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AGRICULTURAL ECONOMICS ADMINISTRATION (PAEA), DEPARTMENT OF
AGRICULTURAL ECONOMICS AND STATISTICS (DAES)

GOVERNMENT OF SUDAN

August, 1986

INPUT USE AND PRODUCTION COSTS IN
RAINFED MECHANIZED AREAS OF SUDAN:
RESULTS OF 1984/85 FARM SURVEY

(SUMMARY AND TABLES)

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6000-1-50007

PS-RR-5-1986

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ABBREVIATIONS

ABS	=	Agricultural Bank of Sudan
BL	=	Barrel
DAES	=	Department of Agricultural Economics and Statistics
FD	=	Feddan
GL	=	Gallon
GOS	=	Government of Sudan
KM	=	Kilometer
LS	=	Sudanese pound
MANR	=	Ministry of Agriculture and Natural Resources
MFC	=	Mechanized Farming Corporation
MT	=	Metric ton
PAEA	=	Planning and Agricultural Economics Administration
PEFMS	=	Production Economics and Farm Management Section

ACKNOWLEDGEMENT

We acknowledge our gratitude as follows: Dr. Abdel Moneim El-Sheikh, Dr. Hassan Sid Ahmed and Taag El-Seir for their guidance, assistance, support and direction of the Project; Drs. Fred Winch and William Bateson who conceived the Project, and without whose help in its early stages the study would not have commenced; Professor Mohamed Mahmoud for exposing us to the agronomic problems of the rainfed sector; Mukhtar Ibrahim for help in sample selection; Regional Officers of MFC and ABS for their general support and numerous discussions; Computer Center of the University of Khartoum for initial data processing; Pierre Sales (Checchi) for stimulation to complete the report; Betty Johnson and Jeanne Pham (Checchi) for typing the report; Field staff for their painstaking efforts to collect and process data; Farmers and Farmers Unions who freely gave their time and answers to the survey; and USAID/Khartoum for financial support to the Project.

INTRODUCTION AND SUMMARY

The main purpose of this study is to generate various types of farm-level information about the rainfed mechanized sector in the Sudan. The overwhelming importance of this sector in Sudan's agriculture is obvious from the data presented in Tables 1.1, 1.2 and 1.3. The vast clay plains of Gedarif (Kassala Province), Demazine (Blue Nile Province), Kosti (White Nile Province), Dalanj-Habila (Southern Kordofan Province), and Rank (Upper Nile Province) represent the main part of the rainfed mechanized sector of Sudan with minor areas in Southern Darfur Province. As shown in Table 1.1, 33% of the total crop areas under five major food crops (sorghum, sesame, millet, groundnuts and wheat) in the Sudan belong to this sector. The contribution of this sector to the total national production of sorghum and sesame (which are the main crops produced in this sector) in the Sudan is 59.9% and 33.8%, respectively (Table 1.2) with corresponding shares in the total national crop areas of 55.9% and 28.0% (Table 1.3). The sector consists of approximately 5 million feddans of total crop areas and is rapidly expanding.

Rainfed mechanized sector operates under the overall guidance and supervision of the Mechanized Farming Corporation (MFC), a GOS entity. They are responsible for (1) initial allocation of long-term land leases to the farmers, (2) demarkation of new lands to be opened up for cultivation in different regions, (3) collection of land tax, (4) construction and maintenance of physical infrastructure, (5) provision of some workshop facilities and fuel for farm machinery, and (6) provision of technical assistance about agronomic, engineering and plant protection questions.

In spite of the obvious importance of the rainfed mechanized sector, however, the information about the sector has been so scarce that even the most obvious developmental questions could not be adequately addressed. Therefore, the present study, by no means comprehensive, is an attempt to analyze and present farm-level data collected by an in-depth survey of 427 farms carried out during 1984/85, about various aspects of the rainfed

Table 1.1
RELATIVE IMPORTANCE OF THE RAINFED MECHANIZED SECTOR IN THE SUDAN

	Crop Areas (000 FD) ^{1/} Averages of 1979/80 to 1983/84	%	%
A. <u>Rainfed mechanized</u>			
Demazine	1,143	7.6	23.0
Kosti	225	1.5	4.5
Gedarif	2,862	19.0	57.5
Dalanj-Habila	355	2.4	7.1
Rank	378	2.5	7.6
South Darfur	11	0.07	0.2
Total rainfed mechanized	4,974	33.0	(100)
B. <u>Total rainfed traditional</u>			
	8,875	58.8	
C. <u>Total irrigated</u>			
	1,243	8.2	
D. <u>Total all</u>			
	15,092	(100)	

Source: MANR

^{1/} Areas of 5 food crops of sorghum, sesame, millet, groundnuts, and wheat.

Table 1.2

CONTRIBUTION OF THE RAINFED MECHANIZED SECTOR TO
SORGHUM AND SESAME PRODUCTION IN THE SUDAN

Sector/Areas	Averages of 1979/80 to 1983/84					
	Sorghum Production (000 MT)	%	%	Sesame Production (000 MT)	%	%
A. <u>Rainfed mechanized</u>						
Demazine	278	13.1	21.9	22	10.5	31.0
Kosti	59	2.8	4.7	-	-	-
Gedarif	735	34.7	57.9	49	20.0	59.2
Dalanj-Habila	88	4.1	6.9	3	1.4	4.2
Rank	107	5.1	8.4	4	1.9	5.6
South Darfur	3	0.1	0.2	-	-	-
Total rainfed mechanized	1,270	59.9	(100)	71	33.8	(100)
B. <u>Total rainfed traditional</u>	601	28.3		139	66.2	
C. <u>Total irrigated</u>	250	11.8		-	-	
D. Total all (A+ B + C)	2,121	(100)		210	(100)	

Source: MANR

Table 1.3

SHARE OF THE RAINFED MECHANIZED SECTOR IN
TOTAL SORGHUM AND SESAME AREAS IN THE SUDAN

Sector/Areas	Averages of 1979/80 to 1983/84					
	Sorghum Area (000 FD)	%	%	Sesame Area (000 FD)	%	%
<u>A. Rainfed mechanized</u>						
Demazine	941	12.0	21.4	202	9.9	35.4
Kosti	225	2.9	5.1	-	-	-
Gedarif	2,546	32.4	57.9	311	15.2	54.4
Dalanj-Habila	333	4.2	7.6	22	1.1	3.9
Rank	342	4.3	7.8	36	1.8	6.3
South Darfur	11	0.1	0.2	-	-	-
Total rainfed mechanized	4,398	55.9	(100)	571	28.0	(100)
<u>B. Total rainfed traditional</u>	2,883	36.7		1,469	72.0	
<u>C. Total irrigated</u>	582	7.4		-	-	
<u>D. Total all (A + B + C)</u>	7,863	(100)	-	2,040	(100)	

mechanized farming in the Sudan.^{1/} In other words the aim is to describe the salient features of the rainfed mechanized farming in the Sudan. It is hoped that the presentation of detailed data on the characteristics of the mechanized sector and the approach used to calculate the input use and production costs will provide increased understanding and stimulate further research about the sector. Specific objectives pursued are the following.

A. Specific Objectives of the Study

1. To describe from sample data the extent of use of undemarkated land in addition to the demarkated land, and to ascertain the extent of the practice of seasonal fallows.

2. To study the role of the farm owner, the extent and costs of hired managers and other skilled and semi-skilled labor in rainfed mechanized production.

3. To verify the allocation of crop areas to different crops produced in the rainfed mechanized sector and within selected regions, and to ascertain production shares and yields of different crops.

4. To study (1) the extent of use and costs of casual labor, (2) the type, extent of use and costs of farm machinery and other inputs; used in the production of sorghum and sesame crops by operation. Also to compare input use and costs of production of these two crops.

5. To ascertain from the sample data the extent of investment in farm machinery in the rainfed mechanized areas.

6. To verify from sample data the extent of: soil erosion due to floods and wind; occurrence of drought, pests and diseases and striga; the

^{1/} Crop year 1984/85 suffered from the worst drought in the history of Sudan. Data about crop yields, input use and production costs, therefore, have to be viewed and interpreted with caution.

need for deeper land ploughing and use of fertilizers expressed by farmers; and the opportunity cost of crop land in the rainfed mechanized areas.

7. An analysis of farm-to-market costs of sorghum and sesame crops produced in the rainfed mechanized sector.^{1/}

B. The Approach Followed for the Analysis

The data for each farm were collected with the help of a structured questionnaire by trained investigators. All data on outputs, input use and costs, within each region and for the whole sample, were standardized per feddan of crop area planted as against crop area harvested. In other words, first, crop yields, use of various inputs and costs for different operations are calculated per feddan. Then total input use and costs per feddan of area planted are obtained by summation over operations. Next input use and costs per MT are derived by multiplying the input use and costs per feddan of crop area planted by the number of crop feddans planted required to produce one MT of crop output. The number of feddans required to produce one MT of crop output are calculated by dividing 1,000 by the number of Kgs of crop output produced per feddan of area planted.

C. Summary and Conclusions

1. Results and findings of this study are based on farm-level data collected by an in-depth farm survey of 427 farms carried out during 1984/85 crop season in the three most important areas of Gedarif (38.2%), Demazine (26.4%), and Dalanj-Habila (35.4%) in the rainfed mechanized areas of the Sudan.

1/ At early stages of the investigation we hoped to pursue some additional analyses: the size and distribution of output and costs; econometric estimation of demand for labor; testing for economies of scale; and economic implications of the results obtained from these analyses. However, these analyses were precluded because of extremely low crop yields during 1984/85 due to a severe drought, but will be pursued with data from 1985/86 survey.

2. In Demazine and Dalanj-Habila regions farms comprised of either the demarkated or the undemarkated land areas only. In Gedarif region, however, approximately 21% farms had both types of areas under their control. In addition, another about 24% farms in this region operated only undemarkated land areas, with the result that approximately 45% farms had control over undemarkated land areas. In Demazine and Dalanj-Habila regions farms in control of undemarkated land areas were 22.1% and 20.5%, respectively. For the total sample (comprising all three locations) 69.6% farms operated only demarkated areas and the remaining 30.4% operated at least some undemarkated areas (Table 2.2).

3. Out of the total land under the control of sample farmers in the respective regions, 35% in Gedarif, 20.8% in Demazine, and 23.5% in Dalanj-Habila was undemarkated land. For the sample as a whole an average farmer operated 2,330 FD, 28.5% of which were undemarkated area.

4. At the time of the farm survey during 1984/85, 8% of the total land area under the control of the farmers in Gedarif, 29% in Demazine, and 21% in Dalanj-Habila had not as yet been cleared of wood and were not under cultivation. Out of the cultivated land approximately 9% were left fallow.

5. Farming in the rainfed mechanized areas of the Sudan is run on commercial lines. Approximately 28% farmers in the sample were basically traders with farming as their part-time business. A large majority of the farmers (77%) employed professional farm managers and an average farmer spent approximately 70% of his time in running the farm. The percentage of farms which employed managers was the highest in the Gedarif region (86%) where an average farm had 1.8 managers. There are some very large farms with as many as 9 hired managers, and some of these managers are university graduates. These farm managers possess varied types of experience and training. During 1984/85 a farm manager on an average earned LS 3,135/year.

On an average a farm manager controlled 1,684 FD of crop area. The costs of hired management per feddan of area planted were LS 1.86 for the whole sample. However, these managerial costs were higher (LS 2.77/FD) in

Dalanj-Habila areas than Gedarif and Demazine areas, because of smaller farm size. These costs of hired managers are in addition to the time spent by the farm owner and his family in supervisory work, the estimated costs for which are 73% of the costs of hired managers.

6. In addition to the hired managers, farms in the rainfed mechanized areas require the services of several other types of skilled and semi-skilled labor. Tractor and lorry drivers, guards, mechanics and some other semi-skilled labor are employed on annual as well as seasonal contracts. Tables 3.2 and 6.2 present data on the employment of this type of labor and their costs. On an average during 1984/85 season, such labor costs were LS 1.44/FD of crop area. However, because of a larger farm size, these costs in the Gedarif region were only LS 1.01/FD.

7. Total managerial and permanent labor costs per feddan for Demazine, Gedarif, and Dalanj-Habila regions, and the total sample were LS 4.79, LS 4.06, LS 6.72 and LS 4.63, respectively.

