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CHAPTER VI

Marketing, Credit and the Rate of Implicit Interest in the Informal Sector

6.1 Setting

The question of interest rate determination in the rural areas of underdeveloped countries has drawn the attention of economists for a long time. Some have asserted that the village moneylender is either a monopolist or an oligopolist and that he takes advantage of his monopolistic postion to charge interest rates higher than the cost of the services he provides. Other economists recognised the high rates of interest which obtain throughout the rural money markets of underdeveloped world but believe the premia for risk and administration charges to be the major determinants of this high level.

In this chapter an attempt will be made to test the validity of these hypothesis with regard to the interest rate charged by the 'shail' merchants in the Gezira Scheme. The results of this investigation will throw light on the relationship between the 'shail' merchants and the tenant farmers, the working operations of the 'shail' merchants and the influence of their lending practices on investment and income distribution.

The discussion in this chapter falls into three sections In the first section a brief description of the environment in which the shail merchants operate is given in order to identify the social, marketing and credit services they provide. The second section discusses the interest rate charged by the shail

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merchants and attempts to establish and quantify the factors determining its level. In the final section, these a priori assumptions about the relevant factors which influence the shail merchants rates will be empirically tested to estimate their relationship and importance. The conclusion that the high interest rates charged by 'shail' merchants in the Gezira Scheme are due to both monopoly exploitation and the high costs throws some light onto the continuing controversy and conflicting beliefs about the behaviour of moneylenders in third world countries.

6.2 The Social System and Development of Economic Systems in the Gezira Scheme

The Gezira Scheme, as was stated earlier, differs from areas of traditional or improved agriculture in being artificially resettled after the introduction of a major irrigation scheme. Bias towards the previous land owners in the allocation of tenancies was practised. The tenants were resettled in their traditional localities or in areas opposite their traditional localities. The settlers from Western Sudan form the major labour force and those from the North engaged mainly in trade and shopkeeping.

The most important features of the social system were the very strong family ties and the common ownership of property maintained by the extended family. However, the economic changes like, for example, those following the 1930's depression and the 1950 Korean War have exerted an important influence on the social system, more especially in the diversification of employment, with some of the natives entering the field of trade and shopkeeping and the evolution of semi-

individualistic and acquisitive modes of behaviour.

The history of 'shail' credit in the Gezira Scheme is not known but the available evidence suggests its unimportance before the end of the depression period. In the early 1940's as stated by Gaitskell (1959), the problem of debts in the villages had emerged very clearly and loans on extortionate conditions were being made.

With the combination of high cotton price following the Korean war and high cotton yields in 1951, the average profit per tenancy rose from £300 to £800. Sadly the tenants recount how wastefully they utilized this wealth without raising productive capacity of the Gezira. Accompanying this scene of prosperity was an increase in debt and a diversification of employment, with many of the tenants applying for licences for shops and flour mills. But economic risk, particularly in a situation where people depend on one crop, is great. In 1952 incomes fell back to £300 and kept falling every subsequent year to the distress of the whole community. Those who suffered least in that period were the shopkeepers and 'shail' merchants. The individualist and acquisitive spirit became very clear with the appearance of 'shail' merchants from within the native tribes themselves, though their number is still very small compared to those who originally came from the Northern Province. In this study, nearly 70 per cent of the shail merchants approached had migrated from the Northern Province, some in the last two decades and others since the establishment of the Scheme in 1925.

In spite of these economic changes resulting in the diversification of employment, the emergence of entrepreneurs and the tendency for residential separation, the extended family

sentiment remained very strong. Within this social set up, individuals in need of resources were provided for by those members of the extended family who were in a position to assist. Natural cooperation, as stated earlier, is widespread among people in most aspects of life, both social and economic, and there is an obligation among the kin, neighbours and friends to help the needy. Borrowing money in the case of illness, funerals and other unexpected disasters as well as small interest-free loans in the case of weddings and other similar occasions is fairly common.

The various sources of help to meet these different occasions are well defined. In the case of unexpected disaster particularly funerals, money is raised in the form of gifts to help the tenant meet the cost of this ceremony. Other help in kind is also given by neighbours providing cooked food for the first two days of the occasion. With this help, the tenant farmer should not do more than return the favour in due course since the quantification of such help is socially unacceptable. Other services like taking a patient to hospital, looking for a mid-wife and the like should be provided by any one who has the resources regardless of whether he is a relative, a friend, a shail merchant, a field inspector or even a research worker having a car at his disposal. By these last services people were judged. Having the resources and failing to offer such help would put a person into high disfavour in this society while, by the offer of such help he would win over not only the beneficiaries but all the members of the society who are very grateful. With other occasions like circumcision and weddings, gifts take the form of reciprocal credit. With all these forms of help, the beneficiary could be any one in the society

regardless of how rich or poor he may be. Other interest-free loans to meet crop production expenses, family and education expenses were provided by members of the extended family, friends and neighbours and the tenant farmer repays whenever he can.

Though the 'shail' merchants, as was seen earlier, were primarily settlers from outside the Gezira, they have the same social values as the natives. Most of the 'shail' merchants have built large guest rooms in their houses to accommodate important guests to the village and provide them with food on behalf of all tenants in the village. Such generosity is greatly esteemed and socially admired. On all the above mentioned services, apart from the last ones directed to help the tenant farmers to meet their crop production expenses, family, education, transport expenses and the like, the 'shail' merchants contribute in the same way as other people in the village. For the last credit needs the tenant farmer resorts first to his relatives, followed next by his friends and neighbours. 'Shail' merchants and shopkeepers even from the same tribe but not directly related are considered as the last resort and credit from them to meet such needs often carry a price directly or indirectly.

In the previous chapter, credit from informal sources was itemised under the following headings: delay in payments, other interest-free traditional credit and shail credit. Part of the first two types was provided by relatives, friends, labourers and neighbours. The other part of the first two and the shail credit were provided by the shail merchants and other shopkeepers.

Credit due to delay in payments occurred in the areas of farm work expenses, family expenses and a very small proportion of the cost of buying assets. The first category was generally the most important among the three types of credit due to delay in payments and was dominated by delays in payments to hired labour, with a few other items like delay in payments for the costs of seed and ploughing provided by other sources. The contribution of delay in payments for farm work ranged between 50 per cent to 100 per cent of the total delay in payments and with an overall average of 76 per cent as can be seen from Appendix 3.F.

Most of the delays in payments to family expenses were from the shopkeepers in the village and constituted, on average about 24 per cent of the total credit due to delay in payments. This is a source of credit which the tenant farmers try to exhaust before shailing their standing farm crop. Such credit is extended by shopkeepers to be repaid from the SGB cash advances which are often less than the actual need as was seen earlier. Once the SGB cash advances have failed to cover such debts, the lender takes the dominant role and can transfer the debt to be repaid in farm produce on shail basis, in farm produce at harvest price or to be repaid whenever the tenant farmer has cash in hand. Even delayed payments covered by the SGB cash advances are not extended free of interest. Hidden charges are commonly levied with or without the borrower's knowledge. This practice is widespread in Sudan even in the capital of the country where the level of literacy is relatively high and where the authorities make frequent checks on the prices of goods and on the shopkeepers' records. It is impossible to know exactly how extensive these practices

are since the lenders, naturally, are unwilling to give such information and many borrowers are either unaware of the charges or do not take them into account at the time of making the final arrangements.

6.3 Marketing System and Marketing Services

Similarly to the credit market, the commodity market in the Gezira Scheme is characterised by its duality, with the institutional sector responsible for marketing cotton and in control of a good proportion of the wheat market and the private sector dominating the disposal of the marketable surplus of the remaining crops. In this section the discussion concentrates on the marketing activities of the non-institutional sector and its relation to the credit activities of these marketeers.

Due to the seasonality of cropping, dura was harvested first in November, followed by groundnuts in January-February and wheat at the end of March. Picking of the perishable vegetables like tomato continued from October till January while onions were harvested once at the end of March. According to the shail system, failure to repay loans extended against dura in dura form shifts the repayment to the crop to be harvested next. Because of the sequentional nature of crop harvesting, accompanied by the carryover of debts from previous crops and because of the variation in the nature of the crops cultivated, the methods of disposal of each crop will be discussed seperately.

a. Vegetables

Marketing of vegetables is either performed by the producer or a commission agent on behalf of the producer. A

small proportion of vegetables is marketed locally either by the tenant and/or his children or through other vegetable sellers in the village. Both dispose of the crop in their own villages, and in neighbouring villages. The bulk of the vegetables is transported to the urban centres such as Wad Medani, Khartoum, Hassahiesa and as far as Kosti in the White Nile Province, Kassala in Eastern Sudan and Atbara in the North. Vegetables are packed in tea cartons or boxes and transported by lorries to the urban centres. Sales are often performed by a commission agent on behalf of the tenants and he is paid a fixed commission of Ls.0.05 on each carton or box. After sales, the commission agent deducts his commission, pays the cost of transport and hands the balance to the producer. Sales of vegetables to the consuming centres are organised by these commission agents and the lorry drivers who make daily trips to the nearby towns during the vegetable picking season and make 2-3 day journeys to distant places like Atbara and Kassala. Part of the tomatoes and chillies are processed by the tenant farmers by cutting them into pieces and leaving them to dry. The crop is, later on, sold by the producers themselves.

b. <u>Dura</u>

Dura, as was stated earlier, is the main subsistence crop and a large proportion of it never leaves the farm and is retained for domestic consumption, for seeds, for feed and as payment in kind to the cotton picking labour. The marketing of the proportion that leaves the farm is done locally, with the traders buying and selling in the same village. A few landless inhibitants pay in advance and get repaid in the

form of dura at the ruling market price at harvest time to satisfy their own consumption requirements. The majority of the marketable surplus of dura is handled through the shail system This constituted 20 per cent of the total dura produced by the sampled tenants or 55 per cent of their marketable surplus. The proportion of dura sold in advance by the tenant farmers who dealt with shail in that season was 48 per cent of their total production or 70 per cent of their marketable surplus as can be seen from Figures 6.1(a) and 6.1(b). The same crop was sold back to the tenant farmers in the off-season at a high price. An average profit of 30 per cent of the purchasing price was calculated for the traders by deducting the harvest price from the off-season price and allowing for storage losses, interest and store costs of 20 per cent. Though not all traders were successful in selling at the highest off-season price, the majority made their purchases at a very low price on shail basis.

