the Post Harvest Survey, included three villages with very large cropped areas: Nyertete town, Umm Dukhn in Mukjar RC and Jumeiza in Rokirroh RC. The area per household was over 10 mukhammas in all three. At Nyertete this is because of the presence of some farmers cropping very large areas of millet and sorghum on the Khawr Ramlah mechanised farm. Umm Dukhn is on or near to extensive goz soils where large areas can be easily cropped. It is a big market and there may have been some commercial farmers in the sample as well. Jumeiza is on the north of Rokirroh RC where the mountains are sloping down in relatively flat stretches that also allow larger areas.

In other words, the larger and wider sample taken for the Post Harvest survey has captured some different groups where larger areas are cropped. The higher figure is, therefore, the more correct one, at least for estimating total cropped acreages in the JMRDP area.

- However, there remains a difference even if these three villages are excluded. Particularly noticeable is the one mukhammas per household difference in the area of non-grain crops grown. This may well be the result of the difference in rainfall between a poor year like 1987 and a rather good one like 1988. When the rains are bad and the main grain crops repeatedly fail to establish, farmers may decide to increase their area of shorter season non-grain crops to compensate. The increase in the area of grain sown may also reflect an attempt to make up for poor yields by expanding the area.

It is to be hoped that future surveys will allow further comparisons to be made to shed more light on these seasonal changes.

Table 3.5 Distribution of Households by Area Cropped

Area Cropped (mk) Mk	Frequency %	Cumulative %
0 - 1.99	10.5	10.5
2 - 2.99	14.7	25.2
3 - 3.99	16.1	41.3
4 - 4.99	13.9	55.2
5 - 5.99	11.7	66.9
6 - 7.99	19.1	81.0
8 -10.99	9.9	90.9
>= 11.00	8.1	100.0

Over all areas, female headed households cropped significantly less land than male headed households. The averages were as follows:

Female headed households: 3.31 mk (se = .22)
Male headed households : 6.12 mk (se = .20).

Female headed households are therefore smaller, have fewer farmers and crop smaller areas of land.

3.3 Total Grain Production and Consumption

Table 3.6 gives information about average levels of grain consumption and production per household (in kilograms) by rural council. From these figures an average surplus/deficit column is derived to indicate differences which occurred in terms of grain balances available for storage and/or sale across all rural councils.

There were wide differences in production between the different rural councils. Nyertete and Zalingei were breakeven areas with production roughly balancing consumption. Rokirroh and Golo (in the Jebel area) had a surplus and the remainder had a deficit. In Zami Baya, Garsila and Zalingei township,the average houshold produced less than half its annual grain consumption requirements. In all areas, yields per mk for grain crops were well below the average in normal rainfall years (see below).

Table 3.6 Grain Consumption, Production and Surplus/Deficit

Per Household

Rural Council	Grain Cons.		Grain Prodn.		Surplus/Deficit	
	Av	(se)	Av	(se)	Av	(se)
Nyertete	921.7	51.0	1002.3	133.0	80.6	132.7
Golo	582.3	37.0	898.1	82.0	315.8	73.1
Rokirroh	827.8	58.3	1025.4	112.8	197.6	102.6
Zalingei	831.3	32.4	840.7	60.5	9.4	60.3
Garsila	841.6	27.4	265.8	30.3	-575.7	33.8
Z-baya	915.2	53.6	277.7	34.7	-637.5	64.3
Mukjar	823.2	40.5	672.8	104.3	-150.4	89.5
Azum	881.8	46.0	786.3	68.1	- 95.5	66.0
Z-township	862.0	67.0	255.0	49.3	-607.0	75.9
All	838.4	14.7	677.8	29.3	-160.6	28.3

Note: (se) denotes the standard error.

A direct comparison may be made between these results and those obtained in the 1987 PreHarvest Survey (JMRDP - October 1987). In that survey, which concerned the same crop season as the one discussed here, 30 villages were covered over the whole project area. One important difference was that the PreHarvest Survey also recorded stocks of grain held. 1986 was a better year than 1987 and substantial stocks were carried over from then. These stocks covered the deficit in production for 1987 over the area as a whole. The PreHarvest Survey results may be summarised as follows:

	Grain Balance Per Household - Kg			
Area	Production	Stored	Consumption	Balance
Jebel	1160	NA	834	NA
Zalingei	807	198	784	+221
Wadi Salih	630	212	776	+65

Given the fact that these results come from completely different samples taken at different times the agreement between the two surveys is close, which adds confidence that the results of both are broadly correct.

Grain requirements per capita may be calculated by dividing the estimated household requirement by the number of members. The results by Rural Council and by Sex are shown in Table 3.7. Some interesting points arise:

- First, the differences between rural councils and between male and female led households were both statistically significant at the 99% level.

- It is particularly noteworthy that per capita consumption is actually higher in female households, which might be expected to be worse off.

- It is noticeable that councils which are known to be wealthier appear to have lower per capita consumption: Golo and Zalingei Town in particular. In the case of the town this might be because the people eat more bread made from imported wheat flour but this explanation does not hold for Golo or the other Jebel councils.

There are two possible reasons why the per capita requirement might differ: the relative wealth of the household and the age structure of the household. A wealthy household, especially a household with more grain available, might be expected to eat more grain. A household with more young children in it will be more likely to eat less per capita than one which is mostly adults.

In order to test these possibilities the relationships between household size, grain production and per capita consumption were tested statistically. There were two hypotheses:

1. If the age of household members is the major factor behind the different levels of consumption then larger households, which presumably have more children will have lower per capita consumption.

2. If wealthier households, or households with more grain available, eat more grain then households with higher grain production, per capita, will have lower per capita consumption.

The correlation coefficients for these three variables were as follows:

	Size	Prod'n	Cons'n
Household size	-		
Production per capita	-0.16**	-	
Consumption per capita	-0.43**	0.10*	-

Note: ** indicates significant at 99 % level
* " " 90 % "

On these figures, the first hypothesis would seem to be confirmed: larger households eat less grain per capita (and to a lesser extent, produce less). The second hypothesis is less clearly confirmed. The relationship between available grain (production per capita) and consumption is weak and only weakly significant.

This second point is important. The fact that the people of the area do not increase the amount of grain they eat by much when there is more available indicates a general level of sufficiency, even after a bad year like 1987, such that any increase in production will either have to go into store or be sold in the market. It also indicates that the income elasticity of grain consumption is likely to be low. In other words, if incomes in the area rise the amount of grain required will not rise by much. People are more likely to want to spend extra money on other foods instead of grain and may even reduce their per capita consumption.

Table 3.7 Annual Per Capita Grain Consumption Requirements

Council	Midd Mean	(se)	Kg Equivalent
Nyertete	27.7	1.0	132
Golo	24.2	1.2	115
Rokirroh	28.9	1.4	137
Zalingei	30.4	0.9	144
Garsila	35.7	1.0	170
Zami Baya	33.1	1.2	157
Mukjar	32.8	0.9	156
Azum	33.8	1.0	161
Zalingei Town	22.4	1.3	106
All	31.4	0.4	149
Male led H'hds	30.8	0.4	146
Female led H'hds	34.3	1.1	163

It is worth noting that the kilo equivalent figure arrived at, 149 kg per head, is extremely close to that used as standard in Darfur for planning food aid requirements: 146 kg per head.

4 DRYLAND CROPPING

In order to assess yields of the different crops grown, farmers were asked to specify for each plot cropped, the crop, the area, the production and other information. A total of 4,525 plots were reported on. From this information, average yields by main crop have been derived and an analysis of the various farming systems made. Table 4.1 shows the frequency of plot sizes over all crops. All measurements were recorded in mukhammas, the local unit which is, on average, to 0.473 hectares (see section 2.5). The average plot size for the project area as a whole was 1.189 mk (se = 0.028) or about 0.56 hectare.

Table 4.1 Distribution of Plots by Size

Plot size mk	Frequency %	Cumulative Freq %
< 0.25	10.3	10.3
0.25 - 0.49	14.4	24.7
0.50 - 0.99	19.9	44.6
1.00 - 1.49	23.5	68.1
1.50 - 1.99	9.7	77.8
2.00 - 2.99	13.9	91.7
> 3.00	8.3	100.0

By crop, average and median plot sizes (in mks) were as follows:

Crop	Mean	se	Median
Sorghum	1.42	.07	1.00
Millet	1.67	.07	1.50
G'nut	0.90	.09	0.50
Okra	0.27	.09	0.25
Chillies	0.44	.03	0.25
Tomatoes	0.95	.05	0.75
Potatoes	0.94	.09	0.50

Emphasis in the discussion which follows is given to the main crops - sorghum, millet, groundnuts, okra, chillies, tomatoes and potatoes.

4.1 Yields in 1987

Yields were low in 1987. Grain yields, for example, were about half those possible in a better year like 1988. Even at these low levels, there were some marked differences in yield between the different rural councils. Table 4.2 shows average yields per mukhammas for each major crop by rural council and for the JMRDP area as a whole. A rough per hectare value can be estimated by multiplying the per mukhammas yield by two.

Table 4.2 Average Yields by Rural Council

kilogrammes per mukhammas

Council	Sor	Mil	Mix	Gnut	Okra	Chil	Tom	Pot
Nyertete	136.8	276.2	140.5	584.5	129.6	145.8	202.8	1289.9
Golo	354.4	375.5	64.2	147.5	-	90.0	318.4	2363.7
Rokirroh	315.2	258.2	59.6	360.0	74.3	33.0	195.5	2013.0
Zalingei	282.1	249.3	72.6	591.0	162.7	207.5	119.1	50.0
Garsila	78.3	76.5	55.7	363.2	148.6	101.1	182.5	-
Z-baya	94.3	93.0	34.5	165.8	114.6	108.7	167.5	-
Mukjar	144.2	155.0	105.1	402.0	163.8	219.6	228.7	-
Azum	385.0	248.9	71.5	363.5	105.9	46.5	354.9	-
Z-township	75.8	104.3	8.3	10.6	28.2	0.0	0.0	-
All	204.6	202.0	75.4	408.0	134.4	159.4	231.3	2152.7
(se)	(11.2)	(6.2)	(6.4)	(6.6)	(22.6)	(15.3)	(16.3)	(252.7)

The following should be noted:

- Grain yields were best in Nyertete, Golo, Rokirroh, Zalingei and Azum: ie the north and east of the area. Wadi Salih did very badly.

- Yields for groundnuts, okra, chillies and tomatoes were fairly consistent throughout, except for okra and chillies in Rokirroh and Golo, where the low yields explain why they are not much grown in the higher parts of the Jebel.

4.2 Factors Affecting Yield Performance

Rainfall is, by far, the most influential factor affecting prod-uction performance across the different councils. Table 4.3 shows the 1987 total rainfall for six stations compared with the 10 year averages for the period 1976-1985. Only one station was even close to its 10 year average, Nyertete, and this in large part explains why yields in the three Jebel councils were so much better than elsewhere.

Table 4.3 Total Rainfall at Six Sites

Millimetres

Rural Council	Station	Rainfall 1987	10 yr Average
Nyertete	Nyertete	534	574
Garsila	Garsila	354	558
Zalingei	Zalingei	224	460
Z-baya	Umbala	323	501
Mukjar	Mukjar	388	581
Zalingei	Dankuch	356	398

An attempt was made in the survey to assess the management practices adopted for the different crops in order to determine, where possible, the effect of each on yield levels achieved. Other factors thought to have had an influence on yield (e.g. flooding adjacent to watercourses/wadis) were also recorded. The following discussion provides a summary of the main findings.

4.2.1 Ploughing and Precultivation

Table 4.4 shows the proportion of plots precultivated by hand or by plough.

Table 4.4 Extent of Precultivation By Hand or Plough

Council	Plots Precultivated - % By Hand	By Plough
Nyertete	38	26
Golo	83	8
Rokirroh	69	3
Zalingei	15	16
Garsila	20	12
Zami Baya	11	3
Mukjar	9	31
Azum	13	9
Zalingei Town	9	6
All	25	14

The proportions by crops were as follows:

	By Hand	By Plough
Sorghum	6	8
Millet	19	11
Groundnut	27	32
Okra	26	11
Tomato	68	9
Chilli	37	22
Potato	75	11

The key points from this analysis are:

- Precultivation by hand is the dominant practice in the two Jebel rural councils: Golo and Rokirroh. This is true for all crops in that area.

- Hand cultivation is also important in Nyertete but to a lesser extent. However, ploughing makes up most of the difference in this council.