8. Sorghum and sesame are the dominant crops produced in the rainfed mechanized areas in the Sudan. Sorghum, according to 1984/85 farm survey data, was planted by every farmer in the sample, and it occupied 84.4% of the area planted to all crops. On the other hand, sesame was planted by 51.8% farms and occupied only 15% of the area planted to all crops. Millet was grown only in Demazine region by a small number of farms. Sample distribution of the planted areas of sorghum, sesame and millet crops in the Gedarif region is identical to the distribution of aggregate crop areas in this region reported by MANR. The sample and aggregate distributions in Dalanj-Habila regions also correspond to each other fairly closely. However, for Demazine region, the aggregate distribution has a smaller (larger) percentage of areas under sesame (sorghum).

9. Of the total crop areas planted by the sample farms during 1984/85, 33.2% were on the undemarkated land. However, 51% of the sesame crop was planted on undemarkated area compared to only 30.4% of sorghum. In Demazine, these figures were 58.7% and 26.7%, respectively. It may be because sesame crop requires better moisture conditions than sorghum, and

most of the undemarkated areas happen to be the southern fringes of Gedarif and Demazine regions with better rainfall conditions.

10. Crop year 1984/85 for which the survey was carried out was the third continuing year of drought in the Sudan, and the effects of drought during this year were the most severe. Crop areas of sorghum harvested by the sample farms were only 63.4% of the areas planted. Sorghum yield per feddan of area planted was only 62 Kgs,^{1/} and 24.4% farmers lost their sorghum crop completely.

Sesame crop seems to have fared slightly better than sorghum. Approximately 81% of the planted areas to sesame were harvested. Yield of sesame per feddan planted was 55.7 Kgs,^{1/} and only 15.8% farmers suffered a total loss of their crop. The ratio of sesame yield to sorghum yield was 0.89. Ordinarily this ratio is 0.44. It may be because, as mentioned above (in item 9), relatively more sesame crop is grown in southern parts of Gedarif and Demazine regions with better rainfall.

The effect of the drought was most severe in the Gedarif region where only 60.5% of the planted areas were harvested. On the other hand in Dalanj-Habila region 90% of the planted areas were harvested.

11. Labor in the rainfed mechanized areas is the most important factor of production. For sorghum production, the main use of labor is for weeding and harvesting operations. Since threshing of sorghum is done mechanically, labor-use for this operation is quite small. A small amount of labor is also used in land clearing activities before land preparation operations start. In the case of sesame, all operations including threshing are carried out manually.

^{1/} Average sorghum yield for the five-year period 1979/80 - 1983/84 was 288 Kgs/FD. For the same period average sesame yield was 126 Kgs/FD. That is, sesame yield, ordinarily, is 44% that of sorghum.

During 1984/85 sample farmers used a total of 3.802 MD of casual labor^{1/} in producing sorghum per feddan of area planted; 0.097 MD (2.6%) for land clearing; 1.64 MD (43.1%) for first weeding; 0.71 MD (18.7%) for second weeding; 1.30 MD (34.2%) for harvesting; 0.005 MD (0.1%) for threshing; and 0.5 MD (1.3%) for activities related to transport of produce to the market. The total cost of casual labor per feddan of sorghum area planted was LS 15.29. The wage rate per MD was approximately LS 4.02.^{2/}

In the production of sesame a total of 5.15 MD^{3/} of casual labor were used per feddan of area planted: 0.097 MD (1.9%) for land clearing, 1.67 MD (32.4%) for first weeding, 0.82 MD (15.9%) for second weeding, 1.90 MD (36.9%) for harvesting, 0.608 MD (11.8%) for threshing, and 0.055 MD (1.1%) for activities related to transport of produce to the market. These data show that all sesame operations use more casual labor than sorghum on the basis of per feddan of planted area. Taken all operations together sesame production used 35.5% more labor.

The total cost of the use of casual labor in sesame production was LS 28.04/FD. The wage rate per MD was approximately LS 5.44,^{4/} which is 35.3% higher than wage rate in sorghum production because most sesame operations are more difficult and demanding than sorghum. Thus, due to larger input

1/ Managerial and permanent labor use (fixed labor) was discussed in items 5, 6 and 7 above. Since 1984/85 was a severe drought year, the use of casual labor was less than it would be during a normal year. For a normal year our estimate is 5 MD of casual labor per feddan of planted area of sorghum.

2/ This wage rate is for male adult labor, the only type of labor used in rainfed mechanized areas.

3/ The use of casual labor in sesame production was less during 1984/85 due to a severe drought. For a normal year we estimate 7 MD of casual labor per feddan of sesame area planted. The managerial and permanent labor component in sesame production was discussed in items 5, 6 and 7.

4/ Only male labor is used in rainfed mechanized production of sesame (and sorghum).

of labor and higher wages, total costs of casual labor per feddan planted are 84.4% more for sesame than for sorghum.

12. Use of machinery in the rainfed mechanized areas of Sudan is the second most important factor of production. Over 94% of the sample farmers owned tractors, and on an average there were 1.53 tractors per farm. Crop area planted per tractor was 1,127 FD. In addition, there were 83 sorghum threshing machines owned by 16.4% of the farmers in the sample.

13. Total market value of farm machinery and equipment owned by sample farmers in 1984/85 was LS 21.184 million, out of which 52.8 percent was in the form of tractors, 26.8% in the form of tractor-related equipment, 13.7% for threshers and 6.7% for transport equipment. An average farmer owned mechanical assets worth about LS 50 thousand, which constituted an investment of about LS 29 thousand per 1,000 FD of crop area planted.

14. An average tractor in the sample used 0.192 hours of time for ploughing one feddan for land preparation operation and used slightly more time (0.196 hours/FD) for the planting operation. In other words, an average tractor completes in one hour 5.2 FD of ploughing and 5.1 FD of planting.

15. Gasoil is the main fuel used which was supplied to the farmers periodically, through the Mechanized Farming Corporation and Farmers Unions. Farmers' purchases each time were limited to the quantities allocated to them based on a rationing system which, in many cases, were less than their requirements. Many farmers faced shortages and made purchases in the black market. During 1984/85 crop season an average farmer purchased approximately 39 Bls of gasoil.

16. Prices of gasoil during 1984/85 were fixed by GOS at LS 2.15/GL, Khartoum base. However, due to transport costs MFC and the Farmers Unions charged LS 2.32 in Gedarif, LS 2.82 in Demazine and LS 3.78 in Dalanj-Habila. The resulting officially charged average sample price was LS 2.71/GL. The black market prices per gallon paid by farmers for

additional purchases in these locations were LS 4.88, 4.13 and 5.83, respectively. The resulting overall weighted average prices paid per gallon by the sample farmers for their total purchases (officially allocated purchases plus purchases made in the black market) were LS 2.75 in Gedarif, LS 3.75 in Demazine, LS 5.21 in Dalanj-Habila, and LS 3.30 for the whole sample. From these data the following general statements can be made about gasoil prices in the rainfed mechanized areas during 1984/85.

(a) The average black market price paid by farmers in the sample areas was LS 5.34/GL, and it was 97% higher than the price of LS 2.71/GL officially charged by MFC and the Unions.

(b) The overall average price of LS 3.30/GL paid by farmers for their total purchases (official and black market) was only 22% higher than the price charged by the MFC and the Unions.

(c) The highest prices for gasoil were paid by farmers in Dalanj-Habila region. For example, they paid 89.5% more per gallon than their counterparts in the Gedarif region.

17. In the rainfed mechanized farming areas, the practice of renting tractor services from other farmers for land preparation and planting operations prevails to some extents. This practice is more common in Dalanj-Habila region than the other two regions. During 1984/85 approximately 20% sample farmers in this region rented tractor services from other farmers. Average rental rate for these services worked out to LS 5.2/FD or LS 26.6/-Hr.

18. Sample data indicate that farmers allocated 85% of the use of tractors to sorghum, 14% to sesame and 1% to millet. This distribution of the total tractor time is quite parallel to the distribution of areas planted to these crops, except that slightly higher percentage of tractor time was allocated to sorghum and slightly lower percentage to sesame than the corresponding allocation of areas planted to these crops. This seems to reflect the fact that relatively higher percentage of areas planted to sorghum are ploughed before planting than is the case for sesame.

19. Practically all sorghum threshing in the rainfed mechanized areas is done by power threshers. During 1984/85 there were 7,484 FD of sorghum planted by sample farmers per thresher. However, due to drought some farms had very small amounts of sorghum to thresh, and, therefore, 4.2% of the crop was threshed by means other than threshers. In general, farmers who own threshers have a surplus capacity and do custom threshing for other farmers. During 1984/85, they charged a rate of LS 1.84/sack. On the other hand, depreciation, interest and fuel costs of use of threshers, assuming 10 years of remaining life and 12% rate of interest worked out to be LS 1.88/sack. These data imply that the rental rates charged by thresher owners during 1984/85 were just sufficient to cover their costs.

20. Cost estimates of producing sorghum and sesame crops per feddan of area planted by sample farms during 1984/85 are LS 39.75 and LS 53.22, respectively. (Tables 9.1, 9.2 and 9.3) These costs comprise of costs of land, materials, labor and machinery including transport to the market, and are briefly described here.

(a) Land Costs.

Land in mechanized areas of Sudan is leased to the farmers by the GOS on a long-term basis. The farmers for all practical purposes are virtual owners of land for which they pay tax to the GOS at the rate of LS 1.00/-FD/year. The land, in addition, has an opportunity rental value to the farmers which they forego by raising their own crops. In some cases, farmers do actually rent their land to others. The opportunity rental cost of land, that is, the amount for which their land could be rented during 1984/85 was estimated by sample farmers to be LS 3.9/FD. This estimate was, on an average LS 4.8 in Gedarif, LS 3.1 in Demazine, and LS 3.9 in Dalanj-Habila. The differences in these figures seem to reflect among other things, differences in land scarcity relative to demand, among the three regions. Thus, on an average for the total sample, total land costs (rental value plus tax) were LS 4.9/FD. In absolute terms, these land costs were the same for sorghum and sesame crops. However, the share of land costs in total costs per feddan was higher for sorghum (12.3%) than for sesame (9.3%) because the total production costs are higher for sesame.

(b) Cost of Materials

(1) Seed Costs. The quantity of seed used per feddan and the price of seed being higher, the seed costs are higher for sesame (LS 3.04/FD) than for sorghum (LS 1.77). The shares of seed costs in production costs of sorghum and sesame crops were 4.5% and 5.7%, respectively.

(2) Cost of Sacks and Strings. A sack of sorghum and sesame weighs 91.5 Kgs and 74 Kgs, respectively, even though the size of the sack used for both crops is the same. Therefore, per feddan costs of sacks and strings are higher for sesame (LS 0.83) than sorghum (LS 0.75) in spite of the fact that yield of sesame is lower than that of sorghum. As a share of the total costs of production, the costs of sacks and strings for sorghum and sesame were 1.9 percent and 1.6 percent, respectively.

(3) Cost Shares of Materials. The costs of seeds, sacks and strings per feddan of area planted were LS 6.4 for sorghum and LS 7.3 for sesame and their respective shares in the total production costs were 6.4% and 7.3%.

(c) Labor Costs

(1) Fixed Labor Costs: Permanent and Managerial Labor. The costs of (1) permanent labor employed on annual or seasonal contracts including drivers, mechanics, guards, etc., and (2) managerial labor including hired managers and the owner operator and his family, are in the nature of fixed costs. These costs were allocated to different crops proportional to their areas planted. In other words, per feddan costs were computed by dividing the total costs of each category of labor by the sum of crop area planted to all crops during 1984/85, that is, per feddan costs of each category of labor are assumed to be uniform for all crops.

Permanent and managerial labor costs so calculated for the total sample were LS 4.63 per feddan of area planted; 31.1% (LS 1.44) of which were for permanent labor, 40.2% (LS 1.86) for hired labor, and 28.7% (LS 1.33) for the owner operator and other family members. Together these

fixed costs constitute 23.2% of the total labor costs (including casual labor) per feddan for sorghum and 13.8% for sesame. The share of these costs in the total production costs for sorghum and sesame crops, respectively, are 11.6% and 8.7%.

The fixed labor costs per feddan of area planted for the sub samples of Demazine, Gedarif and Dalanj-Habila are LS 4.79, LS 4.06 and LS 6.72, respectively. The higher costs in Dalanj-Habila area are because of smaller farm size.

(2) Casual Labor. Casual labor is used for weeding, harvesting and threshing operations. On the basis of per feddan planted 35.5% more casual labor is used for sesame (5.15 MD) production than for sorghum production (3.80 MD). This is partly because threshing of sesame is not mechanized and partly because various sesame operations are more labor intensive than sorghum. In addition, the adverse effects of 1984/85 drought on sesame crop were a bit less severe relative to sorghum.

Costs of casual labor for producing sorghum and sesame crops were LS 15.29/FD and LS 28.99, respectively. That is, casual labor costs per feddan were almost 90% higher for sesame than for sorghum. And the share of casual labor costs in total production costs was 38.5% for sorghum and 54.5% for sesame.