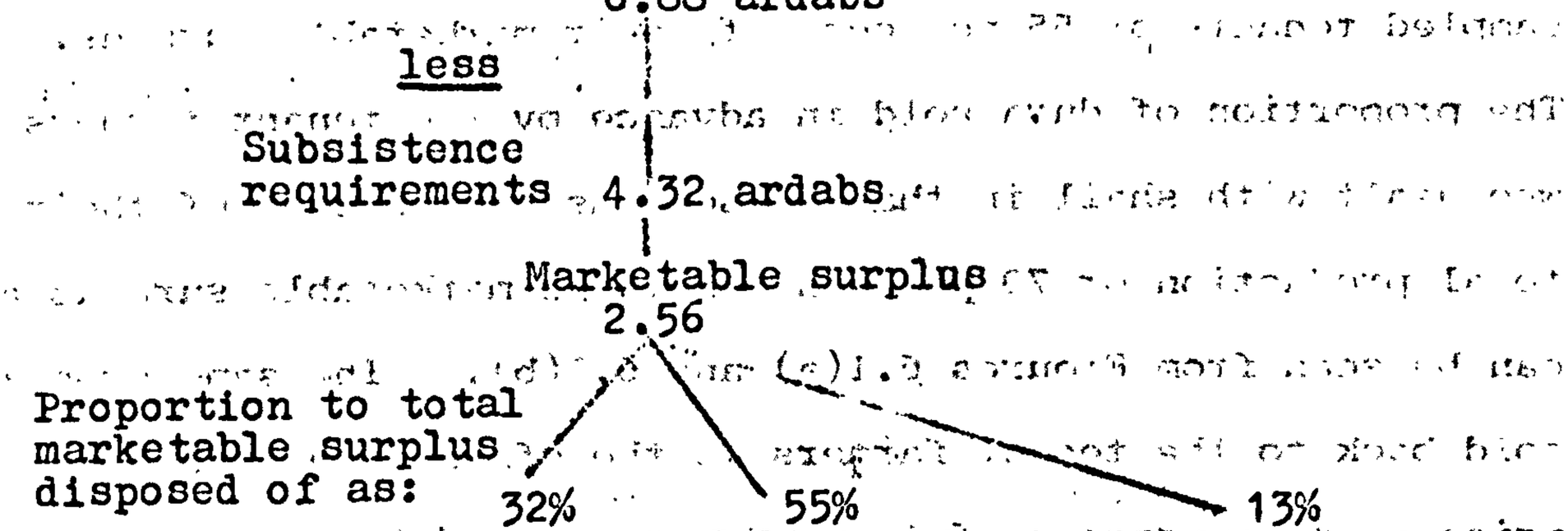
c. Wheat

In the case of wheat, a guaranteed price is always offered by the Government to encourage wheat production and enable the Government to pursue its policy of import substitution. The guaranteed price in 1974 was fixed at Ls.63.84 per tonne and was declared well in advance at the time of sowing the crop. The market price at harvest time, in that year, did not exceed the guaranteed price and most of the wheat crop was sold to the flour-mills via the SGB. Total production was exceptionally high due to the increase in the area cultivated and the favourable weather conditions. An average production of 2.48 tonnes per tenancy was obtained. The declarations of

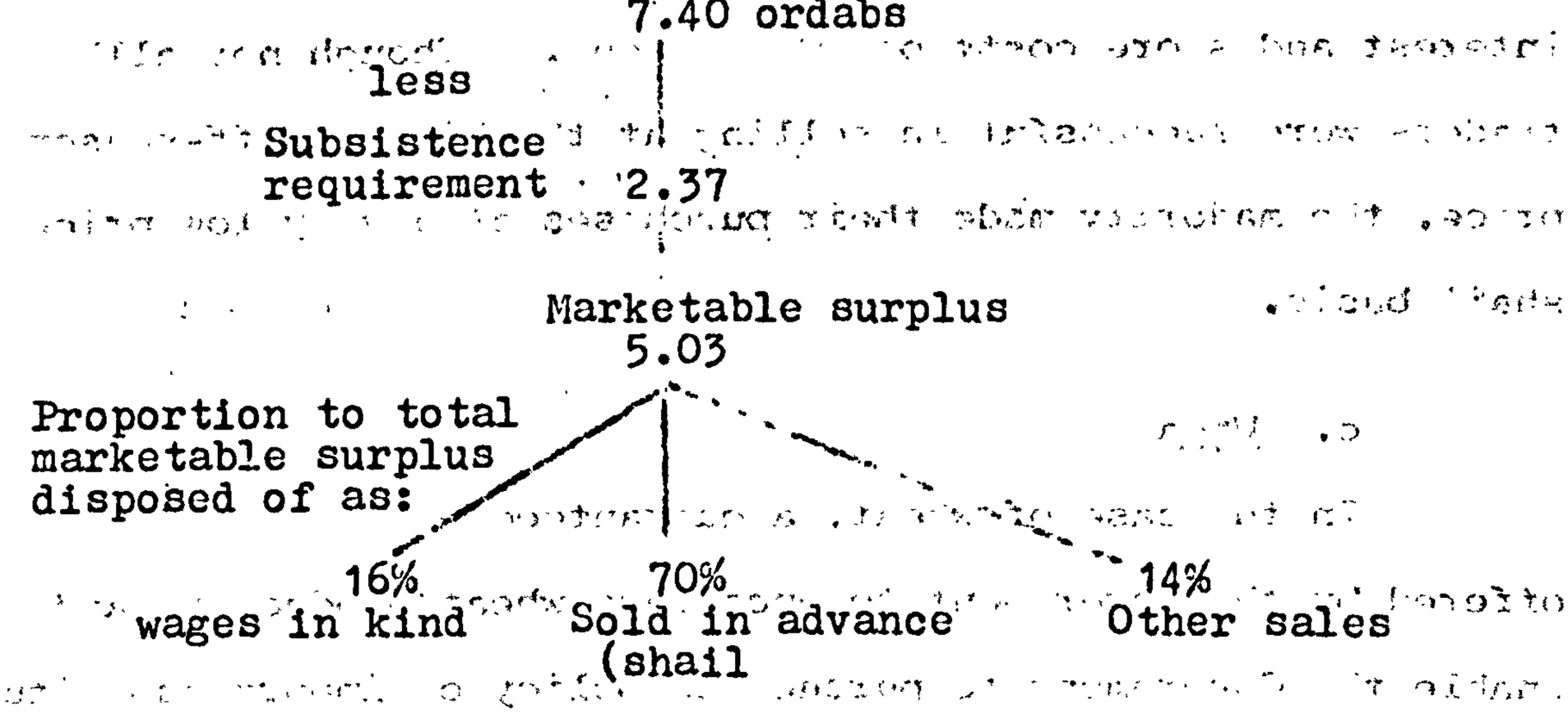
Figure 6-1

Utilization of dura by an average tenant farmer and by a tenant farmer dealing with shail

(a) An average tenant farmer:



(b) An average tenant farmer dealing with shail



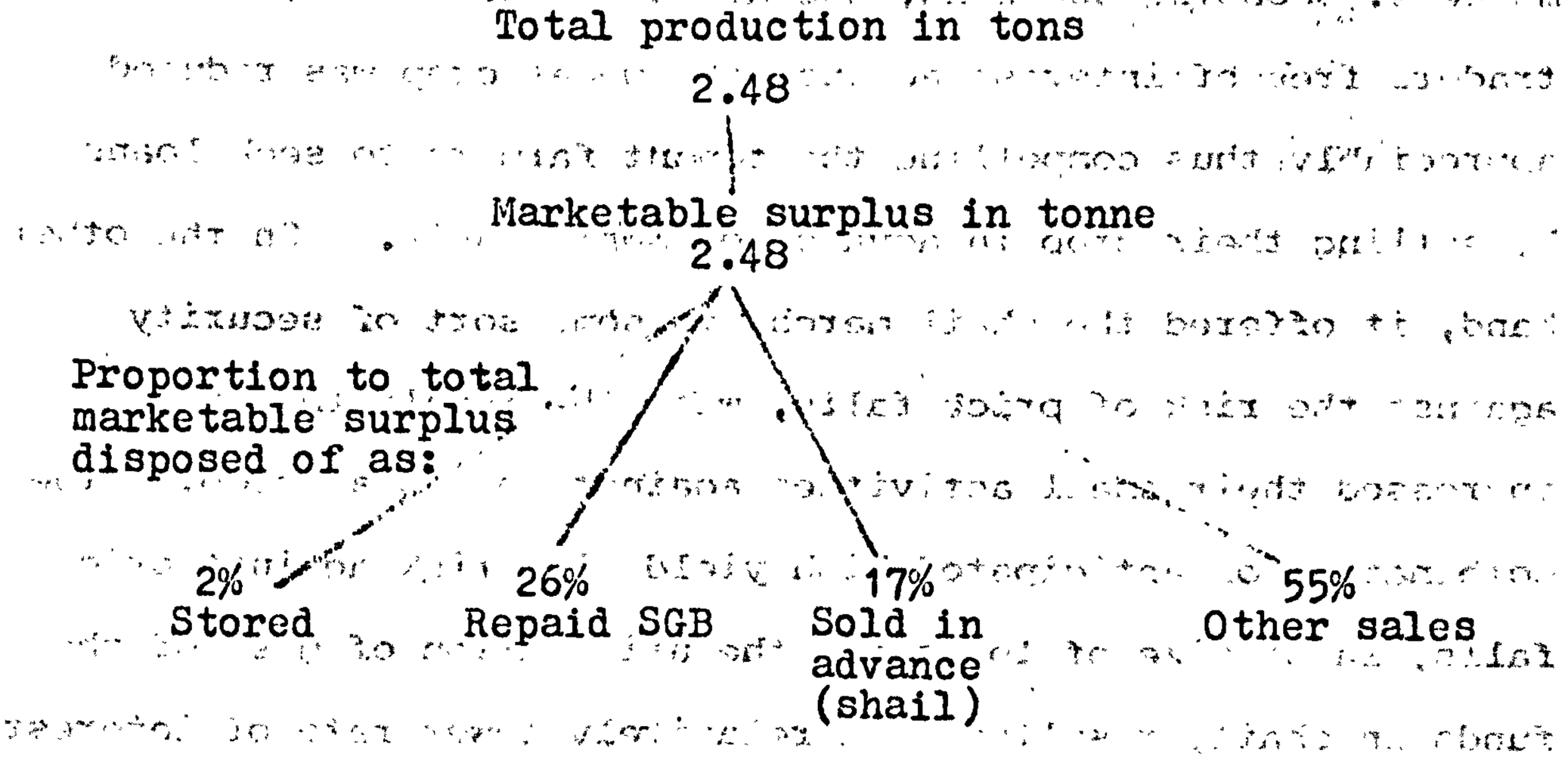
a high guaranteed price early in the season, coupled with the expansion in the area under wheat and the favourable weather conditions, have had many effects on the commodity and credit markets. On the one hand, the amount of money lent by the traders free of interest against the wheat crop was reduced appreciably thus compelling the tenant farmers to seek loans by selling their crop in advance on shail basis. On the other hand, it offered the shail merchants some sort of security against the risk of price falls, with the result that they increased their shail activities against the wheat crop. The combination of anticipated high yield, low risk against price falls, large size of loans and the utilization of most of the funds in shail, resulted in a relatively lower rate of interest charged by the shail merchants on loans against the wheat crop.

Out of the total wheat production in that year, about 26 per cent was handed by the tenant farmers to the SGB in repayment for the SGB and ABS credit to produce the wheat crop. 17 per cent of the marketable surplus was sold in advance through the shail system as can be seen from Figure 6.2(a). For the tenants dealing with shail, approximately one third of their total marketable surplus of wheat was sold in advance as can be seen from Figure 6.2(b). The remaining marketable surplus of about 56 per cent of total production for an average tenant farmer after repaying SGB and shail merchants was sold to the flour mills either directly by the tenants or through the shail merchants who offered interest-free credit against wheat. Less than 2 per cent of the total production was retained by the cultivators for seeds and for domestic consumption.

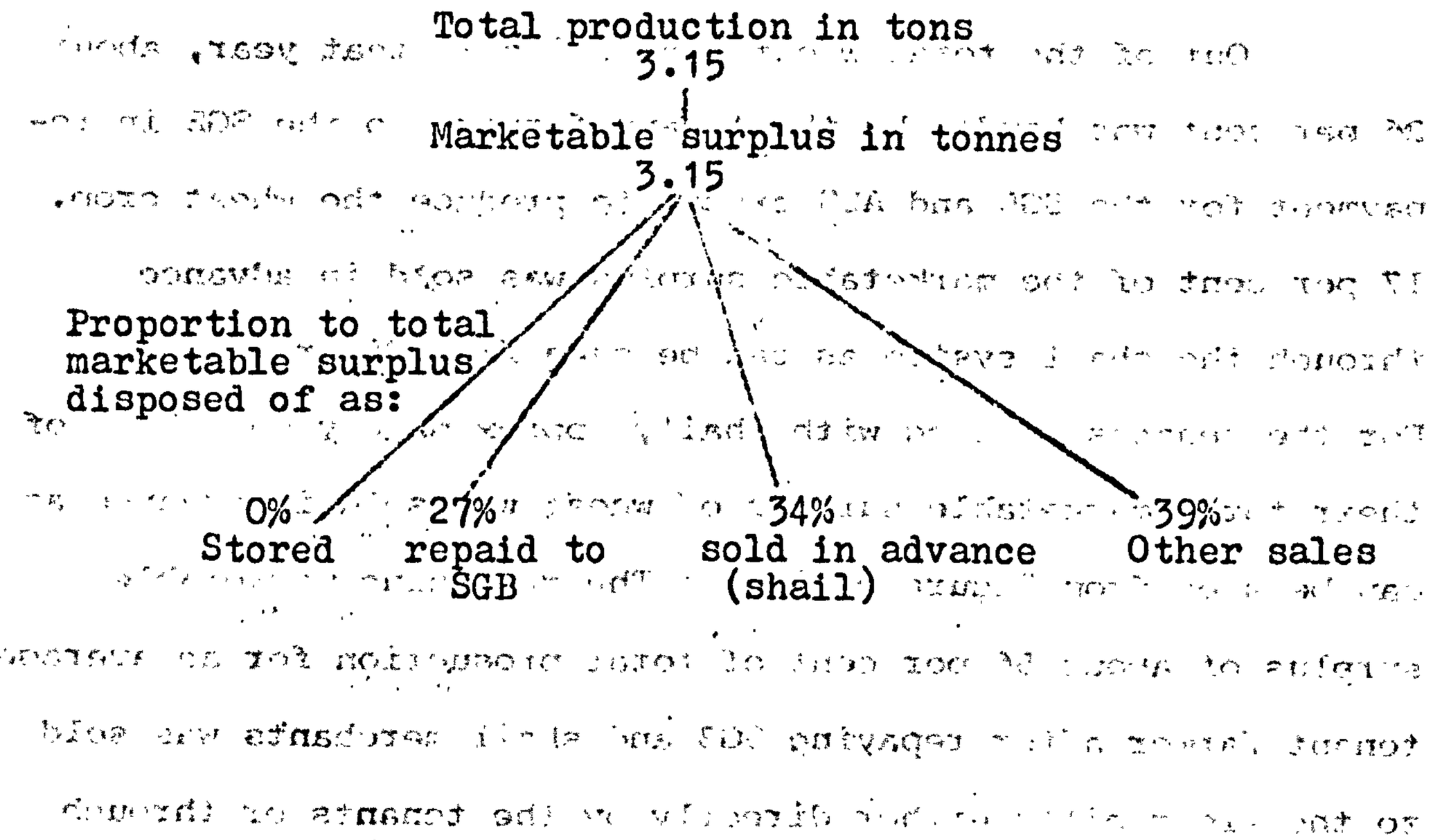
Figure 6-2

Utilization of wheat by an average tenant farmer and by a tenant farmer dealing with shail.

(a) An average tenant farmer.