- In all other areas, only 20% of grain plots were cultivated before sowing, more often with a plough than by hand.

- Groundnuts, on the other hand, were more commonly cultivated before sowing than not. The division between hand cultivation and ploughing was almost even. The exception was Zami Baya council, where precultivation was less common and mostly done by hand.

There are, therefore, considerable differences in the adoption of different techniques between the different rural councils, most markedly between the three Jebel councils and the rest. There were also large differences in grain yield between the councils because of rainfall and other factors. In order to ensure, as far as possible, that like is being compared with like, the effect of the different precultivation strategies on yield is best analysed separately for each rural council where there is a reasonable number using each technique. This is done in Table 4.5.

When considering these results, it must be borne in mind that other, hidden, factors may be at work. If, for example, ploughs are used on poorer soils, yields will be lower compared to hand cultivation on better soil. However, there is no evidence in this survey that either hand precultivation or ploughing is reserved for particular classes of soil.

Table 4.5 The Effect of Precultivation on Yield

Kilogram per Mukhammas

Council	Precultivation Method: None n	None Av	None Sd	By Hand n	By Hand Av	By Hand Sd	By Plough n	By Plough Av	By Plough Sd
SORGHUM									
Garsila	92	82.90	186.00	15	46.93	55.31	6	77.83	97.11
Mukjar	67	135.03	157.81		-		21	180.24	186.44
MILLET									
Zalingei	228	241.79	285.73		-		32	303.12	330.78
Garsila	243	82.11	127.72	31	50.61	115.63	23	52.17	106.79
Mukjar	154	151.01	121.61		-		45	168.82	152.75
GROUNDNUTS									
All	233	317.79	365.56	156	391.86	450.96	185	535.36	740.93

For grain, these results are inconclusive. In Garsila both ploughing and hand precultivation appear to have depressed grain yields. Yields were in any case very low in that council because of poor rains. In Zalingei and Mukjar, ploughing raised grain yields but not by much. In all these cases the variation was high and the differences are not statistically significant. A poor season like 1987 is, perhaps, unlikely to reveal very much about yield effects of cultivation.

For groundnuts both ploughing and hand cultivation raised yields, in the case of ploughing by a substantial amount. This latter result is statistically significant, despite the large standard deviation.

Ploughing was almost all done by camel plough: approximately 90% of the ploughed plots. The remainder were ploughed by tractor. 70% of camel ploughs were bought during the period 1980-1987. The proportion of households that used a plough during 1987 and the proportion of those who had their own plough is shown below. Those who did not own the plough hired it.

Council	Households using a plough - %	Proportion of users who own a plough - %
Nyertete	37.5	25
Golo	15.6	10
Rokirroh	7.6	-
Zalingei	49.5	17
Garsila	23.3	22
Zami Baya	5.0	25
Mukjar	39.6	23
Azum	18.9	21
Zalingei Town	18.5	-
All	24.7	20

Of the owned ploughs, 17.4 % were definitely purchased from JMRDP. It is possible that some of the others were also but were not specifically described as such. Of the hired ploughing, about 14% was done by tractor, the rest by camel ploughs.

The use of ploughs on different soil types was analysed. (See section 4.2.6 for a description of soil types.) It was found that ploughs were used on all major soils although the number of cases on the Jebel 'teen' was small. On the lowland, there was a clear tendency for ploughs to be used more often on the lighter 'tartora' and, especially, 'goz' soils but this did not mean that they were not used on 'teen' as well. About 24% of 'goz' plots were ploughed and 10% of 'teen'. Similarly, ploughs were used more frequently on unflooded land than on flooded but the difference was small.

It might be suggested that if precultivation does not affect yield, it is intended to save labour by reducing the number of weedings after the primary cultivation. This was tested for the three major crops selecting those rural councils where there was an even spread between no precultivation, hand precultivation and ploughing. Table 4.6 shows the results.

Table 4.6 The Effect of Precultivation on Weeding Requirements

Number of Times Weeded After Primary Cultivation

Council	Precultivation Method: None			By Hand			By Plough		
	n	Av	Sd	n	Av	Sd	n	Av	Sd
SORGHUM									
Garsila	92	1.91	1.49	15	2.13	0.83	6	2.00	0.63
Mukjar	67	1.46	0.84		-		21	1.67	0.80
MILLET									
Zalingei	228	1.56	0.66		-		32	1.19	0.59
Garsila	243	2.00	1.30	31	2.13	1.36	23	1.26	0.86
Mukjar	154	1.61	0.70		-		45	1.49	0.69
GROUNDNUTS									
All	233	1.57	0.84	156	1.49	1.04	185	1.34	1.00

It should be emphasised that those who do not cultivate before planting, do a first weeding soon after planting. This takes the place of the primary cultivation. What the table shows is the number of secondary weedings that are done after that.

For sorghum the evidence is not statistically significant and it goes against what was expected: weeding requirements are increased after precultivation by hand or by plough. For millet and groundnuts, on the other hand, there is a decrease in the requirement after ploughing. After hand cultivation, there is only a reduction for groundnuts. For ploughing, the differences are significant at the 99% level.

It should be remembered that times-weeded is only an indicator of the requirement. The effort put in to each weeding may also change. For example, even where two farmers both weed their plots two times, it may take the one who has not ploughed much longer to do the job. The fact that even the number of times shows a reduction after ploughing is, therefore, quite a strong indicator that ploughing does make weeding easier. In addition, it is likely that the labour saving benefits of precultivation are less evident in a dry year like 1987 than they might be in a wetter one.

4.2.2 Weeding

Most farmers weed a plot at least once. Respondents were therefore asked to indicate the number of additional weedings per plot in order to assess the importance of the operation for individual crops. Table 4.7 shows the proportion of plots receiving additional weedings for the most important crops grown in the project area.

Table 4.7 Distribution of Plots by Number of Extra Weedings

	Percent of Plots						
	Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
Extra weedings							
0	7.1	5.2	6.1	10.1	5.5	2.5	10.3
1	41.2	47.7	42.4	46.9	54.5	21.1	68.8
2	38.7	37.4	41.1	33.3	32.5	41.7	20.6
3	11.0	7.3	8.6	7.3	5.5	17.2	1.0
>3	2.0	2.4	1.8	2.4	2.0	20.2	0.0
Av No	1.62	1.56	1.58	1.47	1.44	2.34	1.12

The following should be noted:

- For all crops, at least 50% of plots were weeded at least once after the first weeding/cultivation. Between 30-40% were weeded twice.

- Except for tomatoes and potatoes, the average number of weedings was similar for all crops. Tomatoes were weeded more frequently and potatoes, slightly less.

- The possibility that the intensity of weeding affected yields was tested but the results showed no effect, either with or without a precultivation.

4.2.3 Sowing Times

For a number of reasons, the germination stage is particularly critical to rainfed crops in Darfur. As a general rule crops that are established early do best. On the other hand, there is a risk of failure if a crop is planted on early rains which are not sustained. Termites and ants remove seed just before or during germination and grasshoppers destroy the newly germinated crops. These are hazards which occur every year. Armyworm is not so frequent but particularly damaging when it does attack, as it did in some areas in 1987, especially Wadi Salih.

Various aspects of farming practice reflect these problems. Seed dressing is widely used to try to combat ants and termites. Seed rates are high in the hope that at least some plants will get through the germination stage successfully: as much as ten seeds per hole for grain crops. This means that the stand in those parts of the field where the crop does germinate is too dense and has to be thinned: to two or three plants per hole for grain. The thinnings in turn are used to fill gaps in parts where the germination has failed. Table 4.8 shows the seeding rates for the various crops. These rates include the seed used for replanting so they should not be taken as the rate for a single sowing.

Table 4.8 Average Seeding Rates per Mukhammas

	Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
Kilo per mk	12.2	13.3	45.6	2.5	13.2	5.4	462
se	(.75)	(.80)	(5.3)	(0.2)	(4.9)	(0.6)	(32.2)

Despite all these tricks, partial or total failure to establish is a frequent occurrence, especially in a year like 1987. However, sowing is a relatively quick and easy job so farmers are ready to replant quite frequently until they succeed in getting a crop established. There is a specific term for replanting, "reqaa'a". The number of times they have to replant is a key indicator of the

success or otherwise of the season. Table 4.9 shows the average number and frequency of sowing times by crop for the project area as a whole.

Table 4.9 Frequency of Sowing Times by Crop

	Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
No sowing times							
1	16.2	17.5	58.6	47.9	55.4	60.1	92.3
2	31.3	32.4	31.5	39.3	28.9	25.1	7.7
3	32.3	35.1	7.2	9.5	10.5	12.0	-
4	13.7	10.1	1.9	2.6	3.6	2.3	-
>4	6.5	2.2	0.8	0.8	0.6	0.6	-
Av. No of Times	2.59	2.50	1.53	1.67	1.60	1.36	1.01

The following points should be noted:

- The mean number of sowing times was similar for sorghum and millet. Plots sown to these crops were sown an average of 2.5 times. Other crops with the exception of potatoes were sown an average of about 1.5 times.

- Roughly one third of all plots of millet, sorghum, groundnuts and okra were sown twice. A third of the sorghum and millet plots were sown three times and more than 10% four times.

- The high number of sowings for sorghum and millet indicates how important the struggle is to get these relatively long period crops established, remembering that they are, in area terms, by far the most important. Most of the other crops have a shorter period and they can, therefore, be sown later once the rainy season is well underway. It is believed that repeated failures with the grain crop may actually drive farmers to change over to these other crops in an effort to save something from a particularly bad season.

Not surprisingly, there is a strong relationship the number of replantings and yield. If a crop fails to establish and has to be resown, it will be late and this almost always reduces yield. In particular, a resown crop is likely to miss the benefit of the early flush of soil nitrogen that occurs after the first rains. A late crop is also more likely to become stressed at the end of the rainy season.

The number of sowings may also be a reflection of soil effects - more sowings may be required on the poorer soils with lower moisture retention characteristics (e.g. goz and tartora - see below). These soils would be naturally lower yielding.

Table 4.10 shows an analysis of yield according to the number of sowings for grain sorghum and millet. Comparisons are made between plots receiving less than two sowings and those receiving more than two sowings.

Table 4.10 Effect of Replanting on Yield

	No of Sowings	Av yield kgs/mk	se	Sample Size (n)	Significance Level
Sorghum	<=2	238	17.4	267	99%
	>2	172	13.5	288	
Millet	<=2	253	9.9	791	99%
	>2	149	7.0	776	

4.2.4 Insect pests and pest control

The important pests cited by farmers were grasshoppers, nafaasha (millet head-worm) and armyworm (Mundei in the local dialect). Other pests cited but of relatively minor importance were termites, various animal pests (eg monkeys), mice and rats. Table 4.11 summarises data on the percentage of sorghum, millet and groundnut plots reported as being affected by the main pests.

Table 4.11 Incidence of Major Pests on Main Crops

Pest	Sorghum	Millet	Groundnuts
Grasshopper	54.0	65.3	10.0
Nafaasha	-	17.2	-
Armyworm	59.0	64.1	12.0

The incidence of all three major pests was evenly spread across the whole JMRDP area. No rural council escaped significant levels of attack.

Respondents citing the existence of a particular pest were asked to indicate how severe each was in terms of its perceived effect on the crop. Three levels of severity were nominated in the questionnaire - 'high', 'medium' and 'low'.

In all cases, more than 70% of plots affected were reported as being in the 'high' category, implying that yields should have been affected accordingly. Tests were therefore run to determine the effect of the presence/absence of these particular pests on crop yield performance. The results for the major crops are shown in Table 4.12.

Table 4.12 Effect of Pests on Yield

	Sorghum			Millet			Groundnuts		
	n	Kg/Mk	Sd	n	Kg/Mk	Sd	n	Kg/Mk	Sd
With Armyworm	332	138.58	198.83	1016	176.76	229.23	69	556.17	446.17
Without	231	298.57	316.62	569	246.67	268.67	505	387.80	551.36
With GrassH'r	332	221.59	263.96	969	194.32	230.66	21	491.48	784.64
Without	231	179.26	256.77	616	213.71	268.34	553	404.87	531.32
With Nafaasha		-		255	240.03	243.01		-	
Without		-		1330	194.54	245.80		-	

The effect of armyworm on the grain crops was large and statistically significant. Yields were nearly halved. Surprisingly, however, groundnut yields were significantly higher with armyworm than without, as were millet yields with nafaasha. The effects of grasshopper were not significant. The fact that these results do not show a yield effect or show a contradictory one, is most likely to mean that the effect has been hidden by some other factor. It is possible, for example, that early sown millet will mature at the peak of nafaasha but it is more likely to yield well because it was sown early so the damage done by the pest is hidden. It is also possible that wetter conditions encouraged some of the other pests but the yield benefits of the extra rain offset the damage done by the pest.