(3) Total Labor Costs. Total labor costs (casual labor plus permanent and managerial labor) per feddan planted were 68.8% higher for sesame (LS 33.62) than for sorghum (LS 19.92), and the share of total labor costs in total production costs was 50.1% for sorghum and 63.2% for sesame.

(d) Machinery Costs

(1) Tractor Costs. Costs per feddan of area planted for the use of tractor, ancillary equipment and fuel for land preparation and planting operations of sorghum and sesame crops are almost identical; LS 8.96 for sorghum and LS 8.84 for sesame. The shares of tractor costs in

total production costs, however, are different; 22.5% for sorghum and 16.6% for sesame.

(2) Thresher Costs. Power threshers are used to thresh only sorghum crop. These costs per feddan during 1984/85 were LS 1.28 which are quite low because of low yield. The share of these costs in total production costs was 3.2%.

(3) Costs of Transport. These costs per feddan of area planted were LS 2.17 for sorghum and LS 1.99 for sesame, and the share of these costs in total costs of production was 5.5% for sorghum and 3.7% for sesame.

(4) Total Machine Costs. Total machine costs in producing sorghum and sesame crops per feddan of area planted were LS 12.41 and LS 10.83, respectively. The share of machine costs in total production cost was 31.2% for sorghum and 20.3% for sesame.

(5) Depreciation and Interest Costs and Costs of Fuel. The total machine costs of LS 12.41 for sorghum include LS 2.17 for transport costs which cannot be divided between (1) the cost component related to depreciation and interest, and (2) the fuel costs. The remaining LS 10.24, however, consist of LS 5.86 (57.2%) of costs related to depreciation and interest for the tractors and LS 4.38 (42.7%) of costs of fuel including lubricants. Thus, disregarding the transport component of machine costs, the share of depreciation and interest costs of machinery in total production costs of sorghum was 14.7%, and that of fuel costs was 11.0% (that is, a total of 25.7%).

In the case of sesame the total machine costs of LS 10.83 include LS 1.99 for transport. The remaining LS 8.84 consist of LS 4.63 (52.4%) for depreciation and interest and LS 4.21 (47.6%) for fuel. The shares of these costs in total costs of production were 8.7% for depreciation and interest costs and 7.9% for fuel costs.

21. There is a growing concern in Sudan that a continuing decline of crop yields in rainfed mechanized areas may be due to rapid deforestation leading to soil erosion. The data from the sample farms indicate that not more than 4.6% of the crop land is affected by floods and that not more than 2.5 of the crop land actually is subject to some degree of soil erosion due to floods.

The problem of soil erosion due to wind is reported to affect 4.8% of the total sample land and is relatively more in Gedarif region where 8.9% of the land area is affected.

22. Farmers in the sample reported that productivity of 43.6% of their farm land could be improved by deeper ploughing than is possible with the present mechanical technology in the form of tractors and the ancillary equipment available to them.

23. Answers from the farmers in the sample indicate that five years after initial clearance land becomes less productive and crop yields start to decline. In addition, rapid expansion of production to marginal areas has led to a continuing decline in crop yields. For example, sorghum and sesame yield in the rainfed mechanized areas during the 22-year period 1961/62 to 1982/83, declined at annual rates of 0.79% and 1.92%, respectively. In view of this one may expect some increased use of yield increasing inputs. For example, fertilizer use in the Sudan is not a new thing. Yet, its use in the rainfed mechanized areas is totally absent.

The data from the sample indicate that farmers in general do not have adequate knowledge about fertilizer and intuitively feel that its use may not be profitable for them. The uncertainty to the pay-off for fertilizer use is further complicated by anticipations of the occurrence of drought, the probability for which as perceived by sample farmers is 22.4%. At the same time, output expansion in the rainfed mechanized areas has been possible by bringing into cultivation relatively abundant and cheaper land. Farmers' response to fertilizer use, therefore, may have been quite rational. On the other hand, recent attempts at the introduction of hybrid seed varieties of sorghum into the rainfed mechanized areas and relatively

higher costs of further land clearance may increase the relative pay-off to fertilizer use. It is, therefore, our opinion, that, it is time, fertilizer trials should be carried out in selected rainfed mechanized areas, to determine the marginal productivity of fertilizer use.

24. Both the sorghum and sesame crops in the sample areas suffer from various insect pests and diseases. On an average, farmers in the sample expect serious pest and disease attacks once in 3.4 years on sorghum and once in 4.3 years on sesame. Farmers in Gedarif region report that pest and disease problems occur more often, that is, once in 2.7 years. On the other hand, farmers in Demazine and Dalanj-Habila regions report less frequent occurrence of these problems, that is, once in 5 and 10 years, respectively.

25. Striga is a parasitic plant which affects only the sorghum crop. The plant sheds its seeds at maturity which germinate during the next season. Its infestation increases with continuous cropping of sorghum and is a serious problem in the Gedarif region. So far, no control measures are known for this parasite. Heavily infested lands are used for sesame production.

26. Farmers in the rainfed mechanized areas sell their produce either at the farm gate or in a market town of their choice depending upon the expected differences in farm gate and market prices of the crop and costs of transport services. Econometric analysis of the farm-to-market transport costs per ton per kilometer incurred by the farmers indicates that:

(a) Holding other factors constant, these costs in Demazine and Dalanj-Habila regions are higher than Gedarif region by approximately 20% and 30%, respectively. This means supply of transport services is more competitive in Gedarif than the other two regions.

(b) Holding other things constant per ton per kilometer transport costs are approximately 9% more for sesame than for sorghum. This means that in view of the lower demand for transport services at the time

sesame crop was marketed there was a relative excess supply of transport services in the Gedarif region and transport services were even more competitive.

(c) The results provide strong support to the hypothesis that transport costs per ton per kilometer decrease with increasing distance traversed, holding other things constant. A 10% increase in distance results in 7% decline in per ton per kilometer transport costs.

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Table 1.1

RELATIVE IMPORTANCE OF THE RAINFED MECHANIZED SECTOR IN THE SUDAN

	Crop Areas (000 FD) ^{1/} Averages of 1979/80 to 1983/84	%	%
A. <u>Rainfed mechanized</u>			
Demazine	1,143	7.6	23.0
Kosti	225	1.5	4.5
Gedarif	2,862	19.0	57.5
Dalanj-Habila	355	2.4	7.1
Rank	378	2.5	7.6
South Darfur	11	0.07	0.2
Total rainfed mechanized	4,974	33.0	(100)
B. <u>Total rainfed traditional</u>	8,875	58.8	
C. <u>Total irrigated</u>	1,243	8.2	
D. <u>Total all</u>	15,092	(100)	

Source: MANR

^{1/} Areas of 5 food crops of sorghum, sesame, millet, groundnuts, and wheat.

Table 1.2

CONTRIBUTION OF THE RAINFED MECHANIZED SECTOR TO
SORGHUM AND SESAME PRODUCTION IN THE SUDAN

Sector/Areas	Averages of 1979/80 to 1983/84					
	Sorghum Production (000 MT)	%	%	Sesame Production (000 MT)	%	%
A. <u>Rainfed mechanized</u>						
Demazine	278	13.1	21.9	22	10.5	31.0
Kosti	59	2.8	4.7	-	-	-
Gedarif	735	34.7	57.9	49	20.0	59.2
Dalanj-Habila	88	4.1	6.9	3	1.4	4.2
Rank	107	5.1	8.4	4	1.9	5.6
South Darfur	3	0.1	0.2	-	-	-
Total rainfed mechanized	1,270	59.9	(100)	71	33.8	(100)
B. <u>Total rainfed traditional</u>	601	28.3		139	66.2	
C. <u>Total irrigated</u>	250	11.8		-	-	
D. Total all (A+ B + C)	2,121	(100)		210	(100)	

Source: MANR

Table 1.3

SHARE OF THE RAINFED MECHANIZED SECTOR IN
TOTAL SORGHUM AND SESAME AREAS IN THE SUDAN

Sector/Areas	Averages of 1979/80 to 1983/84					
	Sorghum Area (000 FD)	%	%	Sesame Area (000 FD)	%	%
A. <u>Rainfed mechanized</u>						
Demazine	941	12.0	21.4	202	9.9	35.4
Kosti	225	2.9	5.1	-	-	-
Gedarif	2,546	32.4	57.9	311	15.2	54.4
Dalanj-Habila	333	4.2	7.6	22	1.1	3.9
Rank	342	4.3	7.8	36	1.8	6.3
South Darfur	11	0.1	0.2	-	-	-
Total rainfed mechanized	4,398	55.9	(100)	571	28.0	(100)
B. <u>Total rainfed traditional</u>	2,883	36.7		1,469	72.0	
C. <u>Total irrigated</u>	582	7.4		-	-	
D. <u>Total all (A + B + C)</u>	7,863	(100)	-	2,040	(100)	

Table 2.1

SAMPLE LOCATIONS AND SIZE: FARM SURVEY OF
 RAINFED MECHANIZED AREAS, SUDAN - (1984/85)

Region	Location	Number of Farmers
<u>Demazine</u>	1. Agadi	33
	2. Mazmum	21
	3. Dali	23
	4. Dinder	20
	5. Rehaid	14
	6. Guli	2
	Total	<u>113</u>
<u>Gedarif</u>	7. Gaboub	59
	8. Samsun including Umsainat	32
	9. Wad El Huri	72
	Total	<u>163</u>
<u>Dalanj-Habila</u>	10. Umlobia	28
	11. El Baida	33
	12. Kortala	25
	13. Abu-Jibeha	18
	14. Habila	47
	Total	<u>151</u>
All Sample		<u>427</u>

Table 2.2

NUMBER OF SAMPLE FARMERS WITH DEMARKATED AND
UNDEMARKATED AREAS: FARM SURVEY OF RAINFED
MECHANIZED AREAS, SUDAN - (1984/85)

	Demazine	Gedarif	Dalanj- Habla	All Sample
1. Farmers with demarkated area	88	124	120	332
2. Farmers with undemarkated area	26	73	31	130
3. Farmers with both demarkated and undemarkated area	1 (0.9)	34 (20.9)	0 (0)	38 (8.2)
4. Farmers with only demarkated area	87 (77.0)	90 (55.2)	120 (79.5)	297 (69.6)
5. Farmers with only undemarkated area	25 (22.1)	39 (23.9)	31 (20.5)	95 (22.2)
All Farmers	113 (100) (26.4)	163 (100) (38.2)	151 (100) (35.4)	427 (100) (100)

Note: Figures in parentheses are percentages.

Table 2.3

DEMARKATED AND UNDEMARKATED AREAS CONTROLLED BY
SAMPLE FARMERS: FARM SURVEY OF RAINFED MECHANIZED
AREAS, SUDAN - (1984/85)

	Demazine	Gedarif	Dalanj- Habla	All Sample
1. Total demarkated areas (FD)	248,850(35.0) (79.2)	328,160(46.0) (65.0)	134,750(18.9) (76.5)	711,760(100) (71.5)
2. Total undemarkated areas (FD)	65,400(23.1) (20.8)	176,400(62.3) (35.0)	41,450(14.6) (23.5)	283,250(100) (28.5)
3. Total sample areas (FD)	314,250(31.6) (100)	504,560(50.7) (100)	176,200(17.7) (100)	995,010(100) (100)
<u>Sample Averages</u> ^{1/}				
4. Demarkated areas per farm (FD)	2,202	2,013	892	1,667
5. Undemarkated areas per farm (FD)	579	1,083	275	663
6. Total areas per farm (FD)	2,781	3,095	1,167	2,330
<u>Averages (Demarkated Scheme Holders)</u> ^{2/}				
7. Demarkated areas per farm (FD)	2,828	2,646	1,123	2,144
<u>Averages (Undemarkated Scheme Holders)</u> ^{3/}				
8. Undemarkated areas per farm (FD)	2,525	2,416	1,337	2,179

Notes:

1/ Total areas divided by all sample farmers.

2/ Total demarkated areas divided by the number of only those farmers who controlled demarkated scheme(s).

3/ Total undemarkated areas divided by the number of only those farmers who controlled undemarkated scheme(s).