(b) An average tenant farmer dealing with shail



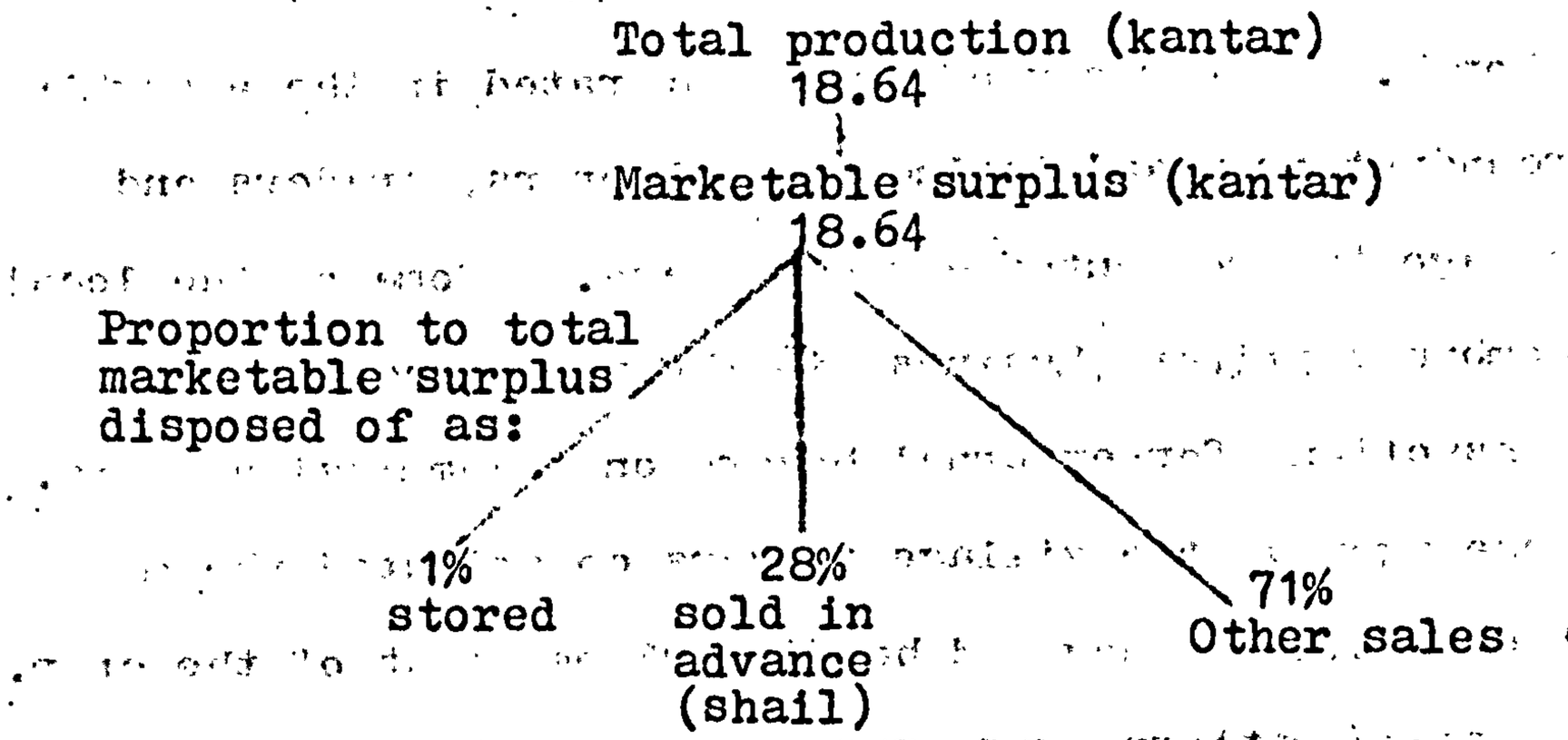
d. Groundnuts

Apart from the cotton crop, groundnut is the only crop exported from the Gezira and its final disposal was dominated by private export companies and owners of local mills in Khartoum North. A variety of agents operated in the assembly of the groundnut crop and included shopkeepers, traders and commission agents from outside the village. Some of the local traders combined private business in their own account with agency transactions for external buyers on a commission basis. Of all these agents, the village traders constituted the most important marketing agency and handled 95 per cent of the crop. Complex disposal patterns were pursued by the tenants due to a nexus of family ties, reciprocal services, commercial interests and anticipated future dependence. Nearly 28 per cent of the total production was sold in advance. For the tenant farmers who dealt with shail, this constituted two thirds of their total production as can be seen from Figure 6.3. A negligible proportion of 1 per cent was retained for use as seeds next season. A good proportion of the remaining 71 per cent of total production was purchased by the local traders either before or after harvest. Some of the crop was purchased by traders who offered interest free credit against this crop and at harvest time were repaid groundnut at the ruling harvest price. Other quantities were sold directly at the farm gate at harvest time. The interest free practice often occurred late in the season, one or two months before harvest, when the lender had accumulated much of the knowledge about the borrowers crop and the anticipated price. Such a practice was followed by the local traders to bind the tenants and get assured supplies.

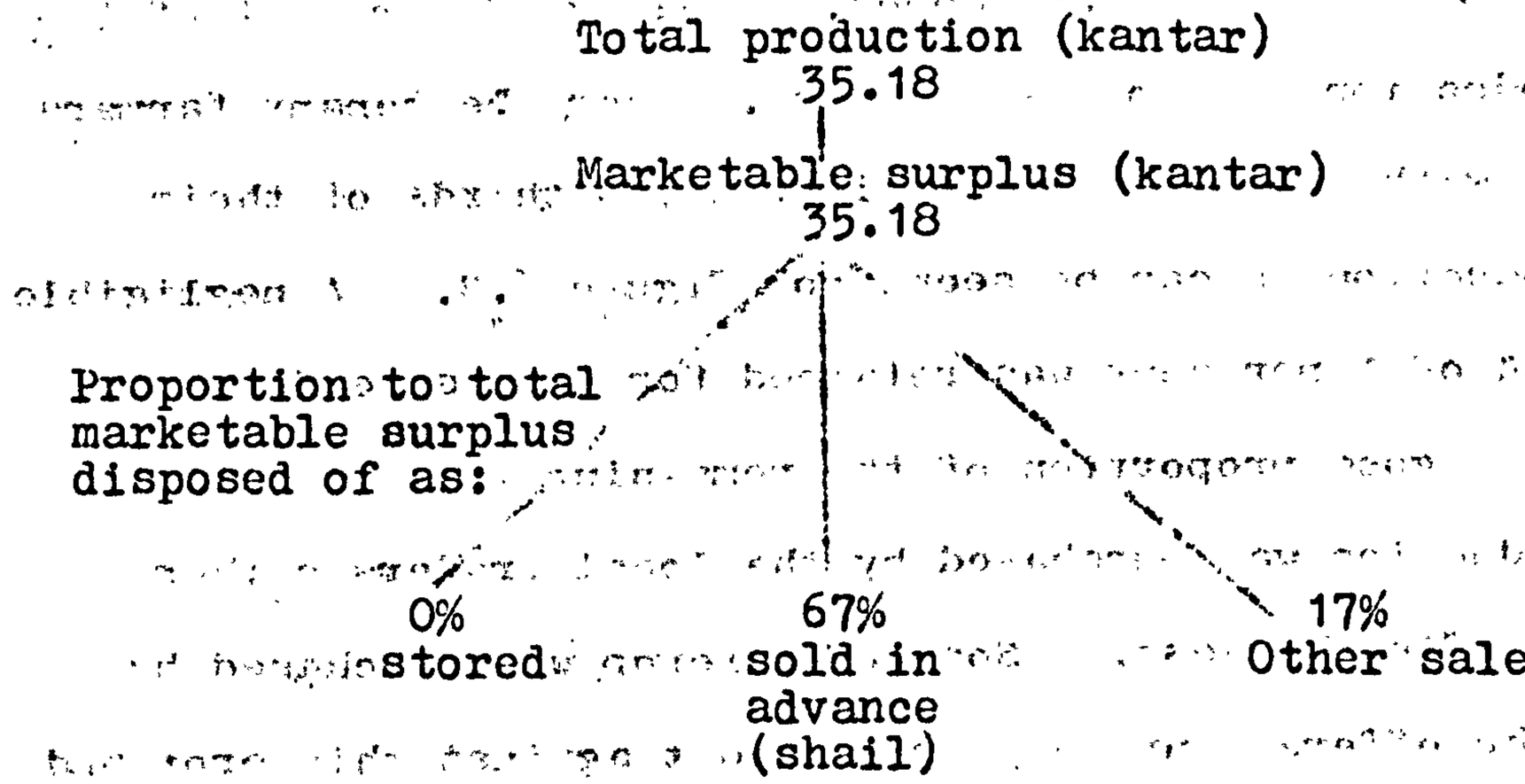
Figure 6-3

Utilization of Groundnuts by an average tenant farmer and by a tenant farmer dealing with shail

(a) An average tenant farmer



(b) An average tenant farmer dealing with shail



Competition to the village traders in the groundnut market came from the commission agents both from the village and from outside the village. The village commission agents, like other village traders, make use of their intimate knowledge of the borrower's circumstances such as his output from last season, his farming skill and other personal information. Purchases by such commission agents were often made by advancing loans free of interest and the village commission agent got Ls.0.05 for every kantar he purchased. Other village traders made their purchases on behalf of wholesalers but on shail basis. In this case the village traders get two thirds of the profit calculated as the difference between the wholesalers money used in the transaction and the value of the collected produce valued at harvest price.

Commission agents from outside the village and some of the village traders make their purchases at harvest time. They move around the farms with their lorries and have their own labourers to pack the crop. Prices are negotiated directly with the farmer in the field. The commission paid to such agents was remarkably uniform and is equal to that obtained by the village commission agents i.e. Ls.0.05/kantar or nearly 3 per cent of the value.

The groundnut market at the village level, as was mentioned earlier, is dominated by the village traders and village commission agents. Nearly 95 per cent of the marketable surplus was purchased by these agents in 1973/74 season and only 5 per cent purchased by the commission agents from outside the village. From the information provided by the merchants, 29 per cent of their purchases were made on shail basis, 11 per cent on interest free loans and about 60 per cent of their

total purchases were made directly at harvest time. Although at harvest time, the village traders faced intense competition from urban commission agents, they succeeded in buying much larger quantities. The explanation may lie in the social and family relationships and in the small price variations confronting the tenant farmer which make it greatly to his interest to sell produce to the village trader to whom he can resort at any time for help.