As already discussed, the germination period is critical and both armyworm and grasshoppers can be particularly damaging at that stage. Even if they do not reduce yield they may force farmers to replant. There was a measurable relation between the incidence of these pests and the number of times a crop was sown. The differences for the main crops were as follows:

	Av Times Sown	SD	Significance Level
SORGHUM			
With Armyworm	2.67	1.27	90%
Without	2.48	1.10	
With G'Hopper	2.72	1.13	99%
Without	2.41	1.14	
MILLET			
With Armyworm	2.60	1.13	99%
Without	2.32	1.06	
With G'Hopper	2.62	1.08	99%
Without	2.31	1.12	
GROUNDNUT			
With Armyworm	1.71	0.81	90%
Without	1.51	0.80	
With G'Hopper	1.76	0.94	NS
Without	1.52	0.78	

In almost all cases the presence of armyworm or grasshopper caused a significant increase in the average number of times a crop had to be sown, although the increase was quite small.

With the exception of seed-dressing, the use of pesticides in the project area is not widespread. Less than 3% of plots received pesticide of any kind during the year of survey. If used, 70% were applied by hand and the remainder by spray. Chemicals, when bought, were mainly purchased at local centres with 40% being obtained through JMRDP extension staff. Sprayers were owned by less than 1% of households in the project area.

Given the high incidence of pests and farmers' high assessment of the damage done, it seems more likely that they rarely use pesticides not because they do not want to but because they cannot get them.

4.2.5 Seed Varieties

Respondents were asked to specify the seed varieties used for plots sown to different crops. For the main crops, sorghum, millet and groundnuts farmers appeared to have a good knowledge of the particular varieties used. For the other crops a large proportion was merely described as 'local' (or 'baladi'). Some caution is needed in interpreting this data. Some commonly used names appear to refer to quite general types or landraces rather than specific varieties. Nevertheless, it is possible to identify differences between the rural councils in the importance of various varieties as follows:

Variety	Proportion of total - %	Important Rural Councils
SORGHUM		
Fasikh	37	Zalingei (70%),Zami Baya (40%), Azum (38%)
Dabar	19	Garsila (32%), Mukjar (34%)
Zarazira	7	Mukjar (39%)
Qadam El Hamam	5	Mostly Garsila
Gandori	3	Mostly Azum
Local unspecified	18	
One other variety 'Kornan' mentioned, in Garsila		
MILLET		
Darmasa	36	Nyertete (45%), Zalingei (53%) Garsila (44%), Zami Baya (65%), Azum (49%)
Bayoudah	19	Nyertete (26%), Azum (23%), Mukjar (51%)
Dimbi	14	Golo (67%), Rokirroh (61%)
Local unspecified	24	
Others:'Kory', all Mukjar,'Ambasa', ditto,'Neelay', mostly Garsila		
GROUNDNUTS		
Barberton	49	Mukjar (70%), ZamiBaya (66%), Garsila (65%), Azum (51%)
Tajarub	16	ZamiBaya (23%), Azum (21%), Garsila (20%)
Toskary	6	Zalingei (18%)
Local unspecified	24	
OKRA		
69% described as local, other names: 'Kory','Raingy' and 'holland'.		
TOMATOES		
47% described as local, 15% as 'salsa' (the name for dried tomato), 15% 'Andal'		
CHILLI		
58% named as 'Koko', the rest 'local'.		
POTATO		
Almost all 'local'		

Points to note from this are:

- For sorghum, there is a distinction between the councils along the line of the main Wadi Azum: Zalingei, Azum and Zami Baya, where Fasikh is dominant and the Wadi Salih councils: Garsila and Mukjar, where Dabar is more important. The importance of Zarazira in Mukjar should also be noted.

- The fact that Fasikh is twice as common as the next variety underlines an important fact: even in a relatively poor year like 1987 this longer period variety is dominant. This indicates that research should not be concentrated only on short or medium varieties. An improved long-period variety would be very attractive to farmers.

- The proportion of farmers growing Dabar is a reasonable indicator of how rapidly new technologies can be taken up in the area. In areas suited to that variety, Dabar is now grown on 30% of the sorghum plots. Small quantities of this variety were introduced to the area as early as 1976 and some was sold in 1979. However, wider distribution was only begun under the JMRDP in 1982 and reached a peak of 1,400 sacks in 1985. It has, therefore, taken a relatively short time to establish Dabar as the second most important variety in the area.

- Darmasa, a relatively long season variety (or group of varieties), is dominant in all the lowland councils except Mukjar. Surprisingly, it is also the major variety in Nyertete. As for Fasikh sorghum, this indicates that the Project should not devote all its work to short season varieties to the exclusion of medium or long ones. The greatest demand is for longer varieties. Also like Fasikh, it is the three councils along the line of the main Wadi Azum where Darmasa is most important.

- The distribution of Bayoudah is a surprise, in particular the fact that it is the most important variety in Mukjar and quite important in Azum and the fact that it is insignificant on the upper Jebel. It should be noted that this survey refers to a period before JMRDP started large scale distribution of this variety.

- It has also not previously been reported that Dimbi is so important on the higher Jebel: Golo and Rokirroh. This clearly indicates a separate requirement in this area.

- For groundnuts, the Project has recently turned its attention away from oilseed varieties to confectionary varieties. The dominance of Barbeton, an oilseed variety, indicates that this is still an important area which should not be ignored. It should be noted that 'tajarub', literally 'trials', probably refers to seed of the Barbeton type which has originated from improved seed distributed in the past. Toskary is a bunch type, like Barbeton, but the seeds are larger and the oil content lower. The other type recognised in the area, called merely 'large local', is a spreading type which also has larger seeds and less oil content.

- Of the okra varieties, Kory is described as longer than Raingy and good both fresh and dried while the latter is only good dried. It should be noted that 'kory' is the word used for the long-horned fulani cattle occasionally seen in the area. The okra variety is named by analogy with the horn, which is also why this name is found for long-headed millet varieties.

- Koko, the principal chilli variety, is described as relatively large fruited and not as hot as other varieties.

Statistical tests were done to assess the effect of variety on the yields of sorghum and millet. For sorghum, differences in yield between the most commonly used varieties, Fasikh and Dabar, were assessed for the project area as a whole. For millet, similar tests were conducted to determine whether there were differences in yield between Darmasa and Bayoudah. Both of these varieties are local but the project has been involved in seed multiplication of Bayoudah because it is both a short season variety suitable for the drier areas and because of its better overall performance in field trials. Table 4.13 shows the results of the analysis.

Table 4.13 The Effect of Variety on Yield - Sorghum and Millet

Crop	Variety	Av.Yield kg/mk	se	Sample Size n	Significance Level
Sorghum	Gandori	328	95.7	19	-
	Fasikh	296	20.6	207	ns
	Zarezira	128	19.2	39	99%
	Dabar	83	13.5	106	90%
	Gadam ElH	50	13.5	32	ns
Millet	Dimbi	252	17.1	215	-
	Bayoudah	209	10.6	569	95%
	Darmasa	170	13.2	303	90%

Note: The significance test compares the difference between any one variety and the one immediately above it.

The following should be noted:

- Results for millet are as expected; Dimbi, the Jebel variety does best of all, and Bayoudah yields are significantly better than Darmasa. Darmasa is a long season variety and relatively poor performance during the 1987/88 season would have been expected. Bayoudah, on the other hand, has a shorter period and can still perform well if sown late. Bayoudah was, if anything, grown slightly more often on goz soils and slightly less often on land that is flooded, that is to say it seems to be on poorer land, but the difference was small. The better performance of Bayoudah therefore seems to be attributable to it being genuinely better suited to the 1987 season.

Nevertheless, it should be emphasised that the difference is quite small and only significant at the 90% level. It should also be remembered that nearly twice as many plots of Darmasa were grown than Bayouda. For whatever reason, more farmers still prefer the longer season variety.

- Results for sorghum, however, go in the opposite direction, with the shorter season, improved variety, Dabar, performing very poorly compared with Fasikh. Dabar is susceptible to blight but this will have been less of a problem in a dry year. The main explanation seems to be that the two crops are grown on different classes of land. 81% of Fasikh was grown on 'teen' soils and 86% on flooded land, which would be expected to do best in a dry year. Dabar was grown on a wider range of soils, including 12% on 'goz'. Only 42% was on 'teen' and 48% on flooded land.

It seems clear that Dabar has, to some extent, taken up the role that the project planned for it: as a shorter variety suitable to drier, more marginal lands. In view of that, it would be wrong to conclude from its poor performance, compared with Fasikh in a dry year like 1987, that it is not a success. However, it is necessary to note that crops grown under these more marginal conditions will always be more risky.

Nevertheless, flooded 'teen' remained the largest single class of Dabar land. The Project recommends farmers not to plant Dabar on this type of land, largely because of the blight hazard, and it is difficult to know why they do so when the performance seems so poor.

Gandori, the highest yielding sorghum of all, was almost entirely grown on flooded 'teen'. It is probably a type of Fasikh which is particularly suited to wet conditions.

It is of interest that Zarezira, an improved variety also grown in central Sudan, did better than Dabar or Gadam ElHamam. It was grown on a similar mix of soils especially Jogoloya. Although it should be noted that farmers sometimes

confuse one improved variety with another it would seem worth investigating whether Zarezira has a place in the area.

4.2.6 Soils

Farmers typically categorise soils within the project area into four main groups:

- teen (medium clay loam) .
- tartora (sandy loam)
- goz (sand)
- jogoloya (heavy clay loam, cracking)

These definitions are fairly well understood throughout the project area but they should be treated with care. It is probable that farmers use the terms in a relative way specific to their own area. Where the soils are generally light, for example, 'teen ' may be used to describe the heaviest of them even when it does not really compare with 'teen' soils in another area.

One specific difference concerns 'teen' soils in the uplands around Jebel Marra. These are volcanic, more fertile and more friable than those on the lowland. These Jebel 'teen' soils should be regarded as a separate group. Much of the mountain land is terraced and it is often quite stony.

On the lowlands, 'teen' refers to the heaviest alluvials along the wadis. 'Tartora' soils, typically, lie on the slightly higher sections of the wadi alluvium. Goz, which literally means sand, may refer to particularly light wadi soils but it also covers windblown sandy soils. The latter are found in larger sections in the southern part of Mukjar RC, around Umm Dukhn, but also locally in the the other lowland councils.

The proportion of plots falling into these different categories in each rural council is shown in Table 4.14 while the distribution by crops is shown in Table 4.15.

Table 4.14 Distribution of Plots by Flooding and Soil Type - (%)

	Flooded	Soil Type				
Council	%	Teen	Tartora	Goz	Jogoloya	Other
Nyertete	20.1	56.3	31.4	8.1	-	4.2
Golo	13.3	83.0	14.0	-	-	3.0
Rokirroh	18.6	78.8	7.7	-	-	13.5
Zalingei	55.9	52.6	31.1	15.5	-	0.8
Garsila	53.5	49.6	19.4	23.2	6.4	1.4
Z-baya	57.1	47.2	26.6	18.3	5.3	2.6
Mukjar	34.3	35.7	19.1	38.1	6.2	0.9
Azum	52.5	39.2	27.5	30.3	-	3.0
Z-township	36.0	25.6	24.4	36.0	4.7	4.3

Note: 'Other' = various mixes of the main types including ‘stony ground’.

Table 4.15 Distribution of Soil Types by Main Crop

	Percent of Plots						
	Sor	Mil	G'Nut	Okra	Chili	Tom'o	Pot'o
Teen	66.1	47.4	10.5	66.6	56.4	73.4	79.4
Tartora	18.5	23.3	35.4	15.0	37.3	15.9	18.6
Goz	5.7	24.4	53.0	10.7	3.9	2.9	-
Jogoloya	7.8	0.6	0.3	6.1	1.5	-	-
Other	1.9	4.3	1.1	1.6	0.9	7.8	2.0

From these tables the following conclusions can be drawn:

- 'Teen' soils are the most important of all. Even if the two high Jebel councils are excluded because the 'teen' there is different, the largest number of plots is on 'teen'. 'Tartora' is the next most important overall and 'goz' at 20% of plots is also important, in some councils more than 'tartora'.