Table 2.4

SAMPLE AREAS PLANTED, FALLOW AND UNDER WOOD:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN - (1984/85)

	Areas in FD	Percent	Percent
<u>Demazine</u>			
1. Planted to crops	165,255	63.5	89.4
2. Fallow	19,515	7.5	10.6
3. Sub-total	(184,770)	(71.0)	(100.0)
4. Under wood	75,380	29.0	
5. Total	260,150	100.0	
<u>Gedarif</u>			
1. Planted to crops	453,590	86.9	94.4
2. Fallow	27,167	5.2	5.6
3. Sub-total	(480,757)	(92.1)	(100.0)
4. Under wood	41,500	7.9	
5. Total	522,257	100.0	
<u>Dalanj-Habila</u>			
1. Planted to crops	117,251	65.2	82.5
2. Fallow	24,966	13.9	17.5
3. Sub-total	(142,217)	(79.1)	(100.0)
4. Under wood	37,673	20.9	
5. Total	179,890	100.0	
<u>All Sample</u>			
1. Planted to crops	736,096	76.5	91.1
2. Fallow	71,648	7.5	8.9
3. Sub-total	(807,744)	(84.0)	(100.0)
4. Under wood	154,553	16.0	
5. Total	962,297	100.0	

Table 2.5

LIST OF THE PARTICIPANTS IN THE SURVEY - 1984/85

Region	Name of the Participant	Designation
<u>Demazine</u>	1. Badr Eldin Atta	Inspector Agricultural Economics (Team Leader)
	2. Hadyat Eltayeb	Inspector Agricultural Economics
	3. Widad Abdel Rahman	Inspector Agricultural Economics
	4. Khalid Ahmed	Inspector Agricultural Economics
	5. Shadia Ahmed	Inspector Agricultural Economics
	6. Nabeel Ahmed	Inspector Agricultural Economics
	7. Insaf Abdel Majid	Inspector Agricultural Economics
	8. Shadia Hassan	Inspector Agricultural Economics
<u>Gedarif</u>	1. Mustafa M. Osman	Head, Gedarif Regional Office of DAES
	2. Mossadag Babiker	Inspector Agricultural Economics
	3. Azhari Mahjoob	Inspector Agricultural Economics
	4. Osama Khalid	Inspector Agricultural Economics
	5. Hassan Nemeir	Inspector Agricultural Economics
<u>Dalanj-Habila</u>	1. Bakri Kamis	Inspector Agricultural Economics (Team Leader)
	2. Adil Ahmed	Inspector Agricultural Economics
	3. Hamza Elnewairi	Inspector Agricultural Economics
	4. Mohammed Ishag	Inspector Agricultural Economics
	5. Mohammed M. Ali	Inspector Agricultural Economics

Table 3.1

SELECTED MANAGEMENT ASPECTS:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
A. <u>Owner Farmer</u>				
1. Average age (years)	47.5	45.7	-	46.4
2. Farmer-trader (%)	34.5	7.4	44.4	27.6
3. Time spent for farm work (%)	66	110	50	70
B. <u>Hired Farm Managers</u>				
1. Farms with hired managers (%)	63.7	85.9	77.5	77.0
2. Average number of managers per farm	1.0	1.8	1.0	1.3
3. Number of managers-range	0-9	0-9	0-1	0-9
4. Average salary per manager (LS/year)	3,240	3,273	2,779	3,135
5. Average work experienced (years)	7.6	13.1	8.3	10.3
6. Agricultural training (years)	2.9	2.4	0	2.7
7. Range - years of training	0-5	0-5	-	0-5

Table 3.2

EMPLOYMENT OF PERMANENT LABOR:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
2. Farms with permanent drivers (%)	55.8	60.1	26.5	47.1
3. Total number of permanent drivers employed	144	239	44	427
4. Permanent drivers per farm - actually employing (No.)	2.3	2.4	1.1	2.1
(Range)	(0-9)	(0-9)	(0-2)	(0-9)
5. Salary of a permanent driver	2,010	1,930	1,810	1,930
(Range)	(0-5000)	(0-4800)	(0-4400)	(0-5000)
6. Farms employed drivers for the season (%)	57.5	44.8	45.0	48.2
7. Total number of seasonally employed drivers	222	340	125	687
8. Seasonally employed drivers per farm - actually employing (No.)	3.4	3.7	1.8	3.0
9. Salary of a seasonally employed driver	660	700	760	710
10. Farms with no driver (No.)	17	13	45	75
(%)	13.3	7.4	26.5	17.6
11. Farms with permanent as well as seasonally employed drivers (No.)	32	22	3	57
(%)	27.4	12.3	1.3	13.3
12. No. of farms with guards (%)	92.9	78.5	97.3	89.0
13. Guards per farm -- All sample (No.)	1.4	1.8	1.5	1.6
14. Guards per farm - only employed (No.)	1.5	2.3	1.6	1.8
(Range)	(0-7)	(0-9)	(0-8)	(0-9)
15. Average salary of a guard (LS)	900	940	730	850
16. Farms with permanent labor (%)	45.1	33.7	18.5	31.4
17. Permanent labor per farm - only employed (No.)	2.6	2.5	1.4	2.3
18. Average salary of a permanent worker (LS)	930	990	720	910
19. Farms employed labor on <u>seasonal basis</u> (%)	55.8	49.7	39.1	47.5
20. Seasonal workers per farm - only employed (No.)	2.6	4.5	1.9	3.2
21. Average wage of a seasonal worker (LS)	380	500	320	410

Note: 1. Permanent farm labor is employed on yearly contracts.
2. Seasonal labor employed on short-term contracts of a few months.

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Table 4.1

SAMPLE DISTRIBUTION OF SORGHUM, SESAME, AND MILLET AREAS PLANTED:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
<u>Sorghum</u>				
Demarkated area (%)	73.0	61.6	72.4	65.6
Undemarkated area (%)	26.7	32.2	27.6	30.4
Rented area (%)	0.3	6.2	0.0	4.0
Total sorghum area (FD)	121,370(19.5) (73.4)	398,770(64.2) (87.9)	101,022(16.3) (86.2)	621,162(100) (84.4)
<u>Sesame</u>				
Demarkated area (%)	41.3	51.5	58.1	49.0
Undemarkated area (%)	58.7	48.2	41.9	50.9
Rented area (%)	0.0	0.3	0.0	0.1
Total Sesame area (FD)	37,975(35.0) (23.0)	54,320(50.0) (12.0)	16,229(15.0) (13.8)	108,524(100) (14.7)
<u>Millet</u>				
Total millet area (FD) ^{1/}	5,910(92.2) (3.6)	500(7.8) (0.1)	0.0(0) (0)	6,410(100) (0.9)
<u>All (three) crops</u>				
Total demarkated (%)	66.7	60.4	70.4	63.4
Total undemarkated (%)	33.1	34.1	29.6	33.2
Total rented (%)	0.2	5.5	0.0	3.4
Total all crops (FD)	165,255(22.5) (100)	453,590(61.6) (100)	117,251(15.9) (100)	736,096(100) (100)

^{1/} All millet was planted on demarkated land.

Table 4.2

DISTRIBUTION OF TOTAL SORGHUM, SESAME AND MILLET AREAS
PLANTED IN RAINFED MECHANIZED AREAS OF DEMAZINE, GEDARIF AND DALANJ-HABILA,
1984/85

	Demazine		Gedarif		Dalanj-Habila		Total	
	<u>000 FD</u>	<u>%</u>						
Sorghum	1,171	85.4	2,502	87.6	250	89.3	3,923	87.0
Sesame	200	14.6	343	12.0	30	10.7	573	12.7
Millet	0	0	11	0.4	0	0	11	0.3
Total	1,371	100	2,856	100	280	100	4,507	100

Source: MANR

Table 4.3

SAMPLE AREAS OF SORGHUM, SESAME AND MILLET HARVESTED:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
<u>Sorghum</u>				
1. Area harvested (FD)	69,070	234,530	90,449	394,049
2. Harvested area as percent of planted area (%)	56.9	58.8	89.5	63.4
<u>Sesame</u>				
3. Area harvested (FD)	33,175	39,600	15,052	87,827
4. Harvested area as percent of planted area (%)	87.4	72.9	92.9	80.9
<u>Millet</u>				
5. Area harvested (FD)	4,360	300	0	4,660
6. Harvested area as percent of planted area (%)	73.8	60.0	-	72.7
<u>All Three Crops</u>				
7. Area harvested (FD)	106,605	274,430	105,501	486,536
8. Harvested areas as percent of planted areas (%)	64.5	60.5	90.0	66.1

Table 4.4

SAMPLE DATA ON SORGHUM PLANTING, HARVEST, OUTPUT AND YIELD:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
2. Farmers who planted sorghum (%)	100	100	100	100
3. Those who planted on demarkated land (%)	78.0	75.5	79.5	77.5
4. Those who planted on undemarkated land (%)	20.4	42.9	20.5	29.0
5. Those who planted on rented land (%)	0.9	4.3	0	1.9
6. Area planted per farm (FD)	1,074	2,446	669	1,455
7. Demarkated area planted per farm by those who planted on demarkated land (FD)	1,007	1,996	609	1,230
8. Undemarkated area planted per farm by those who planted on undemarkated land (FD)	1,407	1,837	901	1,523
9. Those who had a harvest of sorghum (%)	49.6	77.3	93.8	75.6
10. Area harvested as percent of area planted	56.9	58.8	89.5	63.4
11. Area harvested per farm by those who had a harvest (FD)	1,233	1,861	642	1,220
12. Area harvested per farm - all sample (FD)	611	1,439	599	921
13. Output per farm - all sample (MT)	70.2	138.2	54.7	90.7
14. Output per farm of those who had a harvest (MT)	141.7	181.7	59.1	121.0
15. Yield per feddan of harvested area (kgs/FD)	115	96	91.5	98.5
16. Yield per feddan of area planted (kgs/FD)	65	56	82	62

Table 4.5

SAMPLE DATA ON SESAME PLANTING, HARVEST, OUTPUT AND YIELD:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
2. Farmers who planted sesame (%)	54.9	49.3	52.3	51.8
3. Those who planted on demarkated land (%)	36.3	30.0	37.8	34.4
4. Those who planted on undemarkated land (%)	18.6	23.3	14.6	19.0
5. Those who planted on rented land (%)	0	0.6	0	0.2
6. Area planted per farm--only for those who actually planted (FD)	613	679	205	491
7. Demarkated area planted per farm by those who planted on demarkated land (FD)	382	571	166	361
8. Undemarkated area planted per farm by those who planted on undemarkated land (FD)	1,062	689	309	682
9. Those who had a harvest of sesame (%)	79.0	82.5	89.9	84.2
10. Area harvested as percent of area planted	87.4	72.9	92.9	80.9
11. Area harvested per farm by those who had a harvest (FD)	677	600	212	472
12. Area harvested per farm by those who had planted (FD)	535	495	191	397
13. Output per farm - of those who planted (MT)	30.83	41.02	10.78	27.35
14. Output per farm of those who had a harvest (MT)	39.82	49.72	12.34	33.03
15. Yield per feddan of harvested area (kgs/FD)	57.6	82.87	56.58	68.83
16. Yield per feddan of area planted (kgs/FD)	50.3	60.4	52.6	55.7

Table 4.6

SAMPLE DATA ON MILLET PLANTING, HARVEST, OUTPUT AND YIELD:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Delanj-Habile	All Sample
1. All Sample	113	163	151	427
2. Farmers who planted millet (%) <u>1/</u>	10.6	1.2	0	3.3
3. Area planted per farm by those who actually planted (FD)	493	250	0	458
4. Those who had a harvest of millet (%)	67.0	50.0	0	63.6
5. Area harvested as percent of area planted	73.8	60.0	-	72.7
6. Area harvested per farm by those who had a harvest (FD)	545	300	-	518
7. Output per farm of those who had a harvest (MT)	51.75	18.9	-	48.1
8. Yield per feddan of harvested area (kgs/FD)	95.0	63.0	-	92.9
9. Yield per feddan of area planted (kgs/FD)	70.1	37.8	-	67.5

1/ All millet was produced on demarkated land.