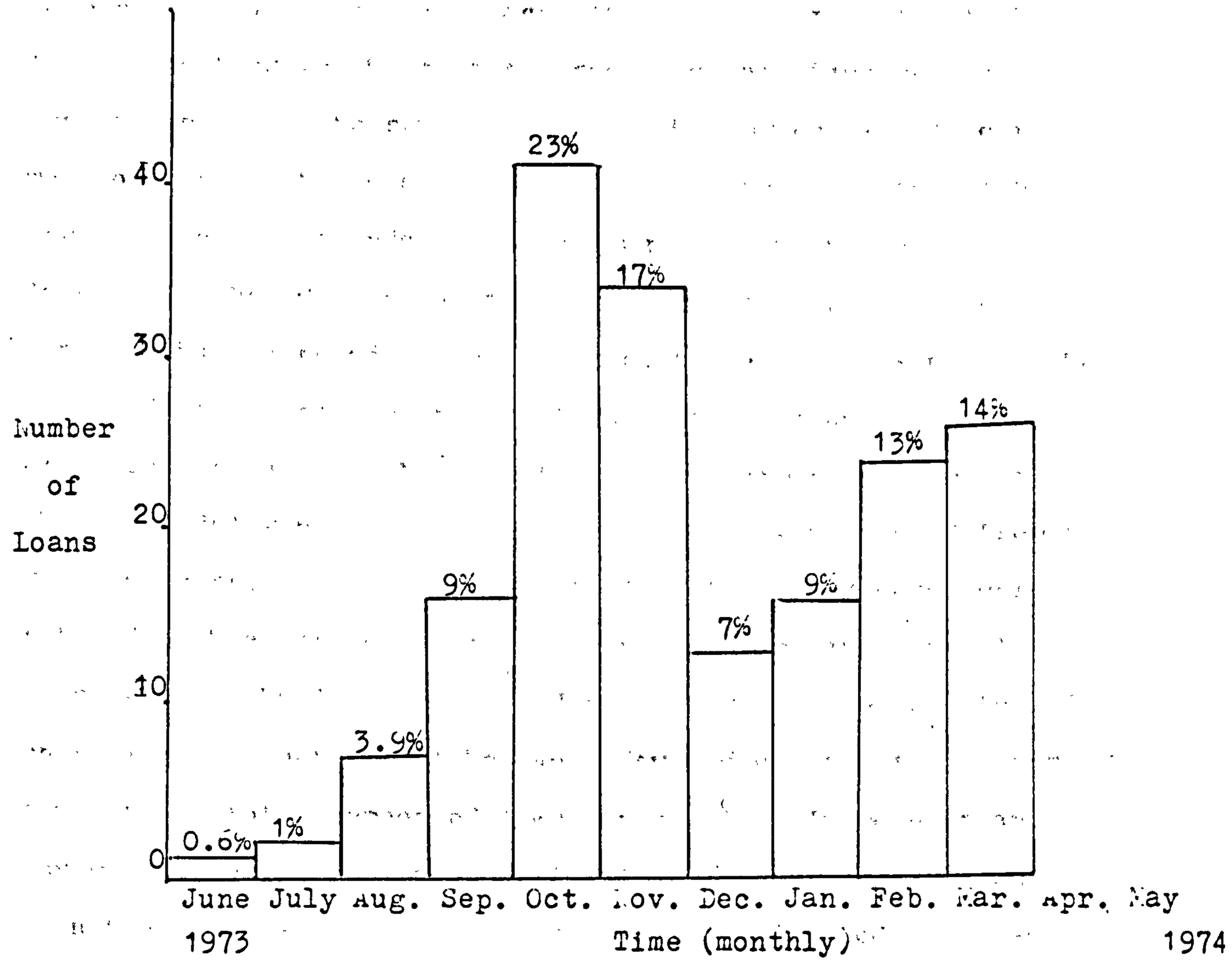
6.4 The Credit System

The credit market in the Gezira Scheme, as was stated earlier, is characterised by its duality, with the institutional credit market provided by the SGB and the ABS, and the informal credit market consisting of localized transactions of money, goods and services among the relatives, friends, neighbours, labourers and the shopkeepers-cum-traders-cum-moneylenders. The operations of the informal credit market differ from those of the institutional market in the terms of loans, their purpose and duration, the basis on which they were granted and the costs at which these services are performed.

The informal credit sources can be classified into two groups of commercial and non commercial lenders. The distinction is based on whether or not the lender offered all his services free of interest. Some of the commercial lenders, as was seen earlier, are direct relatives of some of the tenants and their services to their relatives might take the form of gifts, carry no cost or be performed at a lower rate of interest. On the other hand, all shail merchants offer part of their services free of interest, particularly in the area of social activities.

Figure 6-4

Distribution of loans on shail according to Date when loans were extended (1973-74)



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The tenant farmers, as was mentioned earlier, started by borrowing from the shopkeepers by delaying payment for the goods they purchased and repaid from the SGB cash advances. This continued till September when nearly 70 per cent of the cultivation advances and 59 per cent of the profits and appreciations were paid as shown in Table 5.3 and 5.5 in Chapter 5. Because the SGB cash advances are often short of the tenant's credit requirements, the tenant farmer fails to repay the shop keeper in full. At this stage, the shopkeeper restricts his lending in kind to the tenant farmer and satisfies only a small proportion of the borrower's need. The common example cited by most of the shopkeepers visited was of a tenant asking to borrow, for example, two pounds weight of sugar for which he will pay later from the SGB cash advances. The shopkeeper will offer him only half a pound weight, and so, to satisfy his needs, the tenant farmer purchases the rest on credit against the standing crop i.e. on shail. Not all the tenant farmers get such a chance of delaying payment for the goods they purchased from the village shops. Some, like the small cotton producers, were refused such a service from the very beginning and compelled to borrow on shail as early as June. However, loans extended on shail basis before October were few and constituted 15 per cent of the total number of loans on shail. In October and November alone, 42 per cent of the loans were granted as can be seen from Figure 6.4. The number of loans dropped in December and then rose again till the end of March when all crops had been harvested.

6.4.1 Characteristics of Borrowers from Shail Merchants

The domain of shail credit was among the poor tenant

farmers. Two in three (62 per cent) of all tenant farmers dealt in shail and 91 per cent of these shail borrowers had low assets and only 2 per cent high assets as can be seen from the groups in Table 6.1. 98 per cent of the borrowers from shail merchants were among the tenant farmers depending mainly on their farms and only one tenant farmer earning from farming and trade reported to have borrowed from the shail merchants.

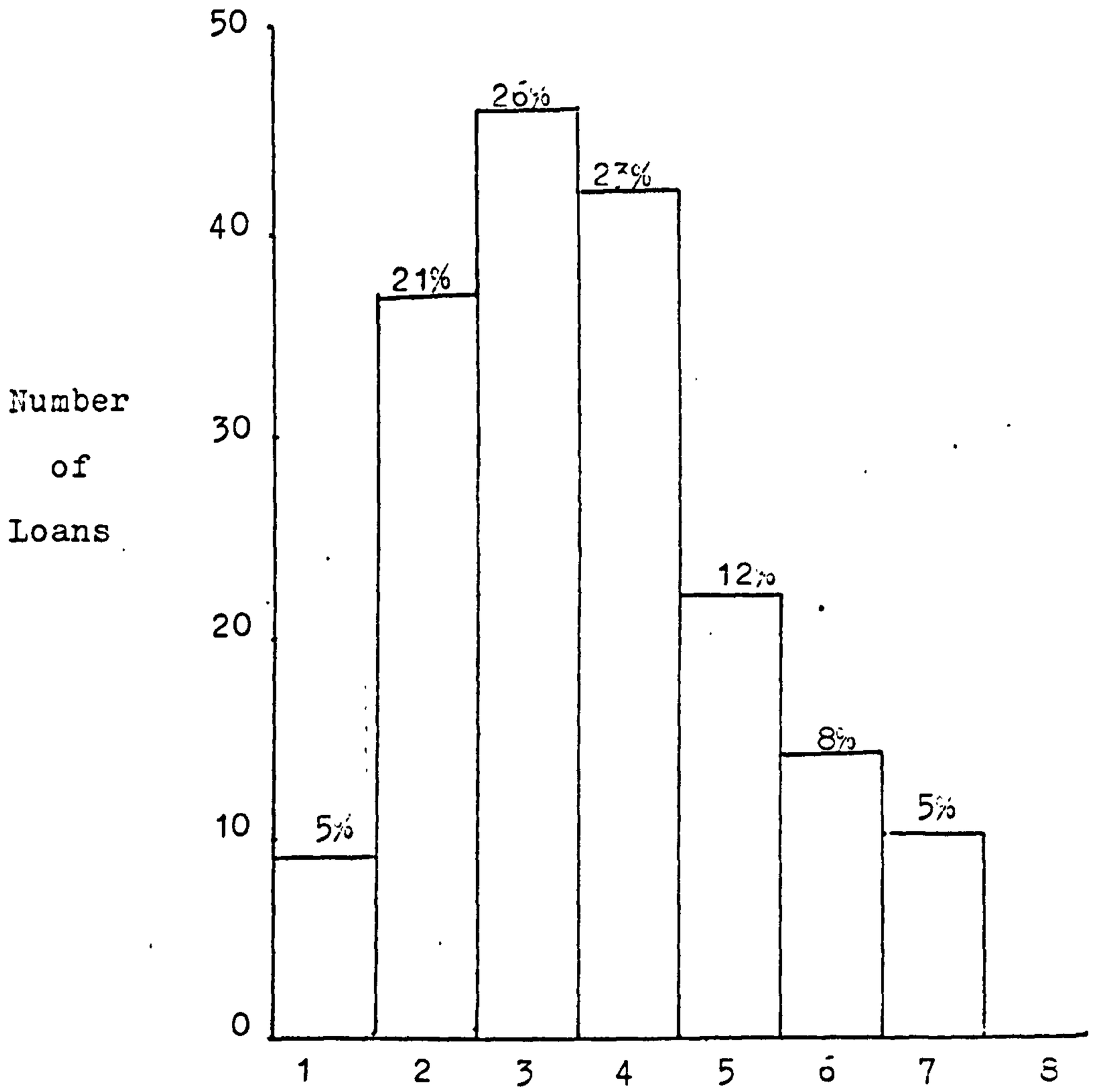
Tenant farmers borrowing from shail also vary according to the crops they sold in advance. Half of these tenant farmers borrow on shail against one crop only, 30 per cent against two crops and the remaining 20 per cent borrow on shail against the three crops of dura, groundnuts and wheat. According to the individual crops, 24 per cent of the loans were extended against dura, 21 per cent against groundnut and 55 per cent against wheat. The preference for wheat by the shail merchants in that season can also be seen from the total amount of money extended on shail basis and the size of loans. 66 per cent of the total amount borrowed on shail was extended against the wheat crop alone as shown in Appendix 6.A, and only 24 per cent against dura or groundnuts. The average size of loans against wheat was Ls.14 and that against dura or groundnuts was Ls.9.