- Sorghum is mainly grown on the heavier 'teen' soils as are chilli, okra and tomatoes as well.

- Although millet appears to be mostly grown on 'teen' it should be remembered that this is the dominant crop on the Jebel volcanics, also described as 'teen' but different in character. On the lowland, the lighter soils are more important for this crop.

- Similarly, it should be noted that the high proportion of 'teen' for potatoes and tomatoes refers mainly to the Jebel volcanics where these are important crops.

- As expected, groundnuts are mostly grown on the two lighter classes: 'goz' and 'tartora'.

Tests were conducted to ascertain the effect of soil type on yield for the three main crops - sorghum, millet and groundnuts. Table 4.16 shows the results. In all cases, the direction of yield change is as expected, although some results are not significant. Grain yields on 'teen' are higher than 'tartora' and those are, in turn, higher than 'goz'.

These results reflect the position of the soils as well as their quality. 'Teen' is low-lying and more likely to be flooded. In a dry year like 1987, this is almost bound to raise yields compared to the lighter soils higher up the slope. Millet, in particular, might do better on 'tartora' in a wet year.

For groundnuts 'tartora' does better than 'teen' even in 1987 but this is not a surprise as this crop does best on relatively light soils.

Table 4.16 The Effect of Soil Type on Yields

Crop	Soil type	Av.yield (kg/mk).	se	Sample Size	Significance Level
TEEN COMPARED WITH TARTORA					
Sorghum	teen	372	14.5	372	
	tartora	167	21.5	104	99%
Millet	teen	217	12.6	544	
	tartora	170	11.3	345	99%
Groundnuts	teen	378	65.0	60	
	tartora	457	36.3	202	ns
TARTORA COMPARED WITH GOZ					
Sorghum	tartora	167	21.5	104	
	goz	132	48.1	32	ns
Millet	tartora	170	11.3	345	
	goz	133	7.7	387	99%
Groundnuts	tartora	457	36.3	202	
	goz	383	32.7	304	ns

Note: The two Jebel councils, Golo and Rokirroh have been excluded from the analysis for millet because the soils are not comparable with the rest of the area.

4.2.7 Flooding adjacent to watercourses

Flooding of plots adjacent to wadis is common. Overall, 42.7% of the plots included in the survey were flooded in 1987/88. For the lowland councils lying along the major wadis it was over 50%. In wetter years it would, presumably, be even higher. Certainly waterlogging is reported as reducing yields. In years of poorer rainfall, however, flooding is more likely to have beneficial effects depending on its timing, duration and extent.

This was found to be the case for sorghum but not for groundnuts, where flooded plots were adversely affected. In the case of sorghum, yields on flooded plots averaged 232 kgs/mk compared with 145 kgs/mk for unflooded plots. With groundnuts, flooding reduced yields from 495kgs/mk (unflooded plots) to 371 kgs/mk. With millet, there was no significant effect on yield resulting from flooding.

Not surprisingly, there was a close relationship between soil type and flooding. If the Jebel soils are excluded, 73% of teen plots were flooded compared with only 38% of tartora and 21% of goz. As already discussed, there are clear indications that farmers chose both the crop and the variety at least partly to suit soil conditions. For sorghum at least the same is true for flooding. 86% of Fasikh plots were sown on flooded plots but only 48% of Dabar. As far as the main lowland crops were concerned, the proportions grown on flooded land, once again excluding the two Jebel councils, were as follows:

	%
Sorghum	69.0
Millet	36.7
Mixed grain	48.8
Groundnut	29.6
Okra	46.9
Chilli	58.8

4.3 Differences Between Male and Female Households

It has been shown that female headed households are smaller and crop smaller areas. Their total production is also less. On the other hand the area per

capita is no less and, as shown in Chapter 3, per capita grain consumption is actually greater. Nevertheless, the survey results show quite clearly that yields are lower in female led households. Table 4.17 shows the yields of the three main crops according to the sex of the household head.

Table 4.17 Yields According to Sex of Household Head

Crop	Household head (m/f)	Av. yield (kg/mk)	se	Sample size(n)	Significance Level
Sorghum	male	205	12.0	498	
	female	192	31.9	62	ns
Millet	male	213	6.8	1399	
	female	113	11.3	182	99%
Groundnuts	male	441	25.8	481	
	female	233	36.5	91	99%

The difference for millet is somewhat exaggerated by the fact that there were very few female headed households on the Jebel where yields were higher. For the lowland councils yields for male households were 174 kg against 109 for the female. This was still significant at the 99% level. Yields for the female households were also substantially lower for the other crops: okra, tomato and chilli. The only exception is for mixed grain where female yields were fractionally higher, although at a very low level.

These substantial differences are worth further investigation. There seem to be two possible reasons: that female headed households have less labour available and therefore do less cultivation and weeding and that they do not have access to the best land for one reason or another.

The most likely cause is that female households cannot mobilise as much labour. However, it must be a little more more complex than that because female headed households in fact have more labour available per unit area cropped than the male:

	Male Hhds	Female Hhds
Av Area cropped mk	6.11	3.31
Av Number of farmers	2.43	1.62
Farmers per mk	0.40	0.49

One possibility is that women farmers are not able, for various reasons, to work as long or as hard as the men. However, it is known that a number of the farmers in male headed households will also be women, so this should not make such a difference. In fact when the relative labour inputs of male and female households, are tested it appears that the female do more work, not less. Table 4.18 shows the difference for sowing and second weeding.

Table 4.18 Sowing and Second Weeding Times by Sex of Hhd Head

	Sowing Times	Signifance Level	2nd Weeding Times	Significance Level
Sorghum - Male	2.58		1.61	
Female	2.92	95%	1.84	ns
Millet - Male	2.55		1.57	
Female	2.91	99%	1.79	99%
G'Nut - Male	1.48		1.46	
Female	1.87	99%	1.60	ns

Note: The two Jebel councils, Golo and Rokirroh, are excluded.There was a very small proportion of female hhds, and other complicating factors there.

On this evidence two things are clear. First, female households had more problems with crop establishment and had to replant more often. Second, female households certainly did no less weeding than the male and probably did more. (It may be noted here that the labour inputs recorded in the 1987 Wet Season survey showed that the labour inputs per unit area for most crops was higher for the female farmer.)

Although it has been shown above that precultivation does not significantly affect yield, at least on the lowland in 1987, it is possible that female households are less able to afford precultivation and this affects their production. There is some evidence to support this idea:

		Proportion of Plots Precultivated	
	HHd	By Hand - %	By Plough - %
Sorghum	- Male	4.7	8.6
	Female	3.2	1.6
Millet	- Male	8.4	14.6
	Female	1.7	2.9
GNut	- Male	25.0	38.5
	Female	36.1	12.1

However, it seems to be the last factor which is the most important of all: land. The distribution of plots farmed by male and female households between the three major land classes was as follows:

	Distribution of Plots by Soil Type	
	Male Hhds - %	Female Hhds - %
Teen	47.6	34.6
Tartora	24.9	24.0
Goz	22.1	35.3
Other	5.4	6.1

Quite clearly, female households had less of the heavy 'teen' soils which did well in 1987 and more of the 'goz' which did badly. Why this should be so needs investigation. It may be that women are less able to work the heavier soils, especially if they are in the lower areas at some distance from the village. It also possible that widowed and divorced women find it less easy to get access to the better soils.

While it is clear that female headed households are, because of the lighter soils, more vulnerable to the effect of low rainfall, it would be wrong to conclude that this definitely indicates that they are worse off. In wetter years crops grown on light soils can be more profitable because they are easier to work and so need less labour effort. Nevertheless, these results certainly indicate that this group deserves to be considered as a separate target population as far as extension messages, crop recommendations etc are concerned.

4.4 Dryland Crop Input Costs

Farmers were asked to record all cash costs for each crop grown. In order not to make the questionnaire even more complicated they were not asked costs in kind except where the goods concerned had been specifically purchased for the purpose. If, for example, the farmer fed his labourers the cost was only recorded if he bought extra food for them. No attempt was made to value food supplied from household stocks.

By far the largest part of the agricultural work in the JMRDP area is carried out by family members. Nevertheless, hired labour is also used by some farmers in almost all areas and for almost all crops. Hired labour is usually paid on piece rate: ie so much per mukhammas. In any season, rates for each operation are fairly standard at least within one part of the area. Hired labourers are usually fed in addition to their pay. Seed is mostly provided from the fami-

ly's store but a significant proportion is bought. Other important cash costs include transport and sacks for storage.

In a situation where only some farmers use cash inputs, the proportion who do is an important indicator of the extent to which the area depends on the hire or purchase of inputs. In the long term this will also be a key indication of the rate of development towards more market oriented farming in the area. The tables that follow, therefore, all show the proportion of plots for which inputs were bought for cash and the average rate/cost per mukhammas, for those plots on which cash was spent. If an average input cost over all plots is required, then the average in the tables should be multiplied by the percentage. Tables 4.19 to 4.21 show this information for the inputs by the main stages of cropping: up to and including sowing, weeding and pest control and harvest and after.

Table 4.19 Input Costs: Land Preparation and Sowing

Percent of Plots on Which Cash Paid and Av Rate - £s per Mk

		Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
	n	563	1585	574	608	204	308	97
Land clearing	%	6	8	4	1	2	9	11
	£s	40.0	29.6	24.0	34.2	25.5	51.0	80.2
Cultivation	%	7	12	29	8	17	21	33
	£s	77.8	63.6	85.4	81.5	82.1	85.8	114.4
Seed	%	17	12	49	24	45	39	50
	£s	10.2	11.5	60.2	29.3	53.2	33.4	370.5
Seed d'ing	%	24	21	5	3	-	1	2
	£s	1.8	2.0	5.6	7.9	-	3.3	1.2
Sowing	%	8	10	8	2	3	13	18
	£s	24.5	37.8	34.4	28.0	70.5	86.7	91.6

The following should be noted:

- With the slight exception of potatoes, land clearing is rarely done with hired labour.

- Hired labour is used more frequently for cultivation before sowing, especially for groundnuts and potatoes.

- Between a third and a half of the seed for non-grain plots is purchased. Even for grain, over 10% is purchased. This has implications for JMRDP's seed distribution programmes.

- Seed dressing is used on at least a fifth of the grain plots. Probably more since the table shows only those who paid cash for it in 1987, not those who already had some in stock or those who were given it free by friends or relatives.

- Apart from the tomatoes and potatoes, the Jebel crops, sowing was almost all done by family labour.

Table 4.20 Input Costs: Weeding and Pest Control

Percent of Plots on Which Cash Paid and Av Rate - £s per Mk

		Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
1st weeding	%	27	29	21	8	15	31	37
	£s	57.2	55.8	62.3	71.7	68.3	81.2	99.3
Other w'ing	%	14	20	15	5	15	24	28
	£s	35.4	44.2	77.2	73.9	85.9	78.1	73.3
Pest control	%	1	1	-	-	3	1	2
	£s	1.8	7.9	-	-	30.6	64.3	17.5

Points arising from this table are:

- Up to a third use hired labour for the first weeding, indicating that this is probably the major cash requirement for crop production for a large number of farmers.

- The use of pesticides in the area is negligible.

Table 4.21 Input Costs: Harvest and After

Percent of Plots on Which Cash Paid and Av Rate - £s per Mk

		Sor	Mil	G'nut	Okra	Chili	Tom'o	Pot'o
Harvest	%	11	14	16	3	5	20	35
	£s	85.8	43.5	42.0	53.0	135.5	95.9	148.9
Thresh	%	30	37	13	3	3	16	10
	£s	76.0	67.8	36.3	64.0	133.4	80.5	118.6
Tr'port	%	33	35	14	1	2	10	22
	£s	34.3	28.8	30.4	22.3	67.1	31.9	101.0
Sacks	%	34	39	46	23	38	55	51
	£s	16.4	15.7	50.8	28.4	44.0	25.0	78.4

Points arising from this table are:

- For the grain crops, threshing is the greatest user of hired labour, even greater than first weeding and even in a year when the harvest is poor. Traditionally threshing has been done by itinerant women from North Darfur, most famously the Zaghawa tribe. These are often paid in a share of the grain and there may have been some under-recording of hired labour for threshing because of the instruction not to record costs in kind. In the Jebel areas, threshing is frequently done by exchange labour, nafir. It may be that what has been classified as hired here, because a cash cost was involved, was actually nafir. Nafir involves significant costs in food for the labourers.

- The high proportion of farmers paying cash for transport and for sacks after a poor harvest is a surprise but it indicates that this is an important cost element.