Table 5.1

LABOR USE AND COSTS OF LAND CLEANING:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Area cleaned (FD)	1,830	62,960	320	65,110
2. Area cleaned as percent of area planted (%)	1.11	13.88	0.27	8.85
3. Mandays of labor used (No.)	1,930	69,180	600	71,710
4. Mandays of labor used per feddan cleaned (MD/FD)	1.06	1.10	1.88	1.10
5. Mandays of labor per feddan planted (MD/FD)	0.012	0.153	0.005	0.097
6. Total cost (LS)	14,440	292,470	490	307,400
7. Cost per feddan cleaned (LS/FD)	7.89	4.65	1.53	4.72
8. Cost per feddan of crop area planted (LS/FD)	0.09	0.65	0.004	0.42
9. Cost per feddan of crop harvested (LS/FD)	0.14	1.07	0.005	0.63
10. Wage per manday (LS)	7.48	4.23	0.82	4.29
11. Cost per ton of sorghum (LS/MT)	1.38	11.60	0.05	6.77
12. Cost per ton of sesame (LS/MT)	1.79	10.76	0.08	7.55
13. Cost per ton of millet (LS/MT)	1.28	17.19	-	6.22
<u>Cost Shares</u>				
14. Cash payment (%)	85.2	65.1	81.6	66.0
15. Water costs (%)	1.7	5.5	18.4	5.5
16. Food costs (%)	11.3	28.3	0	27.4
17. Transport costs (%)	1.9	1.1	0	1.1

Table 5.2

LABOR USE AND COSTS OF FIRST WEEDING OF SORGHUM:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farm which did first weeding (%)	90.3	87.7	97.4	91.8
2. Total areas weeded (FD)	108,330	304,560	96,530	509,420
3. Areas weeded as % of planted (%)	89.2	76.4	95.6	82.0
4. Areas weeded per farm-weeding (FD)	1,062	2,130	657	1,300
5. Total labor use (MD)	107,660	696,870	213,480	1,018,010
6. Labor use per feddan weeded (MD/FD)	0.99	2.29	2.21	2.00
7. Labor use per feddan planted (MD/FD)	0.89	1.75	2.11	1.64
8. Labor use per feddan harvested (MD/FD)	1.56	2.97	2.36	2.58
9. Total costs of first weeding (LS)	504,320	3,116,600	639,410	4,260,330
10. Costs per feddan weeded (LS/FD)	4.66	10.23	6.62	8.36
11. Costs per feddan planted (LS/FD)	4.15	7.82	6.33	6.86
12. Costs per feddan harvested (LS/FD)	7.30	13.29	7.07	10.81
13. Costs per ton. (LS/MT)	63.48	138.44	77.29	109.75
14. Average wage (LS/MD)	4.68	4.47	3.00	4.19
<u>Cost Shares</u>				
15. Cash payments (%)	79.81	71.70	52.55	69.78
16. Water costs (%)	1.81	1.13	1.30	1.24
17. Food costs (%)	16.20	26.02	45.71	27.82
18. Transport costs (%)	2.19	1.14	0.44	1.16

Table 5.3

LABOR USE AND COSTS OF SECOND WEEDING OF SORGHUM:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which did second weeding (%)	37.2	50.3	66.2	52.5
2. Total areas weeded (FD)	49,140	174,600	65,820	289,560
3. Areas weeded as % of planted	40.5	43.8	65.1	46.6
4. Areas weeded per farm-weeding (FD)	1,170	2,129	658	1,293
5. Total labor use (MD)	41,510	303,000	93,790	438,300
6. Labor use per feddan weeded (MD/FD)	0.85	1.74	1.42	1.51
7. Labor use per feddan planted (MD/FD)	0.34	0.76	0.93	0.71
8. Labor use per feddan harvested (MD/FD)	0.60	1.29	1.04	1.11
9. Total costs of second weeding (LS)	218,970	1,342,190	354,090	1,915,250
10. Costs per feddan weeded (LS/FD)	4.46	7.69	5.33	6.61
11. Costs per feddan planted (LS/FD)	1.80	3.37	3.51	3.08
12. Costs per feddan harvested (LS/FD)	3.17	5.72	3.91	4.86
13. Costs per ton (LS/MT)	27.57	59.58	42.73	39.34
14. Average wage (LS/MD)	5.28	4.43	3.78	4.37
<u>Cost Shares</u>				
15. Cash payments (%)	78.81	73.3	52.32	70.07
16. Water costs (%)	1.84	1.16	2.63	1.51
17. Food costs (%)	17.18	24.37	44.47	27.27
18. Transport costs (%)	2.17	1.14	0.58	1.16

Table 5.4

LABOR USE AND COSTS FOR HARVESTING OF SORGHUM:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which had a harvest (%)	49.6	77.3	93.8	75.6
2. Total areas harvested (FD)	69,070	234,520	90,449	394,049
3. Areas harvested as % of planted (%)	56.9	58.8	89.5	63.4
4. Areas harvested per farm-harvesting (FD)	1,233	1,861	642	1,220
5. Total labor use (MD)	120,910	371,630	313,870	806,410
6. Labor use per feddan harvested (MD/FD)	1.75	1.59	3.47	2.05
7. Labor use per feddan planted	1.00	0.93	3.11	1.30
8. Labor use per feddan for harvesting (MD/FD)	650,770	1,493,090	797,150	2,941,010
9. Costs per feddan harvested (LS/FD)	9.42	6.37	8.81	7.46
10. Costs per feddan planted (LS/FD)	5.36	3.74	7.89	4.73
11. Costs per ton (LS/MT)	83.65	66.35	96.28	75.74
12. Average wage (LS/MD)	5.38	4.02	2.54	3.65
<u>Cost Shares</u>				
13. Cash payments (%)	80.20	60.93	36.29	58.51
14. Water costs (%)	1.84	2.35	14.13	5.43
15. Food costs (%)	16.29	35.14	49.12	34.76
16. Transport costs (%)	1.67	1.58	0.47	1.30

Table 5.5

LABOR USE AND COSTS OF FIRST WEEDING OF SESAME:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Daianj-Habila	All Sample
1. Farms which planted Sesame (No.)	62	80	79	221
2. Farms which did first weeding (%)	98.4	68.3	84.8	89.1
3. Total areas weeded (FD)	37,830	41,830	14,490	94,150
4. Areas weeded as % of planted (%)	99.6	77.0	89.3	86.8
5. Areas weeded per farm-weeding (FD)	620	606	216	478
6. Total labor use (MD)	36,130	110,760	34,130	181,020
7. Labor use per feddan weeded (MD/FD)	0.96	2.65	2.36	1.92
8. Labor use per feddan planted (MD/FD)	0.95	2.03	2.10	1.67
9. Labor use per feddan harvested (MD/FD)	1.09	2.80	2.27	2.06
10. Total costs of first weeding (LS)	220,000	691,760	109,160	1,020,920
11. Costs per feddan weeded (LS/FD)	5.82	16.54	7.53	10.84
12. Costs per feddan planted (LS/FD)	5.79	12.73	6.73	9.41
13. Costs per feddan harvested (LS/FD)	6.63	17.47	7.25	11.62
14. Costs per ton (LS/MT)	115.10	210.81	128.14	168.82
15. Average wage (LS/MD)	6.09	6.25	3.20	5.64
<u>Cost Shares</u>				
16. Cash payments (%)	81.27	74.86	55.66	74.19
17. Water costs (%)	1.53	1.45	2.02	1.53
18. Food costs (%)	14.68	22.60	41.92	22.96
19. Transport costs (%)	2.53	1.10	0.39	1.33

Table 5.6

LABOR USE AND COSTS OF SECOND WEEDING OF SESAME:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which planted sesame (No.)	62	80	79	221
2. Farms which did second weeding (%)	66.1	58.8	22.8	48.0
3. Total areas weeded (FD)	29,440	29,090	3,190	61,720
4. Areas weeded as % of planted (%)	77.5	53.6	19.7	56.9
5. Areas weeded per farm-weeding (FD)	718	619	127	582
6. Total labor use (MD)	21,500	61,260	6,350	89,210
7. Labor use per feddan weeded (MD/FD)	0.73	2.10	1.99	1.45
8. Labor use per feddan planted (MD/FD)	0.57	1.13	0.39	0.82
9. Labor use per feddan harvested (MD/FD)	0.61	1.55	0.42	1.02
10. Total costs of second weeding (LS)	130,170	287,960	29,730	447,860
11. Costs per feddan weeded (LS/FD)	4.42	9.90	9.32	7.26
12. Costs per feddan planted (LS/FD)	3.43	5.30	1.83	4.13
13. Costs per feddan harvested (LS/FD)	3.92	7.27	1.98	5.10
14. Costs per ton (LS/MT)	68.06	87.73	35.00	74.10
15. Average wage (LS/MD)	6.03	4.70	4.68	5.02
<u>Cost Shares</u>				
16. Cash payments (%)	79.66	69.12	53.78	71.17
17. Water costs (%)	1.85	2.45	5.95	2.51
18. Food costs (%)	15.48	26.58	39.79	24.23
19. Transport costs (%)	3.01	1.85	0.47	2.09

Table 5.7

LABOR USE AND COSTS FOR HARVESTING OF SESAME:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which had planted (%)	62	80	79	221
2. Farms which had sesame harvest (%)	79.0	82.5	89.9	84.2
3. Total areas harvested (FD)	33,175	39,600	15,052	87,827
4. Areas harvested as % of planted (%)	87.4	72.9	92.9	80.9
5. Areas harvested per farm-harvesting (FD)	677	600	212	472
6. Total labor use (MD)	68,880	93,670	44,160	206,710
7. Labor use per feddan harvested (MD/FD)	2.08	2.37	2.93	2.35
8. Labor use per feddan planted (MD/FD)	1.81	1.72	2.72	1.90
9. Total labor costs for harvesting (LS)	395,240	656,390	158,720	1,210,350
10. Costs per feddan harvested (LS/FD)	11.91	16.58	10.54	13.78
11. Costs per feddan planted (LS/FD)	10.40	12.08	9.78	11.15
12. Costs per ton (LS/MT)	206.77	200.07	186.28	200.20
13. Average wage (LS/MD)	5.74	7.01	3.59	5.86
<u>Cost Shares</u>				
14. Cash payments (%)	82.54	74.49	62.86	75.60
15. Water costs (%)	1.90	4.06	4.64	3.43
16. Food costs (%)	13.40	19.32	31.91	19.04
17. Transport costs (%)	2.16	2.12	0.59	1.93

Table 5.8

COMPARISON OF LABOR USE IN RAINFED MECHANIZED PRODUCTION OF
SORGHUM AND SESAME (TOTAL SAMPLE)
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Mandays/FD	
	Sorghum	Sesame
1. Land cleaning		
- Areas actually cleaned	1.10	1.10
- Areas planted	0.097	0.097
2. First weeding		
- Areas actually weeded	2.00	1.92
- Areas planted	1.64	1.67
3. Second weeding		
- Areas actually weeded	1.51	1.45
- Areas planted	0.71	0.82
3. Harvesting		
- Areas harvested	2.05	2.35
- Areas planted	1.30	1.90
5. Threshing		
- Areas planted	0.005	0.608
6. Transport to market		
- Areas planted	0.050	0.055
7. Total	3.802	5.150 (1.3545) <u>1/</u>
8. Mandays/MT	61.322	92.470 (1.5077) <u>1/</u>

1/ These figures show that sesame crop uses 35.45% more labor than sorghum per feddan and 50.77% per ton.

TABLE 6.1

Management Costs: Farm survey of Rainfed Mechanized Areas, Sudan,
(1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Total Farms (No)	113	163	151	427
<u>A. Hired Managers</u>				
2. Total Number	73	247	117	437
3. Total cost (LS)	236500	808400	325200	1370100
4. Cost per manager (LS/year)	3240	3273	2779	3135
5. Total cropped area (FD)	165 7	453590	117251	736096
6. Management cost per FD of cropped area (LS/FD)	1.43	1.78	2.77	1.86
7. Cost per ton of sorghum (LS/MT)	22.00	31.79	33.78	30.00
8. Cost per ton of sesamee (LS/MT)	28.43	29.47	52.66	33.39
9. Cost per ton of millet (LS/MT)	20.40	47.09	-	27.56
<u>B. Farm Owners' Time</u>				
10. Owners' time spent for farm work (%)	60	108	46	73
11. Owners' total time (1X10) (years)	67.8	176.0	69.5	313.3
12. Total cost of ² owner's time (4X11) (LS)	219672	576048	193141	982196
13. Cost per feddan (LS/FD)	1.33	1.27	1.65	1.33
14. Cost per ton of sorghum (LS/MT)	20.5	22.7	20.1	21.5
15. Cost per ton of sesame (LS/MT)	26.4	21.0	31.4	23.9
16. Cost per ton of millet (LS/MT)	19.0	33.6	-	19.7

1. Sorghum + sesame + millet.

2. Assuming that the opportunity cost of owner's time is equivalent to that of a hired manager.

TABLE 6.2

COSTS OF PERMANENT LABOR: FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN,
(1984/85)