6.4.2 Duration of Loans

Loans extended on shail basis were characterised by their short duration which ranged between a month and slightly less than 7 months. Three quarters of the total number of loans were extended for a period of less than 4 months and only 12 per cent, 8 per cent and 5 per cent were extended for periods of 5, 6 and 7 months respectively as can be seen from Figure 6.5.

Figure 6-5

Distribution of loans according to Duration



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Table 6-1

Distribution of loans on shail basis by Farm Crops and by Farm Group

Farm Crops	Group I NV LAS FY	Group II NV MAS FY	Group III NV MAS FYT	Group IV NV HAS FYT	Group V VG LAS FY	Group VI VG MAS FY	Group VII VG HAS FYT	Total
	Number of tenant farmers dealing with shail							
Dura only	14 (29)				2 (12)			16 (18)
Wheat only	4 (8)				3 (18)			7 (8)
Groundnuts only	3 (6)				-	2 (67)		5 (6)
Dura and wheat	4 (8)				7 (41)			11 (2)
Dura and Groundnuts	-				-			-
Wheat and Groundnuts	5 (10)				1 (6)			6 (7)
All three crops	6 (13)	2 (25)			2 (12)		1 (33)	11 (12)
Total number dealing with shail	36 (75)	2 (25)			15 (88)	2 (67)	1 (33)	56 (62)
Total number not dealing with shail	12 (25)	8 (75)	5 (100)	4 (100)	2 (12)	1 (33)	2 (67)	34 (38)
Total	48 (100)	10 (100)	5 (100)	4 (100)	17 (100)	3 (100)	3 (100)	90 (100)

Figures in brackets denote percentage to total crops dealt with in shail.

The average duration of the loan was 3½ months

6.4.3 Size of Loans

Coupled with the short duration was the small size of the loans. 28 per cent of the loans extended, as can be seen in Figure 6.6, were of a size less than Ls.5 and as much as 84 per cent of the total number of loans was of less than Ls.20 in size. The average size of the loan was Ls.12.

6.5 Level and Structure of Interest Rate

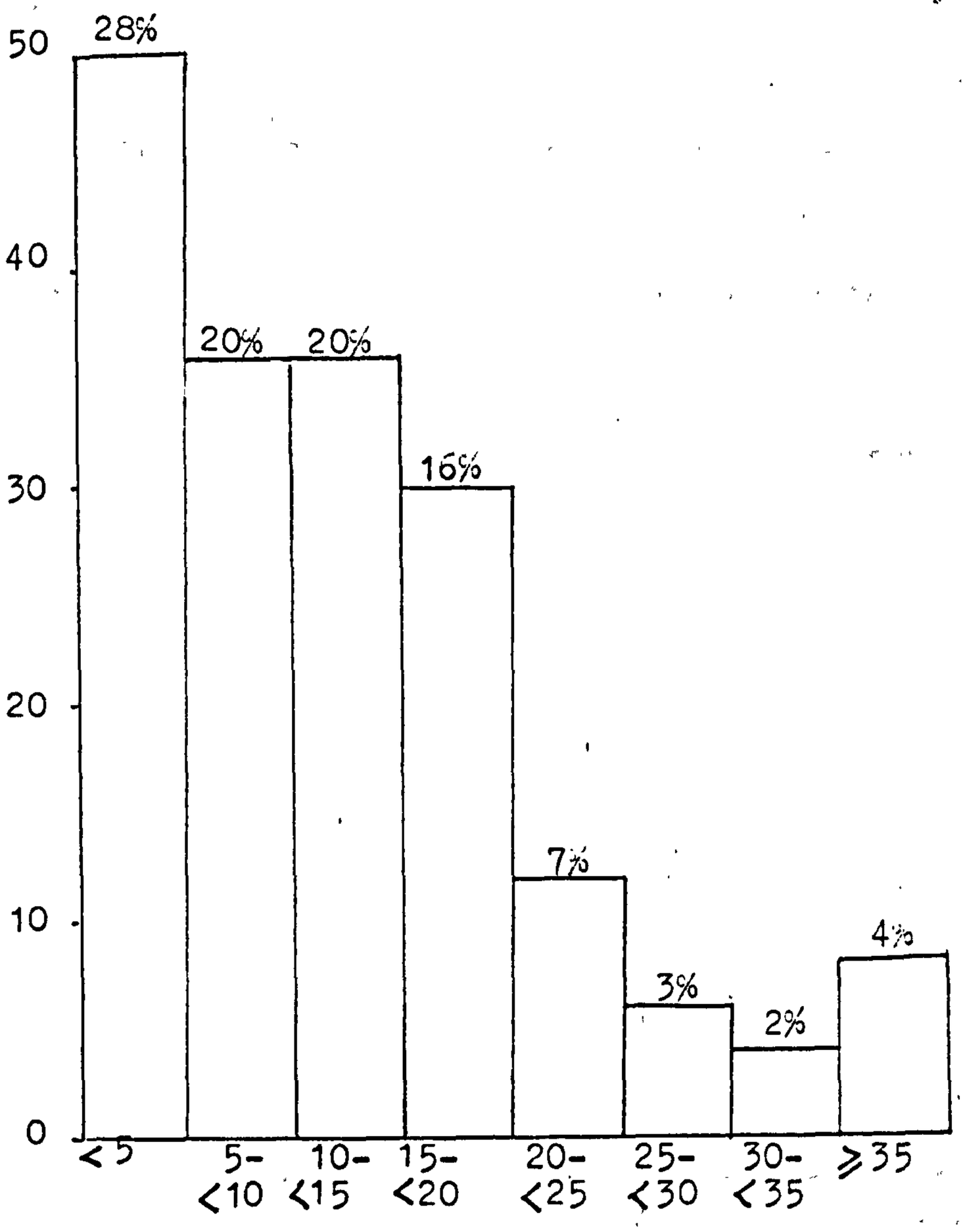
In the foregoing discussion, it was pointed out that the shail merchants, in addition to filling the gap in the credit structure, also offer some social and marketing services and that these services were linked to their credit activities. In this section it will be argued that, even if these social and marketing services were quantified, the shail merchants in the Gezira Scheme appropriated monopoly gains. Their monopolistic position was made possible by some physical and social conditions which will be discussed after calculating the interest rate charged by shail merchants on loans extended on shail basis and analysing the causes of these levels.

In this study emphasis was placed on eliciting accurate information as to the amount of actual money or money equivalents the tenant farmer obtained on shail basis, the length of time he used it and the amount he repaid the lender. The information is shown in Appendix 6.B. From this information, the annual rate of interest was calculated using the formula:

$$R = (1 + r)^{n} - 1$$

Figure 6-6

Distribution of loans according to size



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where: R = annual rate of interest (expressed as a decimal)

r = interest in the period of the loan (expressed as a decimal)

n = 12 months divided by the period for which the loan was used.

The annual rate of interest charged ranged from 3 per cent to 7358 per cent, with a weighted average of 726 per cent per annum as can be seen from Table 6.2, Figure 6.7 and Appendix 6.B.

TABLE 6.2: Distribution of loans by crop according to interest rate charged

Interest rate on an annual basis (%)	Number of loans against Dura	Groundnuts	Wheat	Total number of loans
< 300	8	16	24	(13)
300 — < 500	12	8	39	59 (33)
600 — < 900	9	3	21	33 (18)
900 — < 1200	1	7	4	12 (7)
1200 — < 1500	3	6	3	12 (7)
1500 — < 1800	2	11	13	(9)
1800 — < 2100	2	2	4	(7)
> 2100	10	10	3	23 (2)
				(13)
Total	43 (24)	38 (21)	99 (55)	180 (100)

Figures in brackets indicate percentages to total

Approximately 13 per cent of the loans extended on shail basis were charged at less than 300 per cent, 64 per cent at less than 900 per cent per annum and 13 per cent of the loans carried an interest rate of more than 2100 per cent per annum. Approximately 75 per cent of the loans against wheat were charged at an interest rate of less than 900 per cent per