- Obviously, there is no such thing as threshing for the horticultural crops, okra, chilli, tomato and potato. Other post harvest operations are intended. For okra and tomatoes, both of which are most commonly sold dried, cutting and drying is a major operation. It is less clear what is intended for potato and this may be an error.

5 LAND TENURE

Land tenure in the JMRDP area, as for all of Darfur, is relatively informal. With the exception of high quality irrigated land and Government schemes, land is rarely treated as a commodity for sale or rent. There are still many areas, in the lowlands at least, where it is possible, with the permission of the leaders of the community, to acquire land merely by clearing it from bush or from abandoned fallow. Even where this is not possible it appears to be easy to 'borrow' land (Ar. Salafiya = free loan).

Respondents were asked to say whether their crop land was owned, borrowed or rented and to give details of any land under fallow or being used by someone outside the household, on loan or for rent. They were also asked their reasons for leaving any land fallow during the 1987/88 season. Because of the informality of the system it should be borne in mind that 'owned' covers a range of meanings from land on which ownership is established only by the fact that it is cropped through to land that has been inherited formally through several generations. Similarly, 'borrowed' may cover a very wide range of agreements between a relatively long term transfer between close family members and a short term agreement to allow a migrant from another area to crop for one season only.

One particular point which needs clarification is whether a wife allocated land by her husband considers herself to own it or to have borrowed it. There are court cases on record of a divorced wife maintaining a right to land allocated in this way, at least so long as she continues to crop it. As the tables show, the survey does not indicate any large difference in the pattern of land tenure between male and female headed households, which tends to indicate that wives do gain rights to land one way or another.

Table 5.1 shows the proportion of crop land owned, borrowed or rented by Rural Council while Table 5.2 shows the allocation of land owned but not used between fallow, loan to other people and hire out to other people.

The following points arise from Table 5.1:

- There is a clear division between the four north-eastern rural councils and the rest. In the north east, the vast majority of the land is owned and little is borrowed or rented. The exception is Nyertete, where a substantial proportion is rented, but this is almost all because of a few individuals with very large areas rented from the government mechanised farming scheme at Khawr Ramlah. In the south and west the majority of the land is still owned but a significant proportion is borrowed.

- Although female households are slightly more dependent on borrowed land, the difference is quite small. It is, moreover, largely the result of the difference between areas mentioned above. The four councils with little borrowed land are also those with a markedly smaller proportion of female households. In those areas where there were a significant number of female households, the difference between the sexes as regards their dependence on borrowed land was even smaller than for the area as a whole.

Table 5.1 Tenure of Land Cropped in 1987

Council	Cropped Area Per Hhd - mk	Distribution - Owned	Borrowed	Percent Rented
Nyertete	6.15	69	6	25
Golo	5.46	96	4	-
Rokirroh	7.56	95	4	1
Zalingei	4.87	94	6	1
Garsila	5.68	78	18	4
Z-baya	5.40	73	27	1
Mukjar	6.42	80	20	*
Azum	4.47	79	18	3
Z-township	4.28	85	12	3
Project area	5.62	82	13	4
Male Households	6.11	83	12	4
Female Hhds	3.31	74	24	2

Note: * denotes a very small percentage

Table 5.2 Allocation of Land Not Cropped in 1987

Council	Fallow Mk/Hhd	Fallow % Hhds	Lent Out Mk/Hhd	Lent Out % Hhds	Rented Out Mk/Hhd	Rented Out % Hhds
Nyertete	3.30	79	1.75	17	3.62	2
Golo	1.94	62	1.82	12	-	-
Rokirroh	2.68	81	3.24	22	-	-
Zalingei	3.19	52	2.17	21	-	-
Garsila	2.69	45	1.82	15	1.75	3
Zami Baya	2.12	47	2.13	31	2.00	1
Mukjar	4.66	65	3.02	27	1.00	1
Azum	2.82	42	2.30	17	1.50	2
Zal. Town	1.28	33	1.50	11	2.00	4
All	3.09	56	2.33	20	1.88	2
Male Hhds	3.21	59	2.29	22	1.94	2
Female Hhds	2.26	44	2.64	13	1.50	1

Note: 1. Mk/Hhd is the average area for those households which had fallow, etc.
2. % Hhds is the proportion of households having each class. The overall average area may be calculated as: Mk/Hhd x % Hhds.

Points to note are:

- For those with fallow land, the average area available exceeds one mokhammas in all rural councils. The average is highest in Mukjar and Zalingei and lowest in Zalingei township.

- The overall average fallow area per household is 1.73 mk, 31% of the cropped area (5.62 mk, Table 5.1).

- Nyertete and Mukjar had most fallow available relative to the cropped area: over 40%. In the two upper Jebel councils, a high proportion of households also had fallow but the areas were smaller relative to the cropped area.

- There was no difference whatever in the fallow available to male and female households relative to the cropped area although slightly less female households had fallow.

- Overall, approximately 40% of households did not have access to fallow land.

- Over the whole population the amount of land borrowed or rented (Table 5.1) should balance the land given out on loan or for rent (Table 5.2) unless there are absentee landowners. With the exception of the limited Government schemes, there are no major landlords in the area but emigration is high and it might be expected that migrants would loan or rent their land to other farmers while they were away.

Overall, the amount of land borrowed per household was 0.73 mk while the amount lent out was 0.47 mk. This gives some weak support to the idea that emigrants lend their land to those who stay in the area but the pattern was very variable. In some councils the amount lent out was equal to or greater than the amount borrowed. This is a complex area that needs closer study.

When asked the reasons for not cropping fallow land during the 1987/8 crop year, those with fallow land gave the reasons shown in Table 5.3. Approximately half of the respondents indicated that they had insufficient cash to work the land. The probable interpretation of this is that these households had insufficient labour to work the area and would have had to hire people for that purpose. A further 14% specifically stated that they had insufficient labour. Other reasons given were comparatively unimportant.

Table 5.3 Reasons for Not Using Fallow

Reason Given	Proportion of Households giving it
1. Land clearing involved	3.0%
2. Distance to plot too great	1.2%
3. Already enough land	1.0%
4. Labour shortage	14.0%
5. Insufficient cash to work the area	48.0%
6. Pest problems	5.5%
7. Land of poor quality	3.8%
8. Illness	4.5%
9. No plough	1.5%
10. Other reasons	13.7%

Respondents who lent or hired out land to other farmes were asked to say how long each plot had been handed over for. The results were as follows:

Period	% of plots
1 year	46.3
2 years	14.2
3 years	6.0
>3 years	33.5

Thus, a substantial proportion of loaned land was given out for periods in excess of 3 years. On the other hand, a large amount was given for only one year.

The pattern of land tenure can be an important indicator of the degree of competition for land and, hence, the pressure of population on the land. If there is intense competition for land, it is tightly held, many farmers have to rent and those who do have land prefer to hire labour and crop it themselves rather than let others take the benefit of it. The pattern in the JMRDP area is quite the opposite. Renting is negligible and farmers with land are willing to lend large areas, relative to what they crop, for free. It does not even appear that there are any substantial dues in kind for this type of loan.

It might be expected that a crop/fallow rotation would be important given that the soils in the area are quite poor, the use of animal manures to maintain fertility is rare and the vast majority of the land is monocropped to grain. Farmers responses on why they fallow land do not support this idea although it is possible that they might have done if the question had been better worded. It is certainly known that farmers in the Jebel area fallow their land to restore fertility and this may explain the higher proportion of households with fallow in that area. Similarly, it might be that the higher proportion in Mukjar reflects the need for fallowing on the light goz soils in that area.

However, the fact remains that a negligible proportion even mentioned land quality as a reason for fallowing and the amount of fallow held would not be enough to allow an effective rotation. Overall, it appears that 'fallow', on the lowland at least, is land that is held in the hope that extra resources will become available to crop it at some stage, through the growth of the family or acquisition of money to hire labour. Further investigation is needed to clarify this point.

6 IRRIGATED CROPS AND FRUIT TREES

Although the areas per household are quite small, irrigated crops and fruit trees are grown throughout the project area. In the upper Jebel councils, oranges are an important commercial crop while increasingly large areas of onions are grown in all parts. Mangos, limes and guavas are all locally important as well. Overall, 51% of households in the survey had irrigated crops and 18% had fruit trees.

Table 6.1 gives the frequency distribution of methods used to irrigate crops and fruit trees for the project area as a whole.

Table 6.1 Methods Used to Irrigate Crops and Fruit Trees

Method	Irrigated Crops % of Plots	Fruit Trees % of Plots
Romboya	78.6	43.4
Stream fed	8.5	39.5
Pump	8.1	4.0
Shadouf	4.8	1.2
Not irrigated	-	11.9

The romboya is a leather bucket, a basin or a gourd used to draw water from an hand dug well. These wells are usually shallow and lined with grass or wood. They mostly have to be dug each year. The water is scooped up from the well into small furrows which lead it onto very small basins. Irrigated areas therefore tend to be small with the romboya: 0.15 mk for both irrigated crops and fruit trees. Nevertheless, the very large number of farmers who use this technique indicates that the Project should pay more attention to it.

Stream fed irrigation is used extensively in the Jebel area for fruit orchards and this is reflected in the high overall percentage of plots irrigated by this method. On the other hand, approximately 12% of fruit trees are entirely rainfed: almost all mangoes or guava planted on low lying areas which benefit from residual moisture after the rains.

Pump and shadoof irrigation are both relatively unimportant. However, they do allow the irrigation of larger plots so their contribution, in area terms, is greater than the simple percent-of-plots-irrigated indicates.

6.1 Irrigated Crops

Table 6.2 shows the proportion of households with irrigated crops, the average area irrigated and the relative importance of of the various crops. Average plot size is also shown.

Table 6.2 Areas of Irrigated Crops

Council	% Hhds Growing	Area mk/Hhd	% age of Area Under Each Crop < Onion	WMelon	Sugar	Okra	Garlic	Other >	Plot Size mk
Nyertete	20	0.65	51	2	14	-	12	20	0.11
Golo	55	0.28	26	-	-	-	70	4	0.10
Rokirroh	9	0.30	100	-	-	-	-	-	0.03
Zalingei	77	0.60	60	14	10	4	-	13	0.26
Garsila	48	0.20	92	-	-	6	-	2	0.09
Z-baya	57	0.29	81	-	-	18	*	-	0.11
Mukjar	30	0.30	50	7	-	31	-	13	0.07
Azum	88	0.43	58	6	11	5	2	17	0.21
Z-township	48	0.45	91	9	-	-	-	-	0.14
Overall	51	0.40	62	8	7	6	5	12	0.15

Note: * indicates a very small percentage.

These results show how very important irrigated field crops have become in the Project area. Only in Rokirroh is the proportion of households with irrigation small. Of the remainder, six out of eight have at least half the households with irrigation. The dominance of onions in all areas is equally evident. The only exception is Golo where garlic is more important.

Despite the overall similarity, it is possible to identify two groups among the lowland councils. In one group, Zalingei and Azum, the proportion of households with irrigation is very high indeed and both the area per household and the plot size are larger. The size is double that found in any other council. The range of crops grown is also wider and onion is not quite so important as elsewhere. More sugar cane, watermelon and other crops are grown. 'Other Crops' includes chilli, potato and tomato in Zalingei and snuff tobacco in Azum.

The second group, Garsila, Mukjar and Zami Baya, have less irrigating households and areas are smaller. They are more dependent on onions and, to some extent, okra. It seems reasonable to suggest that these differences indicate that irrigation in the first group is more advanced and developed than in the second.

Nyertete seems to be in an intermediate position. The area per household is high but proportion of households is smaller than anywhere except Rokirroh and plot sizes are also below average. It seems likely that most crop irrigation in this council falls in the western section which is adjacent to Zalingei rural council, the main centre of irrigation in the whole project area.

It is often said that women are, traditionally, the major producers of irrigated onions using the romboya. The survey did not record whether the crop was actually grown by male or female members of the household. In terms of households, however, it is clear that irrigated crops are mostly grown by members of male led households. The proportion of households growing and the area per household by sex of the household head were as follows:

	Proportion of Households - %	Irrigated area Per Household - mk
Male Households	52	0.44
Female Households	8	0.21

Male led households grew 69.9% onions and females 84.8%, which possibly shows that male households are able to diversify more. Certainly, males grew almost all the sugarcane, tomatoes, chilli and watermelon.