	Demazine	Gedarif	Delanj-Habila	All Sample
1. Total farms (no)	113	163	151	427
2. Permanent driver (no)	144	239	44	427
3. Salary of a permanent driver (LS/year)	880	792	1689	914
4. Total cost of permanent drivers (LS)	126700	189200	74300	390200
5. Seasonal drivers (no)	222	268	125	615
6. Cost of seasonal driver (LS/year/Dr)	193	190	407	235
7. Total cost of seasonal drivers (LS)	42900	51000	50900	144800
8. Guards (No)	158	295	232	685
9. Cost of a guard (LS/year/G)	598	409	457	469
10. Total cost of guards (LS)	94500	120500	105900	320900
11. Other permanent labor (No)	134	140	40	314
12. Cost of permanent labor (LS/year/ person)	352	404	485	392
13. Total cost of per- manent labor/LS	47200	56600	19400	123200
14. Other seasonal labor (No)	162	368	110	640
15. Cost of a seasonal laborer (LS/year/ person)	149	109	170	130
16. Total cost of seasonally employed labor (LS)	24200	40000	18700	82900
17. Total cost of all permanent labor (LS) (4+7+13+16)	335500	457000	269200	1062000
18. Total cropped area (FD)	165255	453590	117251	736096
19. Pemanent labor cost per feddan (LS/FD)	2.03	1.01	2.30	1.44
20. Cost per ton of sorghum (LS/MT)	31.23	18.04	28.05	23.23
21. Cost per ton of sesame	40.36	16.72	43.73	25.85
22. Cost per ton of millet (LS/MT)	28.96	26.72	-	21.33

1. Drivers, guards, and other permanent labor.

Table 7.1

LABOR USE AND COSTS FOR SORGHUM PRODUCTION (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine		Gedarif		Dalanj-Habila		All Sample	
	MD	LS	MD	LS	MD	LS	MD	LS
A. Casual Labor								
1. Land cleaning	0.012 (1.06)	0.09 (7.9)	0.153 (1.10)	0.65 (4.7)	0.005 (1.88)	0.004 (1.5)	0.097 (1.10)	0.42 (4.7)
2. First weeding	0.89 (0.99)	4.15 (4.66)	1.75 (2.29)	7.82 (10.23)	2.11 (2.21)	6.33 (6.62)	1.64 (2.00)	6.86 (8.36)
3. Second weeding	0.34 (0.85)	1.80 (4.46)	0.76 (1.74)	3.37 (7.60)	0.93 (1.42)	3.51 (5.38)	0.71 (1.51)	3.08 (6.61)
4. Harvesting	1.00 (1.75)	5.36 (9.42)	0.93 (1.59)	3.74 (6.37)	3.11 (3.47)	7.89 (8.81)	1.30 (2.05)	4.73 (7.46)
5. Threshing	0.005	0.02	0.005	0.02	0.005	0.02	0.005	0.02
6. Transport to market	0.03	0.18	0.04	0.15	0.08	0.22	0.05	0.18
7. All operations	2.28	11.60	3.638	15.75	6.24	17.97	3.602	15.29
8. Casual labor per MT of sorghum	35.08	178.46	64.96	281.25	76.09	219.15	61.32	246.61
B. Permanent Labor and Management								
9. Permanent labor	-	2.03	-	1.01	-	2.30	-	1.44
10. Hired management	-	1.43	-	1.78	-	2.77	-	1.86
11. Owner's time	-	1.33	-	1.27	-	1.65	-	1.33
12. Total permanent labor and management	-	4.79	-	4.06	-	6.72	-	4.63
13. Permanent labor and management costs per MT	-	73.69	-	72.50	-	81.95	-	74.68
C. Total Labor								
14. Total labor costs	-	16.39	-	19.81	-	24.69	-	19.92
15. Total labor per MT of sorghum	-	252.15	-	353.75	-	301.10	-	321.29

Note 1. Figures in parentheses are per feddan of area that was actually treated, e.g., cleaned, weeded, or harvested.

2. MD = mandays.

3. Yield of sorghum per feddan of area planted = 62 kgs.

Table 7.2

LABOR USE AND COSTS FOR SESAME PRODUCTION (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine		Gedarif		Dalanj-Habila		All Sample	
	MD	LS	MD	LS	MD	LS	MD	LS
A. <u>Casual Labor</u>								
1. Land cleaning	0.012 (1.06)	0.09 (7.9)	0.153 (1.10)	0.65 (4.7)	0.005 (1.88)	0.004 (1.5)	0.097 (1.10)	0.42 (4.7)
2. First weeding	0.95 (0.96)	5.79 (5.82)	2.03 (2.65)	12.73 (16.54)	2.10 (2.36)	6.73 (7.53)	1.67 (1.92)	9.41 (10.84)
3. Second weeding	0.57 (0.73)	3.43 (4.42)	1.13 (2.10)	5.30 (9.90)	0.39 (1.99)	1.83 (9.32)	0.82 (1.45)	4.13 (7.26)
4. Harvesting	1.81 (2.08)	10.40 (11.91)	1.72 (2.37)	12.08 (16.58)	2.72 (2.93)	9.78 (10.54)	1.90 (2.35)	11.15 (13.78)
5. Threshing	0.467	2.06	0.739	3.45	0.501	1.88	0.608	2.73
6. Transport to market	0.028	0.17	0.05	0.20	0.06	0.17	0.055	0.20
7. All operations	3.837	21.94	5.822	34.41	5.776	20.39	5.15	28.04
8. Casual labor per MT of Sesame	76.28	363.24	96.39	569.70	109.81	387.64	92.46	503.41
B. <u>Permanent Labor and Management</u>								
9. Permanent labor	-	2.03	-	1.01	-	2.30	-	1.44
10. Hired management	-	1.43	-	1.78	-	2.77	-	1.86
11. Owner's time	-	1.33	-	1.27	-	1.65	-	1.33
12. Total permanent labor and management	-	4.79	-	4.06	-	6.72	-	4.63
13. Permanent labor and managements costs per MT	-	76.30	-	67.22	-	127.76	-	83.12
C. <u>Total Labor</u>								
14. Total labor	-	26.73	-	38.47	-	27.11	-	32.67
15. Total labor per MT of sesame	-	442.54	-	636.92	-	515.40	-	586.54

Note 1. Figures in parentheses are per feddan of areas that actually were treated, e.g., cleaned, weeded, or harvested.

Table 8.1

MARKET VALUE OF FARM MACHINERY AND EQUIPMENT IN 1984/85 PRICES:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Total farmers (No.)	113	163	151	427
2. Farmers with tractors (No.)	104	155	143	402
3. Number of tractors	166	350	137	653
4. Market value of tractors (LS)	3,058,000	6,013,000	2,117,000	11,188,000
5. Market value of one tractor (LS/TR)	18,422	17,180	15,450	17,130
6. Total market value of equipment (LS)	1,984,000	2,934,000	768,000	5,686,000
7. Market value of equipment per tractor (LS)	11,951	8,383	5,606	8,708
8. Farmers with threshers (No.)	14	43	13	70
9. Total threshers (No.)	18	50	15	83
10. Total market value of threshers (LS)	756,000	1,697,000	441,000	2,894,000
11. Average market value of a thresher (LS/TH)	42,000	33,940	29,400	34,867
12. Total market value of lorries, etc. (LS)	203,000	715,000	543,000	1,416,000
13. Total market value of tractors and equipment, etc. (4+6) (LS)	5,042,000	8,947,000	2,885,000	16,874,000
14. Depreciated annual cost of tractors and equipment <u>1/</u> (LS)	1,014,969	1,801,056	580,759	3,396,784
15. Depreciated annual cost of lorries <u>1/</u> (LS)	40,864	143,932	109,307	294,103
16. Depreciated annual cost of threshers <u>2/</u> (LS)	133,800	300,342	78,050	512,192

1/ Assuming remaining life of 8 years and interest rate of 12 percent.

2/ Assuming remaining life of 10 years and interest rate of 12 percent.

Table 8.2

USE OF OWN TRACTORS (ONLY) IN SORGHUM PRODUCTION:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which used own tractors for land preparation (No.)	104	141	143	388
2. Total tractor use for land preparation (Hrs.)	25,030	63,932	19,885	108,847
3. Tractor use per farm for land preparation (Hrs.)	240.7	453.4	139.1	280.5
4. Areas ploughed per hour (FD)	5.1	5.4	5.0	5.2
5. Tractor use per feddan ploughed (Hrs.)	0.1961	0.1852	0.2000	0.1923
6. Use of gasoil per hour of ploughing (Gls./Hr.)	2.1	2.4	2.8	2.4
7. Use of gasoil per feddan for ploughing (Gls./FD)	0.41	0.44	0.56	0.46
8. Tractor use for ploughing per feddan of total sorghum area planted by all sample farms (Hrs./FD)	0.2062	0.1603	0.1968	0.175 ²
9. Tractor use for ploughing per feddan of total sorghum area harvested by all sample farms (Hrs./FD)	0.3624	0.2726	0.2198	0.2762
10. Total tractor use for planting sorghum (Hrs.)	24,609	71,869	20,825	117,303
11. Farms which used owned tractors for planting (No.)	106	155	151	412
12. Tractor use per farm for planting (Hrs.)	232.2	463.7	137.9	284.7
13. Area planted per hour using own tractors (FD)	5.0	5.3	5.0	5.1
14. Tractor use per feddan for planting (Hrs.)	0.2000	0.1887	0.2000	0.1961
15. Use of gasoil per hour for planting (Gls./Hr.)	2.1	2.4	2.8	2.5
16. Use of gasoil per feddan for planting (Gls./FD)	0.42	0.45	0.56	0.49
17. Tractor use for planting - per feddan of area harvested (Hrs./FD)	0.3563	0.3064	0.2302	0.2977
18. Tractor use for land preparation and planting - per feddan of total area planted to sorghum (8+14) (Hrs./FD)	0.4062	0.3490	0.3968	0.3713
19. Tractor use for land preparation and planting - per feddan of total area harvested of sorghum (9+17) (Hrs./FD)	0.7183	0.5790	0.4500	0.5739
20. Own tractor use per ton of sorghum (Hrs./MT)	6.2461	6.0313	4.9180	5.8264

Table 8.3

USE OF OWN TRACTOR (ONLY) IN SESAME PRODUCTION:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN - (1984/85)

	Demazine	Gedarif	Dalanj- Habla	All Sample
1. Farms which used own tractor for land preparation (No.)	55	59	74	188
2. Total tractor use for land preparation (Hrs)	7,687	7,124	3,303	18,114
3. Area ploughed per hour (FD/Hr)	5.16	5.47	4.96	5.18
4. Tractor use per feddan ploughed (Hrs/FD)	0.1937	0.1828	0.2016	0.1930
5. Use of gasoil per hour ploughing (Gls/Hr)	2.05	2.38	2.69	2.41
6. Use of gasoil per feddan for ploughing for sesame (Gls/FD)	0.3972	0.4351	0.5423	0.4652
7. Tractor use for land preparation per feddan of total sesame area planted by all sample farms (Hrs/FD)	0.2024	0.1311	0.2035	0.1669
8. Tractor use per feddan of total sesame area harvested by all sample farms (Hrs/FD)	0.2315	0.1798	0.2190	0.2063
9. Farms which used own tractors for sesame planting	57	72	79	208
10. Total tractor use for planting of sesame (Hrs)	7,720	8,563	3,481	19,764
11. Area planted per hour (FD/Hr)	5.14	5.31	4.91	5.11
12. Tractor use per feddan for planting (Hrs/FD)	0.1945	0.1883	0.2036	0.1956
13. Use of gasoil per hour for planting (Gls/Hr)	2.09	2.45	2.73	2.46
14. Use of gasoil per feddan for planting	0.4066	0.4613	0.5560	0.4814
15. Tractor use for land preparation and planting per feddan of total area planted to sesame (7+12) (Hrs/FD)	0.3969	0.3194	0.4071	0.3625
16. Tractor use for land preparation and planting per feddan of total sesame area harvested (Hrs/FD)	0.4541	0.4381	0.4382	0.4480

Table 8.4

SAMPLE FARMERS' PURCHASES OF FUEL:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All sample
1. No. of sample farmers	113	163	151	427
<u>A. Gasoil</u>				
2. Farmers who purchased (No.)	107	151	150	408
3. Quantity purchased (BLS)	3,617	9,484	2,765	15,866
4. Quantity purchased per farm by purchasers only (BLS/farm)	33.8	62.8	18.4	38.9
5. Total purchase cost (LS)	517,700	1,148,900	634,400	2,301,000
6. Purchase price (LS/GL)	3.75	2.75	5.21	3.30
7. Crop area planted (FD)	165,255	453,590	117,251	736,096
8. Quantity purchased per feddan planted (GL/FD)	0.91	0.92	1.04	0.95
9. Purchase cost per feddan planted (LS/FD)	3.13	2.52	5.41	3.13
<u>B. Benzine</u>				
10. Farmers who purchased (No.)	0	7	0	7
11. Quantity purchased (BLS)	0	42	0	42
12. Quantity purchased per farm (BLS/farm)	0	6	0	6
13. Total purchase cost (LS)	0	7,800	-	7,800
14. Purchase price (LS/GL)	0	4.22	0	4.22
15. Purchase cost per feddan planted (LS/FD)	0	0.02	0	0.01
<u>C. Oil and Lubricants</u>				
16. Purchase cost of oil and lubricants (LS)	84,900	170,800	139,900	395,600
17. Purchase cost per feddan (LS/FD)	0.51	0.39	1.19	0.54
<u>D. All Fuel</u>				
18. Purchase cost per feddan (LS/FD)	3.64	2.92	6.60	3.68
<u>E. MFC and Market Prices of Gasoil</u>				
19. Average price charged by MFC (LS/GL)	2.82	2.32	3.78	2.71
20. Farmers who purchased gasoil in the market (No.)	25	43	104	172
21. Price paid in the market (LS/GL)	4.13	4.88	5.83	5.34