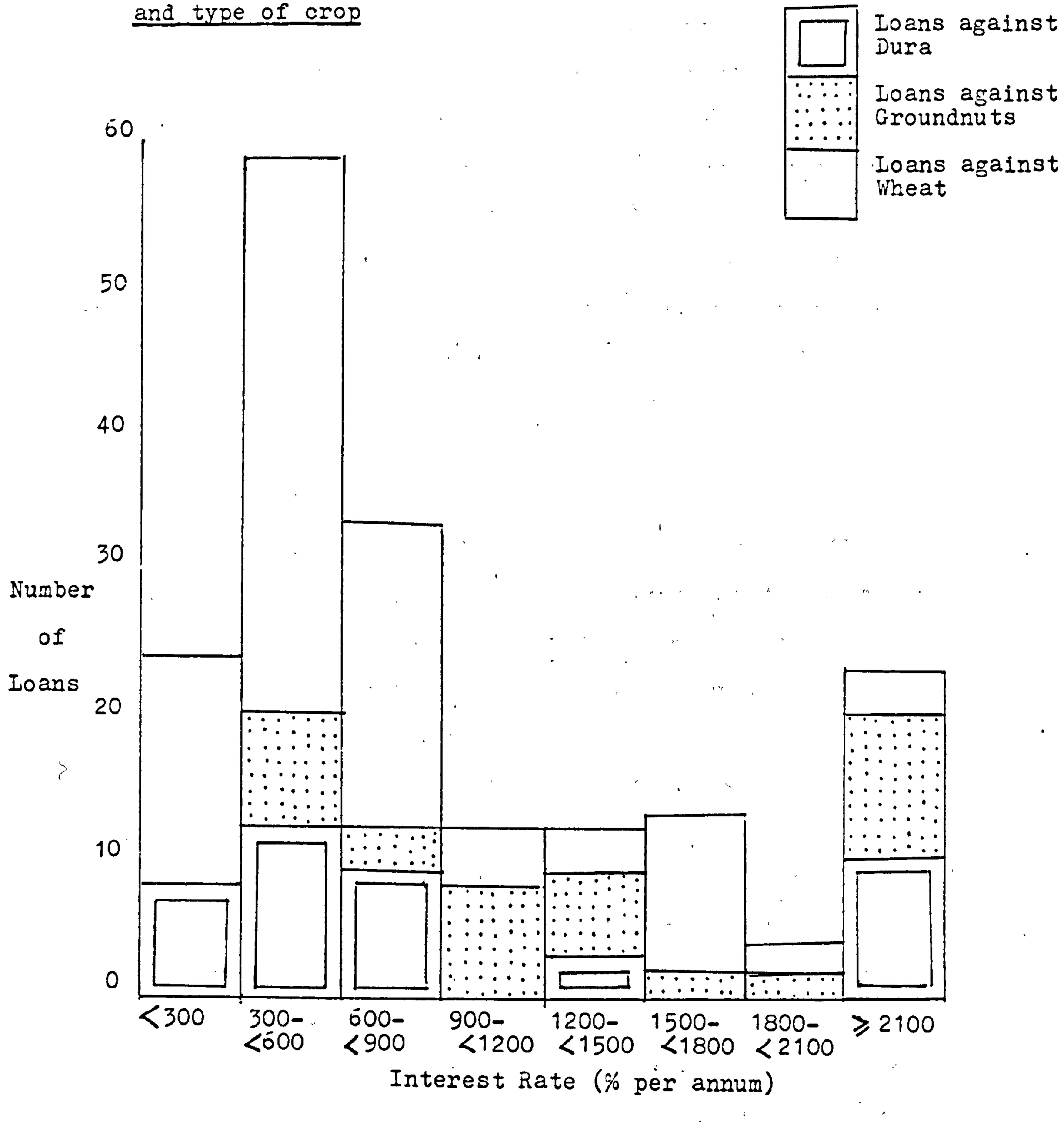
annum and only 3 per cent at an interest rate of more than 2000 per cent per annum. Two thirds and one third of the loans against dura and groundnut respectively were charged at an annual rate of less than 900 per cent per annum and as many as 23 per cent and 27 per cent of the loans against these two crops were at more than 2000 per cent per annum. The high rate of interest in the case of groundnuts can be explained by the relatively considerable amounts of credit extended free of interest. That for dura can be due to the relatively higher risk of default since dura is the subsistence crop and some tenants might prefer to keep their annual stock rather than repay the lenders, particularly when their total production is low.

Similar rates of interest are known to have existed in other developing countries. Interest rates in parts of China in the 1930's, as stated by Sinha (1974), ranged between 2 and 4 per cent per month. Sometimes peasants were required to pay as much as 100 per cent over 20 days or 1825 per cent per annum. Rates of interest of 360 per cent per annum were also reported in Nigeria, Chile and India by Bauman, Connolly and Whitney (1966), Nisbet (1967) and Subratka (1972) respectively.

In the following discussion an attempt will be made to analyse the causes of the high level of interest rate charged by shail merchants in the Gezira Scheme. For analytical purposes we propose to start with a high level of simplification and then to gradually increase the level of realism and complexity as additional elements are brought into the calculations. It has been deemed advisable to take levels for the components in the interest calculations which are most adverse to the farmer and hence provide the greatest degree of justification for high

Figure 6-7

Distribution of loans according to interest rate charged and type of crop



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interest rates. In this way it is hoped to counter any possibility of bias against the shail merchants.

The components of the rural rate of interest (R) in poor countries are: the unit opportunity cost of moneylender's raw material money (α), the administrative charge on each unit loaned (β), the allowances for risk (π), and monopoly profit (μ). The difference between the actual rate of interest charged and the total of the first three cost components would reflect the level of above normal profits gained by the shail merchants.

6.5.1 Opportunity Cost

We begin our analysis by assuming away the last three cost components of risk, administrative charge and monopoly gains plus any random element (ϵ) and assume the interest rate to cover only the opportunity cost of money lent.

Since $R = \alpha + \beta + \pi + \mu + \epsilon$

and we assumed that $\beta = 0$, $\pi = 0$, $\mu = 0$ and $\epsilon = 0$

therefore $r = \alpha$

If we further assumed that, apart from lending, the shail merchants' funds would stay idle for the rest of the year, then the rate of interest will be inversely related to the duration of the loan i.e. the shorter the duration of the loan, the higher the opportunity cost and consequently the higher the rate of interest. However, the assumption about the shail merchants funds lying idle in the off season is untrue within the Gezira context because, due to the seasonality of cropping, as was mentioned earlier, the shail merchants funds keep revolving from one crop to another. In the first half of the

agricultural year the money will be lent against the dura and groundnut crops and after dura harvest, shail credit will be against groundnut and wheat and after groundnut harvest all shail activities will be against the wheat crop. Even in other periods, the shail merchants were known to invest in other ventures like shopkeeping and farm machinery which will be discussed at the end of this chapter. But, to value levels for the components in the interest calculations which are most adverse to the tenant farmers and hence provide the greatest degree of justification for high interest rates, we assume that the shail merchants funds will lie idle for the rest of the year.

The value of α (opportunity cost) in this study would be assumed to be 0.07. This rate might however be artificially low but it corresponds to the 7 per cent given by the Central Bank (Bank of Sudan) on Government bonds and bills of discount in 1973/74. The duration of loans extended by shail merchants, on shail basis ranged between one and seven months, as was mentioned earlier. The average duration of such loans calculated from Appendix 6.B was $3\frac{1}{2}$ months. Therefore, under our assumption of no cost component apart from opportunity cost and that the lenders' funds would stay idle in the off season, the shail merchants are justified in charging an interest rate (R) of

$$R = (1 + 0.07)^{12/3.5} - 1 = 26 \text{ per cent}$$

Little can be done to reduce these opportunity costs, but if money were idle for about $8\frac{1}{2}$ months, then access to short term bills for the shail merchants may increase short term investment and thus lower the annual pure rate of interest.

6.5.2 Rate of Interest under the Presence of Risk

Following Subratka's interesting procedure to determine some of the major components of the rate of interest in India, risks will be divided in this study under the following headings: (1) Natural due to disease, bad weather and shortage of irrigation water, (2) Commercial i.e. risk arising from price fluctuations and (3) Financial i.e. default which, as was seen earlier, is often more a problem of illiquidity than insolvency.

6.5.2.1 Premium for risk in anticipation of default

The derivation of the rural rate of interest in anticipation of default in this section will be based on the following three assumptions: firstly, an opportunity cost of 0.26, secondly, the premium for monopoly (π) administrative charge (β) and the random element (t) each assumed to be zero and finally, the premium for risk based solely on failure of repayment. This last assumption means that the risk premium is inversely related to the probability of recovery (P) and directly related to the probability of default (q). Then to cover the opportunity cost and risk of default alone, the rate of interest (R) will be

$$R = \frac{1+\alpha}{P} - 1 \qquad \frac{1+\alpha}{1-q} - 1$$

Thus when the probability of default q =zero, P will be equal to unity and R will be equal to the opportunity cost alone.

If q = 0.05 with α held constant at 0.26 then

$$R = \frac{1+0.26}{1-0.05} - 1 = 33 \text{ per cent}$$

Having a constant opportunity cost, the rate of interest risesat an increasing rate when the probability of default (q) rises as can be seen in Figure 6.8.

The probability of default (q) as viewed by the shail merchants interviewed ranged between 0,28 and 0,03 with a weighted average of 0.11. Since the total production of the wheat crop, on which most of the loans by shail merchants were granted, was exceptionally high in the agricultural season 1973/74, this might have caused an unusually high rate of recovery. To provide the greatest degree of justification for high interest rates we will consider the merchants highest estimate for default in our calculations.

When $q = 0.28$, then $P = 0.72$ and

$$R = \frac{1 + 0.26}{1 - 0.28} - 1 \text{ or } \frac{1.26}{0.72} - 1 = 75 \text{ per cent}$$