Irrigated crops are considered as dry season crops but they are often planted in the late rainy season before the harvest of rainfed crops is completed. Some crops, tomato, chilli and snuff tobacco, may even be deliberately sown on the rains to be given supplementary irrigation after they stop. However, apart from

those it is possible that there is a conflict between irrigation and rainfed cropping: if a rainfed crop . Overall, the pattern of rainfed cropping on irrigated land was as follows:

Rainfed Crop Preceding the Irrigated Crop	Proportion of Irrigated Plots
Millet	10.0%
Sorghum	31.2%
Mixed grain	2.0%
Other crops(chilli, g'nuts,etc)	9.0%
Fallow	44.8%.

The fact that the larger proportion of irrigated land was fallow during the rains indicates several possibilities:

- that land for rainfed crops is relatively abundant so it is easier to leave land for irrigated crops fallow during the rains,

- that the benefits of sowing the irrigated crop early are large and so it is better not to delay it by growing a rainfed crop which will have to be harvested first,

- that much irrigated land is very low and flooding makes it impossible to crop during the rains or that the only possible crop is the long period fasikh sorghum which will definitely delay the planting of the irrigated crop,

- that other features of irrigated land make it unsuitable for rainfed cropping. Heavy weed infestation and heavy soils that cannot be cultivated when wet, for example.

Irrigated crops were grown predominantly on flooded land (72% of plots) and on 'teen' soils (71%). Almost all the rest was 'tartora'. As already mentioned, this may be the explanation for the large amount of irrigated land that is not cropped during the rains. It also explains why the greater part of the land that did have a rainfed crop was under sorghum, the crop most suited to heavy, wet soil.

Farmers were also asked whether they ploughed their irrigated plots or not. Only 14 % did, the remainder cultivated by hand. There was no obvious pattern to show, for example that ploughing was only used on one soil type or for one crop.

Given that the majority of rainfed crop land is owned, a surprisingly large proportion of the irrigated was borrowed or rented. The percentages by sex of household head were as follows:

Tenure	Male Hhds	Female Hhds	All Hhds
Owned	45.8%	17.4%	42.4%
Borrowed	40.2	59.8	42.4
Rented	14.0	22.8	15.5

By area, most of the irrigated land in the three Jebel councils was owned. Borrowing was particularly frequent, well over half the plots, in the three Wadi Salih councils and in Azum. Renting was also more common in these areas, with the exception of Mukjar for some reason.

The high proportion of female irrigating households which had to borrow or rent land is a further indicator of the pattern shown in rainfed cropping: that female households mostly hold land with lighter soils, goz and tartora, which are less suitable for irrigation. They are, therefore, more likely to have to borrow or rent 'teen' soils for irrigation. (See section 4.3).

The principal varieties reported for onions, the dominant irrigated crop, were as follows:

	No of Plots
Dongodrol	4
Fellatiya	28
Furia	274
Halfa	3
Kassala	12
Kosti	214

The three commonest varieties are well known. The others are not and there is a possibility that they are not real varieties as farmers have the habit of giving the name of the place they bought the seed or believe it to have come from as the variety.

The Congo variety of watermelon, promoted by JMRDP, was equally popular as the modern variety known locally as Rothman. Charleston, the other JMRDP variety, was not common. Almost all the sugar cane was described as 'jenayd', after the place in the Gezira where the oldest sugar factory in Sudan is located. Okra was still mostly 'local', as was garlic and tomato. Half the chilli reported was 'koko', the rest 'local'.

6.2 Fruit Trees

Table 6.3 shows the proportion of households owning fruit trees and the average number of trees owned. The table shows very clearly that orange production in Golo outweighs all the other fruit in the whole Project area although mango and guava are common on the lowland in smaller numbers. Limes were also common but in very small numbers.

By sex of household head, 21.0% of male led households had fruit trees and only 5.6% of female. This partly reflects the fact that there were few female led households in Golo, the major fruit growing area.

Table 6.3 Ownership of Fruit Trees

Council	% Hhds with Fruit Trees	Trees/ Hhd	< Proportion of Trees - % > Orange	Mango	Guava	Lime	G'fruit
Nyertete	15	36	81.5	10.5	1.0	0.8	5.4
Golo	83	77	98.9	0.3	0.4	0.2	-
Rokirroh	4	13	46.2	28.2	-	25.6	-
Zalingei	21	22	20.3	29.2	39.7	9.0	1.8
Garsila	5	7	3.4	59.3	28.8	8.5	-
Z-baya	21	16	-	70.1	24.8	3.6	-
Mukjar	13	18	2.6	30.2	65.8	1.4	-
Azum	18	11	8.7	19.4	59.9	11.1	0.8
Z-town	18	19	1.0	46.9	32.3	18.8	1.0
Overall	18	37	72.9	11.2	12.6	2.4	0.7

Note: There was also one plot each of: apple, banana and loquat.

Estimates of production were obtained for the major fruits. Farmers normally measure fruit in numbers harvested, commonly dozens, rather than by weight. Average production levels per tree were as follows:

Oranges	: 55/tree
Limes	: 45/tree
Guava	: 230/tree
Mango	: 130/tree

Note: Mangos tend to crop every second year so the average per tree shown here may be overestimated. It is believed that some orange growers on the high Jebel also leave the fruit to ripen on the tree well into a second season so the same may also apply to oranges.

Although farmers think more easily about numbers of trees than areas, they were also asked to estimate the area of each orchard and tentative estimates of planting densities can be made:

	Trees Per Mk
Oranges	119
Mango	21
Guava	24
Lime	14

Farmers were asked to name the variety of fruit tree. Three quarters of the oranges were Abu Surra (Navel type) and all the limes were Ben Zuhair. Although Hindi type mangos (improved Indian) have been in the area for some time, it was notable that 93 per cent were still local type. Guava were all local.

In order to gain a picture of the development of fruit tree production over the recent past, farmers were asked when they had planted their trees. Unfortunately they did not make the distinction between the first establishment of the orchard and any subsequent replanting clear so the results are indicative only. The proportion of orchards with trees planted in each of the last four decades was as follows:

	Oranges	Mango	Guava	Lime
1950's	6.5%	5.0%	5.0%	2.9%
1960's	5.4	30.4	57.6	2.9
1970's	30.4	28.8	35.0	11.4
1980's	57.6	46.2	40.0	82.9

Note: Trees in some orchards had been planted in more than one decade so percentages add to more than 100.

Tentatively, it may be concluded that the area of fruit trees has been expanding quite rapidly and is still expanding. The larger proportion has been planted relatively recently, even for more traditional types like mango and guava.

As for the irrigated crops, most fruit trees are grown on heavy soils subject to flooding: 58.8% on flooded 'teen' and 23.6% on non-flooded 'teen'.

7 SOURCES OF CASH INCOME

In order to gain some impression of the household's income, respondents were asked about crop sales, livestock sales and other possible sources of cash. As the survey took place in March 1988, they were asked to report all sales over the preceding 12 months, ie since March 1987. Depending on how farmers time their sales this period will have included late sales from the 1986 season, which was a good one, and early sales from the much poorer 1987 season. Table 7.1 shows the average income per household from sales of crops, livestock and other produce.

Table 7.1 Household Income from Sales of Produce

Rural Council	Crop Sales % Hhds	Crop Sales £s	Livestock Sales % Hhds	Livestock Sales £s	Other Produce £s	Total £s
Nyertete	54	580	39	490	14	1,084
Golo	95	1,444	16	70	8	1,522
Rokirroh	86	879	33	210	0	1,089
Zalingei	73	720	41	414	2	1,137
Garsila	41	265	57	325	38	629
Zami Baya	53	210	51	293	13	516
Mukjar	69	483	44	298	51	833
Azum	57	467	61	341	14	823
Zal. Town	26	580	15	20	89	689
Overall	62	568	45	317	23	907

Note: The average income is for all households in the sample, whether they made a sale or not.

7.1 Crop Sales

Overall, 62% of households sold crop products and this gave an average cash income of £s 570 per household. Particularly noticeable are the very high proportion of households making sales in Golo and Rokirroh and the high average income. On this evidence farming in both these areas must be considered at least semi-commercial. Selling for cash in Zalingei RC is also very important.

Although similar in the degree of involvement in cash farming, the crops sold are very different in each one of these three RCs. Golo is principally involved in orange production, which made up 48% of sales by value. Dried tomato and potatoes each contributed 23%. In Rokirroh, dried tomatoes contributed 68% by value and potatoes and coriander around 10% each. In Zalingei RC there was a wider range: onions, 33%, groundnut, 25% and chilli, sugarcane and sweet potato, each around 10%.

For the other rural councils the major items, also as a percentage of the total value of sales, were as follows:

- Nyertete: Millet 22%, groundnut 17, potato 17, tomato 15, onion 10, orange 9.
- Garsila: Groundnut 25%, okra 17, chilli 14, sorghum 11, tomato 10, cowpea 10.
- Zami Baya: Okra 33%, groundnut 21, tomato 10, chilli 10, sorghum 9.
- Mukjar: Groundnut 59%, cowpea 12.
- Azum: Groundnut 37%, millet 10.
- Zalingei Town: Onion 60%, okra 23.

Table 7.2 shows the relative contribution of each of the ten most important crops, in terms of cash income, the percentage of households selling each crop and the average quantity sold per selling household.

Table 7.2 Relative Contribution of Each Crop to Cash Income

Crop	% by Value	% HHDs	Av Qty Sold - Kg
Groundnut	21.6	16.5	607
Dried Tomato	17.2	17.7	263
Onion	10.9	9.2	675
Oranges	9.3	4.5	530 (Doz)
Potato	7.0	4.9	2,316
Millet	7.0	13.0	415
Chilli	5.5	7.3	114
Okra	4.7	10.3	77
Sorghum	2.8	4.2	31
Cowpea	2.6	2.8	287

Perhaps the most striking feature of this table is the position of tomatoes, second only to groundnuts and well ahead of both onion and oranges. More research and promotion work on this crop might well pay dividends. Other crops that were locally important included mango and guava, sweet potato, sugarcane and snuff tobacco. These secondary crops were found in Zalingei district more than elsewhere.

Respondents were asked to indicate where their produce was sold in order to assess proportions sold within and outside the council. In all areas, more than 90% of products sold were sold locally, ie within council boundaries. In Golo, roughly 10% was sold outside the area, as far away as Nyala.

Proportions sold on-farm, to other farmers or traders, varied considerably between councils as shown below:

Nyertete: nil	Zalingei : 15%	Mukjar : 16%
Golo : 12%	Garsila : 8%	Azum : 34%
Rokirroh: 4%	Zami baya: 25%	Z-town : 50%

Farmers were also asked to report their marketing costs: transport, packing and tax. Overall, these costs were very low reflecting the fact that most farmers sold in the nearest market. Transport costs were 4% of revenue on average, packing only 1% and taxes or market fees virtually nothing. It should be noted that dealers who bulk up goods bought from farmers for transport elsewhere will have to pay tax at some stage so this very low figure at the farmer's level does not necessarily mean that the crops are not taxed at all.

7.2 Livestock sales

Survey respondents were asked to give details about livestock sales and prices received during the previous twelve months. In terms of numbers of livestock sold in the project area, goats were the most important species. Cattle were also relatively important in numbers and the most important by far in value. The details are as follows:

Species	% of Total Sales	Proportion of which: Male	Female	% of Total value
Goats	55.7	62%	38%	23
Cattle	17.7	58%	42%	46
Sheep	11.0	77%	23%	10
Donkeys	10.4	75%	25%	8
Horses	3.4	46%	54%	7
Camels	1.8	100%	-	7

The preponderance of males in all classes, indicates that farmers were retaining their breeding stock. This is one sign that livestock sales were not the result of any distress pressures to sell, even after the relatively poor 1987 harvest.

Table 7.3 gives a breakdown of sales by age and class of livestock. It shows that most goats and sheep sold were between six months and two years old. For the other species the average age of sale was between three and four years. However, the proportion of large stock sold at ages older than 4 years was substantial.

Table 7.3 Distribution of Livestock Sales by Age

	Cattle	Goats	Sheep	Donkeys	Horses	Camels
Age Category	%	%	%	%	%	%
< 0.5 years	-	3.9	3.6	1.2	-	3.6
0.5 - 1.0 years	1.4	20.7	22.7	4.9	4.0	22.7
1.0 - 2.0 years	16.8	44.3	51.2	23.4	24.0	51.0
2.0 - 3.0 years	23.4	20.7	14.3	27.1	24.0	14.3
3.0 - 4.0 years	16.0	4.4	4.8	18.5	12.0	4.8
4.0 - 5.0 years	30.7	4.6	3.4	17.2	16.0	2.4
> 5 years	11.7	1.0	1.0	7.7	20.0	1.2
Average Age	3.4	1.5	1.3	3.2	3.4	4.1
se	(.18)	(.07)	(.09)	(.32)	(.46)	(.78)

Table 7.4 shows the number of livestock sales and the numbers sold as an average for all households and for those that made a sale only.