BLS = Barrels; barrel = 44 GLs)
GL = Gallon

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Table 8.5

TRACTOR RENTAL RATES
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Farms which received tractor rental services for land preparation and planting (%)	12.4	2.5	19.9	11.2
2. Rental rates per feddan actually ploughed or planted (LS/FD)	12.9	5.3	4.6	5.2
3. Rental rates per hour (LS/Hr)	65.8	28.5	22.0	26.6
4. Total rental costs (LS)	78,600	29,200	116,800	224,600
5. Rental costs for ploughing-planting per feddan of total crop areas planted by sample farmers (LS/FD)	0.48	0.07	1.00	0.31
6. Total tractor rental income of all sample farmers (LS)	53,100	32,200	24,000	109,300
7. Net costs incurred by sample farmers for renting tractors (LS)	25,500	-3,000	92,800	115,300
8. Net use of rented tractors by sample farmers (Hrs)	386	-105	4,052	4,333
9. Net rental costs per feddan of crop area planted by all sample farmers (LS/FD)	0.15	-0.007	0.79	0.16
10. Net rental costs of tractors per ton of sorghum (LS/MT)	2.30	-0.13	9.63	2.58
11. Net rental costs of tractors per ton of sesame (LS/MT)	2.98	-0.12	15.01	2.87
12. Net rental costs of tractors per ton of millet (LS/MT)	2.14	-0.19	-	2.37

Note: Crop areas planted in item 9 include all areas planted to sorghum, sesame and millet crops.

Table 8.6

TOTAL USE OF TRACTORS (HRS) BY SAMPLE FARMERS AND COSTS OF USE PER HOUR:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
A. Land Preparation				
1. Sorghum	25,030	63,932	19,885	108,847
2. Sesame	7,687	7,124	3,303	18,114
3. Millet	1,030	0	0	1,030
4. Total	33,747 (50.2)	71,056 (46.9)	23,188 (48.8)	127,991 (48.1)
B. Planting				
5. Sorghum	24,609	71,869	20,825	117,303
6. Sesame	7,720	8,563	3,481	19,764
7. Millet	1,133	0	0	1,133
8. Total	33,462 (49.8)	80,432 (53.1)	24,306 (51.2)	138,200 (51.9)
C. Prep. + Planting				
9. Sorghum	49,639(74)	135,801(90)	40,710(86)	226,150(85)
10. Sesame	15,407(23)	15,687(10)	6,784(14)	37,878(14)
11. Millet	2,163(3)	0(0)	0(0)	2,163(1)
12. Total -- all three crops	67,209(100)	151,488(100)	47,494(100)	266,191(100)
D. Total Use for Sorghum				
13. Land preparation (Hrs)	25,030	63,932	19,885	108,847
14. Planting (Hrs)	24,609	71,869	20,825	117,303
15. Total (Hrs)	49,639(22) (74)	135,801(60) (90)	40,710(18) (86)	226,150(100) (86)
E. Total Use for Sesame				
16. Land preparation (Hrs)	7,687	7,124	3,303	18,114
17. Planting (Hrs)	7,720	8,563	3,481	19,764
18. Total (Hrs)	15,407(41) (23)	15,687(41) (10)	6,784(18) (14)	37,878(100) (14)
F. Total Use for Millet				
19. Land preparation (Hrs)	1,030	-	-	1,030
20. Planting (Hrs)	1,133	-	-	1,133
21. Total (Hrs)	2,163 (3)	- (0)	- (0)	2,163(100) (1)
22. Annual depreciation and interest costs of tractors and equipment (LS)				
	1,014,969(30)	1,801,056(53)	580,759(17)	3,396,784(100)
23. Depreciation and interest costs of tractors and equipment per hour (LS/Hr)				
	15.10	11.89	12.23	12.76
24. Use of gasoil (GL/Hr)				
	2.1	2.4	2.8	2.5
25. Cost of gasoil per hour (LS/Hr)				
	6.83	6.60	14.59	8.25
26. Cost of oil and lubricants (LS/Hr)				
	1.26	1.13	2.95	1.49
27. Depreciation, interest and fuel costs of use of own tractors and equipment(LS/Hr)				
	23.19	19.62	29.77	22.50
28. Net total rental costs (LS)				
	25,500	-3,000	92,800	115,300
29. Net rental hours of use (Hrs)				
	386	-105	4,052	4,333
30. Weighted average cost of tractor services per hour (LS/Hr)				
	23.43	19.61	29.23	22.57

Table 8.7

OWNERSHIP, MARKET VALUE AND USE OF THRESHERS FOR
THRESHING SORGHUM: FARM SURVEY OF RAINFED MECHANIZED AREAS,
SUDAN - (1984/85)

	Demazine	Gedarif	Dalanj- Habla	All Sample
1. Sample size	113	163	151	427
2. Farmers with threshers (No.)	14	43	13	70
3. Number of threshers	18	50	15	83
4. Threshers per farm-owning (No.)	1.3	1.2	1.2	1.2
5. Total market value of threshers (LS)	756,000	1,697,000	441,000	2,894,000
6. Average market value of a thresher (LS/Thresher)	42,000	33,940	29,400	34,867
7. Own sorghum threshed (MT)	3,354.3	14,314.6	683.2	18,352.1
8. Sorghum threshed for others on rental basis (MT)	8,153.4	1,505.9	251.3	9,910.6
9. Income from threshing (LS/sack)	1.6	2.3	1.7	1.7
10. Total income from threshing (LS)	143,500	38,100	4,700	186,300
11. Total sorghum threshed by threshers owned by sample farmers - (7+8) (MT)	11,507.7	15,820.5	934.5	28,262.7
12. Sorghum threshed per owned thresher (MT)	639.3	316.4	62.3	340.5
13. Sample farmers who rented threshers from others (No.)	37	72	116	225
14. Total rental costs of sorghum threshing paid by sample farmers (LS)	74,600	183,100	136,000	393,700
15. Quantity of sorghum threshed for which rental costs were paid out by sample farmers (MT)	4,238.6	7,237.2	7,272.7	18,748.5
16. Total quantity of sorghum of sample farmers threshed by threshers - (7+15) (MT)	7,592.9	21,551.8	7,955.9	37,100.6
17. Total sorghum output (MT)	7,937.8	22,526.7	8,268.0	38,732.5
18. Sorghum threshed by means other than threshers (MT)	344.9	974.9	312.1	1,631.9

Table 8.8

COSTS OF THRESHER USE PER METRIC TON OF SORGHUM:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Number of threshers	18	50	15	83
2. Annual depreciation and interest costs (LS)	133,800	300,342	78,050	512,192
3. Own sorghum threshed (MT)	3,354.3	14,314.6	683.2	18,352.1
4. Sorghum threshed for others on rental basis (MT)	8,153.4	1,505.9	251.3	9,910.6
5. Total sorghum threshed by threshers owned by sample farmers (MT)	11,507.7	15,820.5	934.5	28,262.7
6. Depreciation and interest costs per ton of sorghum threshed (LS/MT)	11.63	18.98	83.52	18.12
7. Use of gasoil per ton (Gls/MT)	0.78	0.78	0.78	0.78
8. Cost of gasoil and lubricants (LS/MT)	2.54	2.15	4.06	2.57
9. Depreciation, interest and fuel costs of threshing (LS/MT)	14.17	21.13	87.58	20.69
10. Depreciation, interest and fuel costs of threshing (LS/sack)	1.29	1.92	7.96	1.88
11. Depreciation, interest and fuel costs of threshing per feddan of planted sorghum (LS/FD)	0.92	1.18	7.18	1.28

Table 8.9

USE AND COSTS OF FARM MACHINERY AND EQUIPMENT FOR SORGHUM PRODUCTION (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine		Gedarif		Dalanj-Habila		All Sample	
	Units	LS	Units	LS	Units	LS	Units	LS
1. Land preparation								
- Tractor use (Hrs)	0.2062	3.11	0.1603	1.90	0.1968	2.41	0.1752	2.24
- Fuel use (Gls)	0.41	1.33	0.44	1.21	0.56	2.92	0.46	1.52
- Lubricants (LS)	-	0.51	-	0.38	-	1.19	-	0.54
- Total (LS)	-	4.95	-	3.49	-	6.52	-	4.30
2. Planting								
- Tractor use (Hrs)	0.2000	3.02	0.1887	2.24	0.2000	2.45	0.1961	2.50
- Fuel use (Gls)	0.42	1.37	0.45	1.24	0.56	2.92	0.49	1.62
- Lubricants (LS)	-	0.51	-	0.38	-	1.19	-	0.54
- Total (LS)	-	4.90	-	3.86	-	6.56	-	4.66
3. Land preparation and planting								
- Tractor use (Hrs)	0.4062	6.13	0.3490	4.14	0.3968	4.86	0.3613	4.74
- Fuel use (Gls)	0.83	2.70	0.89	2.45	1.12	5.84	0.95	3.14
- Lubricants (LS)	-	1.02	-	0.76	-	2.38	-	1.08
- Total (LS)	-	9.85	-	7.35	-	13.08	-	8.96
4. Threshing								
- Thresher use (Hrs)	0.012	0.76	0.010	1.06	0.015	6.85	0.011	1.12
- Fuel use ^{1/} (Gls)	0.051	0.17	0.044	0.12	0.064	0.33	0.048	0.16
- Total (LS)	-	0.93	-	1.18	-	7.18	-	1.28
5. Transport to market (Sacks/FD)								
	0.71	1.93	0.61	1.66	0.90	3.62	0.68	2.17
6. Total (LS)								
	-	12.71	-	10.19	-	23.88	-	12.41

^{1/} Including oil and lubricants.

Table 8.10

USE AND COSTS OF FARM MACHINERY AND EQUIPMENT FOR SESAME PRODUCTION (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine		Gedarif		Dalanj-Habila		Total Sample	
	Units	LS	Units	LS	Units	LS	Units	LS
1. Land preparation								
- Tractor use (Hrs)	0.2024	3.04	0.1311	1.56	0.2035	2.49	0.1669	2.13
- Fuel use (Gls)	0.3972	1.29	0.4351	1.20	0.5423	2.83	0.4652	1.54
- Lubricants (LS)	-	0.51	-	0.38	-	1.19	-	0.54
- Total (LS)	-	4.84	-	3.14	-	6.51	-	4.21
2. Planting								
- Tractor use (Hrs)	0.1945	2.94	0.1883	2.24	0.2036	2.49	0.1956	2.50
- Fuel use (Gls)	0.4066	1.32	0.4613	1.27	0.5560	2.90	0.4814	1.59
- Lubricants (LS)	-	0.51	-	0.38	-	1.19	-	0.54
- Total (LS)	-	4.77	-	3.89	-	6.58	-	4.63
3. Land preparation and planting								
- Tractor use (Hrs)	0.3969	5.98	0.3194	3.80	0.4071	4.98	0.3625	4.63
- Fuel use (Gls)	0.8038	2.61	0.8964	2.47	1.0983	5.73	0.9466	3.13
- Lubricants (LS)	-	1.02	-	0.76	-	2.38	-	1.08
- Total (LS)	-	9.61	-	7.03	-	13.09	-	8.84
4. Transport to market (sacks/FD)	0.68	1.71	0.82	1.92	0.71	2.23	0.75	1.99
5. Total (LS)	-	11.32	-	8.95	-	15.32	-	10.83

Table 9.1

COST OF PRODUCING SORGHUM (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

Sample size:	Demazine 113		Gedarif 163		Delanj-Habila 151		All Sample 427	
	Units	LS	Units	LS	Units	LS	Units	LS
1. Rental value of land (LS)	1	3.1	1	4.8	1	3.9	1	3.9
2. Land tax (LS) <u>1/</u>	1	1.0	1	1.0	1	1.0	1	1.0
3. Seed (Kgs) <u>2/</u>	3.6	1.77	3.6	1.77	3.6	1.77	3.6	1.77
4. Labor								
- Casual (MD)	2.28	11.60	3.63	15.75	6.24	17.97	3.80	15.29
- Permanent	-	2.03	-	1.01	-	2.30	-	1.44
- Manager	-	1.43	-	1.78	-	2.77	-	1.86
- Owner	-	1.33	-	1.27	-	1.65	-	1.33
Total Labor	-	16.39	-	19.81	-	24.69	-	19.92
5. Machinery								
(a) Land preparation & planting								
- Tractor use (Hrs)	0.4063	6.13	0.3490	4.14	0.3968	4.86	0.3613	4.74
- Fuel use (Gls)	0.83	2.70	0.49	2.45	1.12	5.83	0.95	3.14
- Lubricants (LS)	-	1.02	-	0.76	-	2.38	-	1.08
- Total (LS)	-	9.85	-	7.35	-	13.08	-	8.96
(b) Threshing								
- Thresher use (Hrs)	0.012	0.76	0.010	1.06	0.015	6.85	0.011	1.12
- Fuel and lubricants (Gls)	0.051	0.17	0.044	0.12	0.064	0.33	0.048	0.16
- Total (LS)	-	0.93	-	1.18	-	7.18	-	1.28
(c) Transport to market								
- Sacks/FD	0.71	1.93	0.61	1.66	0.90	3.26	0.68	2.17
Total (LS)	-	12.71	-	10.19	-	23.88	-	12.41
6. Sacks and strings (Sacks/FD)	0.71	0.78	0.61	0.67	0.90	0.99	0.68	0.75
Total (LS/FD)	-	35.75	-	38.24	-	55.87	-	39.75
Total (LS/MT)	-	553.87	-	689.57	-	682.86	-	643.01
Total (LS/sack)	-	50.35	-	62.69	-	62.08	-	58.46

1/ Local taxes which vary in different areas are not included here.

2/ Sorghum seed is priced at LS 45/sack of 91.5 Kgs.

Table 9.2

COST OF PRODUCING SESAME (PER FEDDAN PLANTED):
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/84)

Sample size	Demazine 113		Gedarif 163		Dalanj-Habila 151		Total Sample 427	
	Units	LS	Units	LS	Units	LS	Units	LS
1. Rental value of land (LS)	1	3.1	1	4.8	1	3.9	1	3.9
2. Land tax (LS) <u>1/</u>	1	1.0	1	1.0	1	1.0	1	1.0
3. Seed (kgs) <u>2/</u>	2.5	3.04	2.5	3.04	2.5	3.04	2.5	3.04
4. Labor								
- Casual (MD)	3.94	23.16	5.76	35.84	4.85	20.60	5.15	28.99
- Permanent (LS)	-	2.03	-	1.01	-	2.30	-	1.44
- Manager (LS)	-	1.43	-	1.78	-	2.77	-	1.86
- Owner (LS)	-	1.33	-	1.27	-	1.65	-	1.33
Total labor	-	27.95	-	39.90	-	27.32	-	33.62
5. Machinery								
(a) Land preparation & planting								
- Tractor use (Hrs)	0.3969	5.98	0.3194	3.80	0.4071	4.98	0.3625	4.63
- Fuel use (Gls)	0.8038	2.61	0.8964	2.47	1.0983	5.73	0.9466	3.13
- Lubricants (LS)	-	1.02	-	0.76	-	2.38	-	1.08
Total (LS)	-	9.61	-	7.03	-	13.09	-	8.84
(b) Transport to market								
- Sacks/FD	0.68	1.71	0.82	1.92	0.71	2.23	0.75	1.99
Total (LS)	-	11.32	-	8.95	-	15.32	-	10.83
6. Sacks and strings (Sacks/FD)	0.68	0.75	0.82	0.90	0.71	0.78	0.75	0.83
Total (LS/FD)	-	47.16	-	58.59	-	51.36	-	53.22
Total (LS/MT)	-	936.26	-	964.59	-	976.56	-	957.96
Total (LS/Sack)	-	69.35	-	71.45	-	72.34	-	70.96

1/ Local taxes which vary in different areas are not included here.

2/ Sesame seed is priced at LS 90/sack of 74 Kgs.

Table 9.3

INPUT COST SHARES IN THE PRODUCTION OF SORGHUM AND SESAME:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Cost Shares			
	Sorghum		Sesame	
	LS/FD	%	LS/FD	%
A. <u>Land</u>				
1. Rental value of land	3.9	9.8	3.9	7.3
2. Land tax	1.0	2.5	1.0	1.9
Total land	(4.9)	(12.3)	(4.9)	(9.2)
B. <u>Materials</u>				
1. Seeds	1.77	4.5	3.04	5.7
2. Sacks and strings	0.75	1.9	0.83	1.6
Total materials	(2.52)	(6.4)	(3.87)	(7.3)
C. <u>Labor</u>				
1. Fixed labor costs				
- Permanent labor	1.44	3.6	1.44	2.7
- Hired management	1.86	4.7	1.86	3.5
- Owner and family	1.33	3.3	1.33	2.5
Total fixed labor	4.63	11.6	4.63	8.7
2. Casual labor	15.29	38.5	28.99	54.5
Total labor	(19.92)	(50.1)	(33.62)	(63.2)
D. <u>Machinery</u>				
1. Depreciation and interest	5.86	14.7	4.63	8.7
2. Fuel	4.38	11.0	4.21	7.9
Total depreciation, interest and fuel	10.24	25.7	8.84	16.6
3. Transport to market	2.17	5.5	1.99	3.7
Total machinery	(12.41)	(31.2)	(10.83)	(20.3)
Total	39.75	100.0	53.22	100.0

Table 10.1

LAND PROBLEMS:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
2. Farms which have flood problem	(No.) 20	22	67	109
	(%) 17.7	13.5	44.4	25.5
3. Percent of area of affected farms which gets flood	(%) 33.6	26.8	11.1	17.9
4. Sample area which gets flood	(%) 6.0	3.6	4.9	4.6
5. Farms which get flood erosion	(No.) 16	17	36	69
	(%) 14.2	10.4	23.8	16.2
6. Area of affected farms which gets flood erosion	(%) 22.3	17.5	11.3	15.3
7. Sample area which has flood erosion problem	(%) 3.2	1.8	2.7	2.5
8. Farms which suffer from wind erosion	(No.) 6	42	11	59
	(%) 5.3	25.8	7.3	13.8
9. Area of affected farms which suffer from wind erosion	(%) 36.7	34.4	33.7	34.5
10. Sample area which suffers from wind erosion	(%) 2.0	8.9	2.5	4.8
11. Farmers who indicated their land needs deep ploughing	(No.) 36	117	72	225
	(%) 31.9	71.8	47.7	52.7
12. Area of farms indicating the need for deep ploughing	(%) 78.3	77.8	92.6	82.7
13. Sample area which needs deep ploughing	(%) 25.0	55.9	44.2	43.6
14. Number of years after land clearing that yields start to decline	(No.) 4.5	5.5	5	5

Table 10.2

REASONS FOR NON-USE OF FERTILIZER:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
<u>Reasons for non-use:</u>				
2. Fertilizer not available				
(No.)	101	143	138	382
(%)	89.4	78.7	91.4	89.5
- Percent of which indicated non-availability as:				
- the most important reason (%)	13.9	17.5	35.5	23.0
- the second most important reason (%)	22.8	22.4	9.4	17.8
- the least important reason (%)	63.8	60.1	55.1	59.2
3. Fertilizer use not profitable				
(No.)	98	143	138	379
(%)	86.7	87.7	91.4	88.8
- Percent of which indicated lack of profitability as:				
- the most important reason (%)	2.0	19.6	42.0	23.2
- the second most important reason (%)	65.3	58.7	29.7	49.9
- the least important reason (%)	32.7	21.7	28.3	26.9
4. Not enough knowledge about fertilizer				
(No.)	100	147	138	385
(%)	88.5	90.2	91.4	90.2
- Percent of which indicated lack of knowledge as:				
- the most important reason (%)	85.0	64.6	22.5	54.8
- the second most important reason (%)	13.0	18.4	60.9	32.2
- the least important reason (%)	2.0	17.0	16.6	13.0

Table 10.3

FARMERS' PERCEPTIONS ABOUT OCCURRENCE OF DROUGHT,
PESTS, DISEASES, AND STRIGA:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
1. Sample size	113	163	151	427
2. Occurrence of drought:				
- Number of respondents	106	148	125	375
- Probability of occurrence of drought (%)	15.4	32.4	17.4	22.4
3. Occurrence of pests and diseases:				
<u>Sorghum</u>				
- Number of respondents	23	80	19	122
- Probability of occurrence of pests and diseases (%)	20.6	37	9.9	29.7
<u>Sesame</u>				
- Number of respondents	32	17	9	58
- Probability of occurrence of pests and diseases (%)	19.8	37.5	8.2	23.2
4. Occurrence of striga				
- Number of respondents	0	63	6	69
- Probability of occurrence of striga (%)	-	46.2	8.3	42.9
5. Occurrence of floods:				
- Number of respondents	17	35	4	56
- Probability of occurrence (%)	14.7	25.1	20	21.6

Table 10.4

FARMERS' ASSESSMENT OF OPPORTUNITY COST OF LAND:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	No.	LS/FD
Demazine	113 (98.2)	3.1
Gedarif	163 (62.0)	4.8
Dalanj-Habila	151 (49.0)	3.9
All Sample	427 (67.0)	3.9

Note: Figures in parentheses indicate the percent of sample farmers who responded.

Table 11.1

FARM TO MARKET TRANSPORT COSTS FOR SORGHUM AND SESAME:
FARM SURVEY OF RAINFED MECHANIZED AREAS, SUDAN (1984/85)

	Demazine	Gedarif	Dalanj-Habila	All Sample
<u>Sorghum</u>				
1. Number of observations	39	92	78	209
2. Average load per farm (MT)	148.6	171.1	57.8	124.6
3. Average distance (KM)	62.5	91.0	146.0	106.2
4. Transport costs - per ton per kilometer (LS/MT/KM)	0.762	0.465	0.588	0.566
5. Transport costs - per ton per farm (LS/MT)	29.7	29.6	44.1	35.0
<u>Sesame</u>				
1. Number of observations	33	59	46	138
2. Average load per farm (MT)	34.9	43.2	14.3	31.6
3. Average distance (Km)	64.6	102.2	116.2	97.9
4. Transport costs - per ton per kilometer (LS/MT/KM)	0.850	0.441	0.616	0.597
5. Transport costs - per ton per farm (LS/MT)	33.9	31.8	42.3	35.8

Table 11.2

REGRESSION ESTIMATES OF FARM TO MARKET TRANSPORT COSTS
(PER TON PER KILOMETER):
FARM SURVEY OF MECHANIZED RAINFED AREAS, SUDAN (1984/85)

Sorghum

1. Linear : $TRCTK = 0.8122 + 0.1865DDM + 0.345DHB - 0.0039DSM + 0.0001LOD$
(1.410) (3.022) (6.424) (0.276)

$n = 209 ; R^2 = 0.189$

2. Logarithmic : $LNTRCTK = 1.9341 + 0.1950DDM + 0.3270DHB - 0.6989LNDSM +$
(2.269) (4.673) (18.831)

$0.0005LNLOD$
(0.022)

$n = 209 ; R^2 = 0.676$

Sesame

3. Linear : $TRCTK = 0.8470 + 0.2527DDM + 0.2618DHB - 0.0044DSM + 0.0009LOD$
(2.203) (2.469) (6.696) (0.970)

$n = 138 ; R^2 = 0.306$

4. Logarithmic : $LNTRCTK = 2.0369 + 0.1828DDM + 0.2206DHB - 0.7072LNDSM +$
(1.824) (2.437) (14.971)

$0.0194LNLOD$
(0.723)

$n = 138 ; R^2 = 0.433$

Sorghum and Sesame Combined

5. Linear : $TRCTK = 0.8257 + 0.2212DDM + 0.3077DHB + 0.0040DC - 0.0040DSM +$
(2.446) (3.847) (0.057) (8.930)

$0.0001LOD$
(0.343)

$n = 347 ; R^2 = 0.221$

6. Logarithmic : $LNTRCTK = 1.9168 + 0.1941DDM + 0.2870DHB + 0.0883DC -$
(2.993) (5.217) (1.643)

$0.7005LNDSM + 0.0107LNLOD$
(24.123) (0.604)

$n = 347 ; R^2 = 0.678$

Note: Figures in parentheses are t-values.