Table 7.4 Numbers of Livestock Sold

	No of Sales	No Sold Per Hhd	% Hhds selling	No Sold Per selling Hhd
Cattle	175	0.18	14.4	1.28
Goats	1057	1.10	45.1	2.45
Sheep	198	0.20	8.8	2.35
Donkeys	109	0.11	8.5	1.34
Horses	28	0.03	2.7	1.08
Camels	16	0.015	1.5	1.00

Table 7.5 shows the monthly pattern of sales for cattle, sheep and goats. Most sales were made between November and February. Most sales of camels, horses and donkeys were made in the same period. This is the time when the stock is in its best condition after the rains and when the young stock, mostly born in the early rainy season is reasonably well established. This means it is a good time for livestock owners to sell for two reasons. First, the stock sold will go for good prices because of their condition. Second, the owners know how many animals they will have to try and keep alive during the difficult dry season and so this is a good time to adjust their herds accordingly.

It is important to note that this pattern indicates that there was relatively little distress selling in the late dry season when owners might be forced to sell in order to buy grain, at a time when grain prices are high and stock prices low. However, the 1987 dry season covered by the survey came after the good harvest of 1986 when distress selling would be at a minimum. It may be that the pattern in the 1988 dry season, after a poor 1987 harvest, was different but that came after the survey took place.

Table 7.5 Livestock Sales by Month

Sale date	Cattle	Goats	Sheep
May 1987	1.5	2.3	1.2
June	0.7	0.9	1.2
July	2.2	1.9	3.5
August	2.5	7.0	7.0
September	5.1	2.1	3.5
October	5.1	4.0	10.5
November	13.1	6.5	4.6
December	17.5	14.4	16.3
January 1988	19.0	13.5	11.6
February	19.7	17.7	14.0
March	8.0	23.8	23.3
April	6.6	5.8	3.5

Prices for the different species sold differ between councils, across months and by age and sex. On the basis of figures given by the farmers themselves, the average prices obtained for each species were as follows:

	£s
Cattle	850.86
Goats	66.50
Sheep	142.93
Donkeys	241.46
Camel	1,392.50
Horses	917.50

In all areas, livestock sales tended to be concentrated in the local village centres. There were few cases where sales were made outside the council boundaries. Less than 5% of sales were made on-farm. The majority of farmers, therefore, appear to sell through recognised market outlets with which they are familiar. As for crops, marketing costs paid by the farmer were small: about 1% for brokerage and 1% for taxes and fees.

7.3 Sales of Other Produce

Although the contribution of produce other than crops and livestock was small, the range of items was very wide. Surprisingly, dairy produce such as eggs, chickens, milk, ghee and buttermilk was rarely mentioned. The most important single class was that comprising the various handicrafts: string beds (Ar Angareib), woven mats (Ar Burush), food covers (Ar Tabaq or Barateel) and several others.

7.4 Other Sources of Cash Income

The survey also aimed to obtain an impression of other sources of cash income earned by sample households. Overall, less than 30% of respondents indicated that household members earned money from non-farm activities. Of those who did, the following broad categories of employment/earnings were nominated:

Traders, middlemen, merchants	: 32.9%
Fakih - man of religion	: 8.5%
Builders	: 9.4%
Livestock traders	: 5.9%
Labourers	: 7.2%
Tailors	: 6.6%
Other activities (e.g. blacksmith, civil servants, guards etc.)	: 29.5%

8 EXTENSION CONTACT

The last part of the Post Harvest Survey questionnaire dealt with contact between the JMRDP Extension Service and the farmers. Respondents were asked to give information about their knowledge of and personal contact with the extension assistant in their area. They were also asked to give their opinions about the quality of the service offered and to indicate their preferences in terms of the assistance they would like to see the Project provide. The following brief sections discuss their replies. When considering these results, it should be remembered that one whole rural council, Rokirroh, and a large portion of another, the southern part of Mukjar, are not covered by the Extension Service.

8.1 Familiarity with the JMRDP extension service

Farmers were first asked if they knew of the existence of the JMRDP Extension Service and if so, to state whether they knew the extension assistant operating in their area. Table 8.1 summarises the replies.

Table 8.1 Farmers' Knowledge of the JMRDP Extension Service

	% Knowing about the service	% Knowing the Extension Assistant
Yes	69.8	59.8
No	30.2	40.2

Overall, therefore, roughly 70% of respondents knew about the service and most of these (90%) knew who the extension assistant was. When asked if they knew the name of the extension assistant, roughly half (53%) knew him well enough to know his name. Such results are encouraging. Of those responding, 45% indicated that they had met the EA at least once in the last 12 months, either officially or socially.

8.2 Visits by or to the EA and Inputs Purchased

Official visits by or to the EA provide an indicator of effective contact as opposed to mere familiarity. Table 8.2 shows the responses to the question, "How many times did the EA visit you on official business last year?"

Table 8.2 Households Visited on Business by the EA

1987/88

No of Visits	In the Fields %	At Home %
0	85.6	87.3
1	5.1	3.9
2	4.5	3.0
3	1.6	2.9
4	0.8	1.2
>4	2.4	1.7

As the table shows, while approximately two-thirds of respondents indicated that they knew of the EA and that they were personally familiar with him, he only managed to visit between 12 and 15 percent, either at home or in the fields, in the previous twelve months. This is somewhat disappointing but it should be remembered that the total population of the Project area is estimated to be as much as 90,000 households. These statistics therefore indicate that each of 60 EA's visited over 200 households. (14.4% of 90,000/60 = 216).

Analyses were done to determine whether female headed households received less visits from EAs than male headed households. Of the total number of female headed households (n=160), three (2%) indicated that they received an official house visit and seven (4%), an official field visit. Corresponding figures for male headed households were:

Official house visits : 15.0%
Official field visits: 16.5%

Similar results were also obtained when respondents were asked to state whether they had attended meetings held by the EA in the village or at other village centres. While 11% of the respondents from female headed households indicated that they had been asked to attend meetings, less than 1% actually attended any meetings in the 12 months prior to survey.

The point to note about these results is that the Project has, in the past, tended to argue that if direct contact with female farmers was not established, male farmers would pass on the information so that indirect contact was adequate. While this is probably true for female farmers in male led households, it is less easy to be confident that it is so for female farmers in female led households. These results clearly show that the latter group are not in direct contact with the extension service and that an effort to establish such contact is required.

Table 8.3 summarises the responses to questions about how long the EA stayed with the farmers in the field or at the house when on a business visit. Most visits were under one hour long but that is perhaps to be expected. Table 8.4 shows the kind of topics that were reported to have been discussed in the visits.

Table 8.3 Distribution of EA Visits
By Time Spent with the Farmer

Time	Field Visits (n=137)	House Visits (n=121)
<1 hour	69.5	46.2
1-2 hours	21.9	36.7
2-3 hours	3.1	6.8
>3 hours	5.5	10.3

Table 8.4 Topics Discussed by the EA on Visits to Farmers

Topic	% of all topics discussed
Crop protection	33.1
Planting and seed spacing	7.9
Thinning	5.0
Seed varieties	4.3
Ploughing	2.9
Fertiliser	2.2
General advice (several topics)	26.6
Other (land clearing, resowing etc)	11.5
Not specified	6.5

From Table 8.4, crop protection appears to be the topic of major concern. Other specific topics appear to have been of relatively minor importance and in a high proportion of cases the advice given seems to have been on a range of general topics. About 6% said that when advice was sought it was not given or was of no real help.

Farmers were also asked to state how many times they had been to visit the EA to obtain advice or to buy inputs and the results are shown in Table 8.5.

Table 8.5 Frequency of Farmer Visits to the EA

No of Visits	Percent of Farmers: To Obtain Advice (n=70)	To Buy Inputs (n=269)
1	75.7	59.9
2	17.1	27.1
3	5.7	8.9
4	1.4	2.2
>4	-	1.9

Thus, only 7% of survey respondents (70/954) had visited the EA to obtain advice while 28% (269/954) visited him to buy inputs. When these visits were made, the majority visited only once. About a quarter of the farmers participating in the survey indicated that they visited the EA purely for social reasons.

Thirty nine percent of participants had purchased inputs through the extension service at some time in the past. During the 1987/88 crop year, the relative importance of the different inputs bought was as follows:-

Input	% of Purchases Made
Aldrex-T	50.9
Seeds/seedlings	31.1
Malathion	3.6
Other (ploughs, various chemicals etc)	14.4

Thus, the important inputs purchased were Aldrex-T and seeds or seedlings of various kinds. Aldrex-T was purchased by 30% of the households in the project area.

8.3 Attendance at Meetings Convened by the EA

Farmers were asked whether they had attended meetings convened by the EA during the twelve months before the survey. 28% answered that they had. 9% said that they had been asked to a meeting but had not gone to it, for various reasons. It is important to note that in 1987/88, at least, meetings were the most important form of contact along with farmer visits to the EA. EA field visits only reached about 15% of households. (See Table 8.2 above).

Of those attending meetings, 57% said that they thought the meetings were very useful and 36% said they were useful. Only 3% stated positively that they were not useful. Contact through meetings, therefore, seems to be reasonably wide and farmers appear, on the whole, to be satisfied with the information given.

8.4 Farmers' Evaluation of the Extension Service

The last part of the questionnaire dealt with the farmers' evaluation of the project extension service. Respondents with an opinion to offer were asked to rank the service into the following categories: 'very good', 'good', 'fair' or 'poor'. Approximately 60% offered no opinion, presumably those who had little or no contact (Table 8.1). For those who did have an opinion, the results were as follows:

Category	% Responses within each category (n=386)
very good	54.9
good	32.8
fair	6.8
poor	5.5

Thus, on the whole, impressions appear to be favourable. When asked to indicate preferences for future areas of extension assistance, the following were the responses obtained:

Assistance Requested	% of Responses
Seeds and seedings	47.7
Crop protection	14.9
Credit	11.1
Ploughs (all types nominated)	10.9
Pumps	9.9
Crop sprayers	2.6
Fertilisers	0.7
Aldrex-T	0.6
Other	1.6

The results indicate that farmers see the provision of inputs and advice on their use as the main functions of the extension service. The provision of seeds and seedlings (e.g. fruit tree seedlings) ranked far ahead of the other areas of assistance requested. Crop protection (in terms of the provision of chemicals to control insect pests) ranked second. This is despite the fact that few farmers use pesticides. (See Chapter 4) This presumably indicates that it is only supply problems that is preventing the much wider use of pesticides.

Provided that the extension service can maintain its current levels of contact and meet demands in terms of the provision of inputs, the evidence available suggests that its impact over the long term could be significant. There is both wide general knowledge of its existence in the project area and a demand for the services it offers.

9 APPENDIX I - QUESTIONNAIRES

JEBEL MARRA RURAL DEVELOPMENT PROJECT
MONITORING AND EVALUATION DEPARTMENT

POST HARVEST SURVEY 1988

Form 1 VILLAGE SHIEKH QUESTIONNAIRE

Section 1 IDENTIFICATION

Rural Council: ---------- Village Council: --------- Village:----

Shiekh: ---------- Enumerator: ---------- Date: ------

Checked By: ---------- IDCODE: ----

Section II VILLAGE FACILITIES

1. Does the village has a dispensary? WORKING/ NOT WORKING/ NONE

if NOT WORKING, Why not? ----------

if NOT WOPKING or NONE where do the people go? ----------
How far is it? (Hours walking)

2. Does the village has a primary school? Y/N

if No, do any children go to school in another village? Y/N

Where? ----------

How Many? ----------

How far? (Hours) ------

3. Is there a Khalwa in the village? Y/N

If yes How many students? ----------

4. Is there a Mill in the village? Y/N

a) If No, where do they go? ----------
How far? (Hours)? ----------

b) Are there any people who normally grind by hand? MOST/ MANY/ FEW/ NONE

5. Where do the village get their water?

WET SEASON? PERMANENT WELL/TEMP WELL/WADI BED/SPRING/POND

DRY SEASON? PERMANENT WELL/ TEMP WELL/ WADI BED/ SPRING/ POND

If any OTHER, specily:----------

6. If the village has PERMANENT WELLS give details in tne table.

Well	Depth (m)	Lining	Year Dug	Project Y/N	Distance (Hours)	Water	
						Quality	Quantity
1							
2							
3							
4							
5							

NOTE: For WATER QUANTITY: PLENTY/ ENOUGH/ NOT ENOUGH

7. If the village has no PERMANENT WELLS, give details as follows:

Distance to water? (Hours) ----------

Water Quantity? ----------

Quality ? ----------

8. Give details of any other important facilities in the village: -------

---

Section II MIGRATION

1. Have any refugees come to the village in the last 12 Months? Y/N

2. If YES, where did they come from and how many?

	Men	Women	Children
N. Darfor	-------	-------	----------
S. Darfor	-------	-------	----------
Chad	-------	-------	----------
Others (specify)	-------	-------	----------

3. Have any refugees begun farming in the area since 1987? Y/N

if YES,

a) How many households? ----------

b) How much land (Mk): ----------

Soiltype:

	WAD/UPLAND	FROM SHEIKH	BUY	RENT	SALAFIA	OTHER (specify)
TIN	----------	----------	------	------	---------	----------
TARTURA	----------	----------	------	------	---------	----------
GOZ	----------	----------	------	------	---------	----------
JAGALOYA	----------	----------	------	------	---------	----------
OTHER (specify)	----------	----------	------	------	---------	----------

NOTE: ----------

c) Was all the land they were given cultivated before or did they have to clear (Kabir) it?

All CULTIVATED/ MOST/ SOME/ALL CLEARED

NOTES: ----------

d) If the Sheikh allocated land, how did he decide the allocation? ----------

---

---

e) If the refugees bought or rented land, give details of the price or the rent and the conditions of the bargain: ----------

---

Section III GENERAL SITUATION

1. What was the harvest like this year?

	AREA	PRODUCTION	% AREA	REMARKS
Sorghum	-------	----------	---------	----------
Millet	-------	----------	---------	----------
Groundnut	-------	----------	---------	----------
Other (specify)	-------	----------	---------	----------

NOTE: FOR AREA and PRODUCTION: VERY HIGH/ HIGH/ AVERAGE/ BELOW AVERAGE/ LOW

2. What were the major problems (if any) in crop production this years?

	RAIN	LABOUR	FLOOD	PESTS	OTHER (SPECIFY)
Sorghum	------	-------	-------	-------	---------------
Millet	------	-------	-------	-------	---------------
Groundnut	------	-------	-------	-------	---------------
Other (specify)	------	-------	-------	-------	---------------

3. Measure a rope used to make out the Mukhammas in the village:---------CM

4. What are the dimension of a mokhamas? ----------

Remarks:----------

JEBEL MARRA RURAL DEVELOPMENT PROJECT
MONITORING AND EVALUATION DEPARTMENT

* see note at end

Post Harvest Survey - 1988

Form 2 Household Questionnaire

Section I IDENTIFICATION

Rural Council ---------- village ----------

Household No ------- Household head --------- Sex ----------

Enumerator ---------- Date ---------- IDCODE ----------

Checked by ----------

Section II FARMING DETAILS

1. How many members in the household? ----------

2. What is the annual grain consumption of the household? ----------

3. How many farmers are there in the household? ----------

TABLE 1 DETAILS OF LAND CROPPING IN 1987 BY PLOT

	FARMER	OWNERSHIP	AREA MK	SOIL TYPE	FLOODED Y/N	PLOWED Y/N	CROP	VARIETY	YIELD	YIELD UNIT
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

13										
14										
15										
16										
17										
18										
19										
20										

TABLE 2 CULTIVATION COSTS AND PRACTICES BY PLOT

PLOT NO.	QUA	SEED COST	DRESSING	COST	LAND CLEANING COST	PRECULTIVATION Y/N	HAN/PL	COST	SOWING TIMES	COST	1st WEEDING COST	OTHER WEEDING TIMES	COST	PEST AND DISEASES TYPE/LEVEL	TREAT/COST	CUT COST/ THRESH COST	TRANS'T COST	SACK COST	REMARKS

4. If a plough was used, What type ? ----------
Owned or hired ? ----------
if owned, where did he buy it? -------- When? --------- Cost?-----

5. If seed dressing was used, where did they get it?
JMRDP/ Local Sug/ Other (specify)

6. If crop protection chemicals were used, Where did they get it?

JMRDP/ Local Suq/ Other(specify)

How applied? spray/ By hand/ Other(specify)

Where did they get the sprayers? ---------- Cost? ----

---

7. Does the household have any plots that were fallow during the Kharif? Y/N

Record details below:

	AREA - MK	SOIL TYPE	NORMALLY FLOOD - Y/N	WHY - FALLOW?
1	----------	----------	----------	----------
2	----------	----------	----------	----------
3	----------	----------	----------	----------
4	----------	----------	----------	----------

---

8. Did the household loan or rent out any plots during 1987 Kharif? Y/N

Record details below:

	AREA/MK	LOAN OR RENT	RENT/LS	HOW LONG FOR	REMARKS
1	------	----------	-------	----------	----------
2	------	----------	-------	----------	----------
3	------	----------	-------	----------	----------
4	------	----------	-------	----------	----------

9. Fill in Table 3 showing details of any irrigated crops grown by the household - 1987/88

Table 3 IRRIGATED LAND BY PLOT

FARMER	OWNERSHIP	KHARIF CROP/PLOT	AREA MK	SOIL TYPE/FLOOD	PLOWED Y/N	TYPE OF IRRIGATION	CROP	VARIETY

10. Fill in Table 4 showing details of any fruit trees owned by the household

	TYPE	VARIETY	NUMBER OF TREES	AREA MK	DATE PLANTED	HOW IRRIGATED	SOIL TYPE/ FLOOD	PRODUCTION 1987/88	REMARKS
1									
2									
3									
4									

Remarks:----------

Section III CASH SALES

1. Fill in Table 5 showing details of any crop sales including fruit made by the household since March 1987, ie the last 12 Month.

Table 5 FARMER CROP SALES SINCE MARCH 1987

	CROP	QUANTITY	UNIT	DATE OF SALE	SUQ	TOTAL PRICE	COST OF SALES			REMARKS
							TRANS.	SACKS	TAX	
1										
2										
3										
4										
5										

2. Fill in Table 6 showing details of any livestock sales since March 1987

Table 6 LIVESTOCK SALES SINCE MARCH 1987

	TYPE	AGE	SEX	NUMBER	DATE OF SALE	SUQ	TOTAL PRICE	COST OF SALE DLALAL	TAX		REMARKS
1											
2											
3											
4											
5											

3. Does the household has another business apart from agriculture? Y/N

If yes, show details ----------

4. Has the household sold any other produce since March 1987 ?

Burush, Shargania, Milk, Chickens, Eggs etc etc. Give Details .

	ITEM	QTY	TOTAL PRICE	REMARKS
1	----------	---------	----------	----------
2	----------	---------	----------	----------
3	----------	---------	----------	----------
4	----------	---------	----------	----------
5	----------	---------	----------	----------

Section IV - EXTENSION CONTACT

1. Do you know about the JMRDP Extension Service ? Y/N ----

2. Do you know the Extension Agent of this area? Y/N

Does he know his name ? Y/N

3. Did you meet him last year ? Y/N ----

If yes :

a) How many times did he visit you on official business last year ?

In your house ? ----- times. How long did he stay ? ----------

On your field ? ----- times. How long did he stay ? ----------

What advice/demonstration did he give you ? ----------

---

b) How many times did you visit him ?

To ask advice ? -------- About what ? ----------

To buy inputs ? -------- What inputs ? ----------

Socialy ? ----------

C) Did you attend any farmers meetings ? Y/N

In this village ? ----------

At other village ? ----------

What where the topics? ----------

Where there any meetings which you were asked to attened

That you did not attend? Y/N How many ? ----------

Why not ? ----------

What is your opinion of the meetings ?

VERY USEFUL/ USEFUL/ NOT USEFUL/ NO OPINION

d) What is your opinion of the extension service offered

by the Project ?

VERY GOOD/ GOOD/ FAIR/ POOR/ NO OPINION

e) Why? ----------

4. Have you ever bought or been given anything from the Project? Y/N

Give details:

	BEFORE 1987 Y/N	IN 1987 Y/N	QTY	PRICE	OPINION
Dabar	----------	-------	----	------	----------
Gadam EL Hamam	----------	-------	----	------	----------
Barberton (GN)	----------	-------	----	------	----------
Bayouda	----------	-------	----	------	----------
Phosphate	----------	-------	----	------	----------
Aldrex T	----------	-------	----	------	----------
Suwade Dawa	----------	-------	----	------	----------
Malathion	----------	-------	----	------	----------
Ripcord	----------	-------	----	------	----------
Camel Plough	----------	-------	----	------	----------
JM Toolbar	----------	-------	----	------	----------
Eucalyhptes Seedlings	----------	-------	----	------	----------
Cupressas Seedlings	----------	-------	----	------	----------
Orange Seedlings	----------	-------	----	------	----------
Grapefruit Seedlings	----------	-------	----	------	----------
Mango Seedlings	----------	-------	----	------	----------
Lime "	----------	-------	----	------	----------
Other (specify)	----------	-------	----	------	----------

5. What inputs or services would you Most like to see the JMRDP offers ?

a) ----------

b) ----------

c) ----------

d) ----------

e) ----------

Note: This form has been edited to make it easy to print on A4 for reference. It is slightly different from the form actually used in the survey as a result.

10 APPENDIX II VILLAGES SURVEYED

VILLAGES IN THE SURVEY SAMPLE

	Village Name	Rural Council	Extension Station	Households Interviewed
1.	Istiraina	Nyertete	Nyertete (W)	16
2.	Nyertete	"	Nyertete (E)	"
3.	Maara	"	Not Contacted	"
4.	Disangei	"	"	"
5.	Umm Haraaz	"	Umm Haraaz	"
6.	Touro	"	Not Contacted	"
7.	Kourmaa	Golo	Not Contacted	16
8.	Doursa	"	Killing	"
9.	Killing	"	Killing	"
10.	Kairo	"	Golo	"
11.	Jimaiza	Rokirroh	Not Contacted	16
12.	Ahmad Rasheed	"	"	"
13.	Mohamed Din	"	"	"
14.	Deemo	"	"	15
15.	Tibun	"	Tibun	16
16.	Dayaa	Zalingei	Not Contacted	16
17.	Misterei	"	"	"
18.	Kalgo	"	Kalgo	"
19.	Taaringa	"	Uyur	"
20.	Tangarsa	"	Not Contacted	"
21.	Dabinga	"	Dabinga	"
22.	Gino	"	Shawa	"
23.	Dangal	"	Kurgo	"
24.	Tamar	"	Garaash	"
25.	Kadalingei	"	Kadalingei	"
26.	Sagargarei	Garsila	Garsila	16
27.	Umm Sineina	"	Not Contacted	"
28.	Maara	"	Sigei	"
29.	Faya	"	Garsila	"
30.	Bayla	"	Not Contacted	"
31.	Fourgo	"	Gaba	"
32.	Duro	"	Not Contacted	"
33.	Anjikoti	"	Anjikoti	"
34.	Zoulo	"	Anjikoti	"
35.	Wastani	"	Wastani	"
36.	Durmi	"	Not Contacted	"
37.	Kuroukoula	Zami Baya	Not Contacted	16
38.	Mingo Dabba Naira	"	"	"
39.	Tanako	"	Tanako	"
40.	Amballa	"	Amballa	"
41.	Ashanja	"	Kurdul	"

42. Bindis (E)	Mukjar	Bindis (E)	16
43. Rumaaliya	"	Mukjar	"
44. Dino	"	Not Contacted	"
45. Balda	"	"	"
46. Jaal Gaseem	"	Artaala	"
47. Bouro	"	Not Contacted	"
48. Umm Dukhn	"	"	"
49. Sourei	"	"	"
50. Dango	"	Kabar	"
51. Tibigei	Azum	Not Contacted	16
52. Bargei	"	Tululu	"
53. Naalei	"	Not Contacted	"
54. Jarjara	"	Sulu	"
55. Seilei	"	Not Contacted	"
56. Dingo Haraaz	"	"	"
57. Direisaaya	"	Soulu	"
58. Direisa	"	Direisa	"
59. Hayy Kunjoumia	Zalingei Town	Zalingei	11
60. Hayy AlQoura	"	"	16

Tables