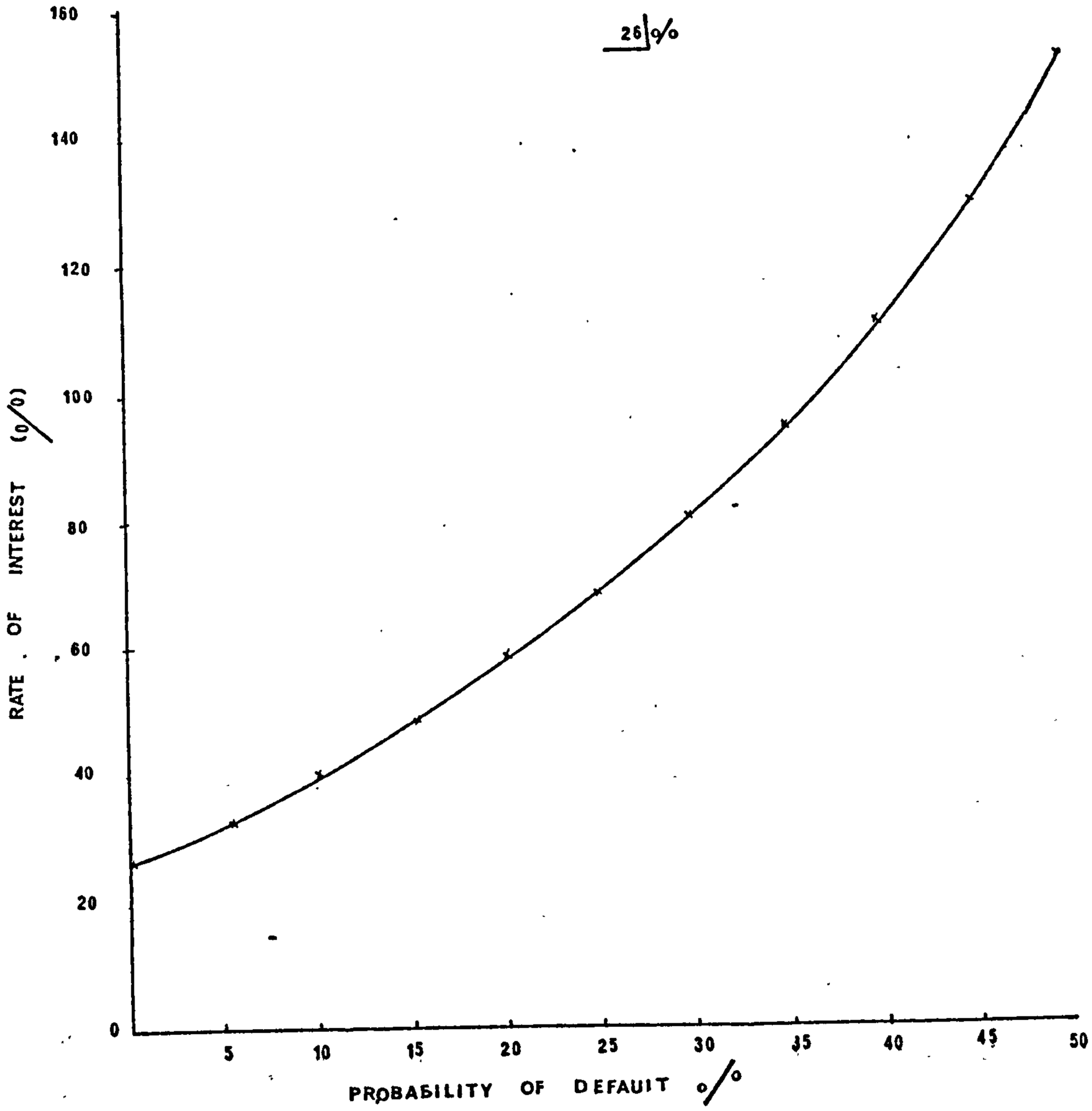
The influence of tenant farmers' higher incomes on reducing default and consequently rural rates of interest can be seen from the investigation in the next section.

6.5.2.2 Premium for risk in anticipation of inflation

Inflation is often regarded as a special type of risk due to changing prices and costs. It generally leads to a fall in the real value of money and creditors stand to lose in real terms when they get repayment. The creditors' loss largely depends upon the rate of price rise and the time lag between loans advanced and loans repaid. Thus, the greater the price rise, and the longer the duration of the loan, the greater will be the loss to the creditors and the need for a compensating increase in interest rates. In this section an attempt will be

FIGURE 6-8

RELATIONSHIP BETWEEN RATE OF INTEREST AND PROBABILITY OF DEFAULT AT A CONSTANT OPPORTUNITY COST OF



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made to estimate the rate of interest to be charged by the shail merchants in periods of inflation.

In allowing for inflation in the rate of interest charged by shail merchants we first assume α to be the cost of capital in the absence of inflation. With no inflation, when a future payment is being converted to its present value equivalent, it is discounted at α as shown by Merrett and Sykes (1963). Thus the present value of the sum A due in n years

$$= \frac{A}{(1+\alpha)^n}$$

But when the money values are not fixed, then discounting A at the rate α will not indicate the present value equivalent of A received in n years time. Thus A must be modified by the change in the general price level that is expected to occur over the n years. If prices are expected to rise at an annual rate of d over the period, then to present A in money units of the same worth as present units, A must be reduced by the factor $(1+d)^n$. This sum is then discounted at α to reduce it to its present value equivalent. Therefore the present value of a given sum of money A, due in n years when the cost of capital is α and the expected rate of inflation is d is

$$\frac{A}{(1+\alpha)^n(1+d)^n} = \left[\frac{A}{(1+\alpha)(1+d)}\right]^n$$

Thus the cost of capital in money terms, α_i, under inflation at rate d is

$$\alpha_i = (1+\alpha)(1+d)-1$$

That is to say, the cost of capital is multiplied by the rate of inflation and their product is used to discount future payments.

If α = 0.28 and d = 0.15[1], the appropriate discount

(1) The rate of inflation in Sudan is not known. The figure used represents the estimate provided the commercial attache', Sudan Embassy, London.

factor is

$$(1 + 0.26)(1 + 0.15)^{3.5/12} - 1$$

$$= (1.26)(1.04) - 1 = 31 \text{ per cent}$$

The assumption that $\alpha = 0.26$ was discussed earlier as being the opportunity cost of the lenders' funds in the event of their being idle in the off season and being valued at the Bank of Sudan rates. That of d = 0.15 represents the prevailing rate of inflation in Sudan in 1973/74 since prices rose by 60 per cent from 1972 to 1976 inclusive.

We can now combine the risk of price rise with the risk of default in repaying loans and the opportunity cost of money in order to measure the rate of interest to be charged by shail merchants in presence of these two types of risk and under our previous assumption of shail merchants' funds lying idle in the off season. For this purpose we can use this formula:

$$R_i = \frac{1+\alpha}{P} - 1 + \left[(1+\alpha)(1+d) - 1\right]$$

Thus with the shail merchant funds lying idle for 8½ months and with $\alpha = 0.26$, P = 0.72 and d = 0.15 per annum, the shail merchants are justified in charging a rate of interest of:

$$R = \frac{(1+0.16)}{0.72} - 1 + \left[(1+0.26)(1+0.15)^{3.5/12} - 1\right]$$

$$= \frac{1.26}{0.72} - 1 + \left[(1.26)(1.04) - 1\right]$$

$$= 0.75 + 0.31 = 106 \text{ per cent}$$

Therefore, the provision for the risk premium for inflation raises the average rate of interest to 106 per cent compared with 75 per cent from consideration of opportunity cost and risk of default alone.

6.5.3 Cost of Administration

To these premia should be added the cost of administrating these loans. Such changes for the shail merchants are difficult to estimate for two reasons. Firstly, most of the shail merchants were engaged in other activities besides lending such as farming, shopkeeping, trading in farm crops and other ventures like hiring agricultural machinery and managing flour mills. Since lending formed only part of their overall activities, the cost of adminstrating their loans is bound to be low. On the other hand, the characteristics of the loans as being small in size, small in number and of short duration, demand more of the lender's time particularly in collection. At harvest time, most of the shail merchants personally collect in the field the quantities of crops against which they advanced loans. If we confine ourselves to the shail merchants' lending activities alone, a higher cost should be charged for administrating the granting and recovery of their loans. The estimate of the World Bank (1974) for administrative charges is 7 to 10 per cent. Also Bottomley (1971) estimated the world wide weighted average rate of interest for private rural lending in under developed countries between 24 per cent and 36 per cent. Bottomley (1965) also estimated the opportunity cost and premium for risk to be about 20 per cent thus leaving 4 per cent to 16 per cent for administration charges. Following our procedure of taking the highest level of 16 per cent for administrative charge in order to provide the greatest degree of justification for high interest rates, the shail merchants are justified in charging an annual rate of interest of.

R = 106 per cent + B

R = 106 per cent + 16 = 122 per cent

6.6 Other Lending Activities of the Shail Merchants

In the previous section, mention was made of the shop keeper's and shail merchants' other lending activities. Tables 1.4 and 3.16 showed that the weighted average for the total credit due to delay in payment was Ls.85:21. The delay in payments for farm work expenses consituted about 76 per cent of the total delays in payments and the remaining Ls:20:45 constituted the delays to family expenses and purchases of capital items. For the tenant farmers dealing with shail merchants, the weighted average of total delays in payments was Ls.120.64 of which delays for family expenses were Ls.30.60 and delays in payments for farm work were Ls.90.04. Most of the delays to family expenses came from the village shopkeepers. The total interest free credit for an average farm as shown in Table 1.4 amounted to about Ls.42.84 and that for an average tenant farmer dealing with shail was Ls.41.28. The majority of the interest free traditional credit was provided by relatives, friends and neighbours, and by other landless inhabitants in order to get their annual supply of dura for consumption. The information provided by the shail merchants showed that about 60 per cent of their funds were used for straight purchases and 40 per cent were extended for advance purchases. Out of the total merchants' funds used for lending, 72 per cent were extended on shail basis and only 28 per cent were lent free of interest. Since the average tenant farmer dealing with shail obtained Ls.46.01 on shail basis, therefore the amount lent to him free of interest by the shail merchants will be

$$\frac{46.01 \times 28}{72} = \text{Ls. } 17.89$$

If all the credit due to delay in payments for family expenses and purchases of assets came from the shail merchants, its total value for an average tenant farmer dealing with shail will be Ls.30.60. Thus, the total amount lent by shail merchants for an average tenant farmer dealing with shail will be:

	Ls.
amount lent on shail basis	46.01
delay in payment for family expenses and purchased assets	30.60
other interest free traditional credit	17.89
TOTAL	94.50

Expressed on shail basis, this amount will be equal to

$$94.50 \div 46.01 = 2.05$$

i.e. the total amount of other types of credit is equal to 105 per cent of the amount lent on shail.

Since the theoretically calculated rate of interest for loans granted on shail basis ought to be 122 per cent per annum, then, the total interest to be charged by shail merchants to cover the cost of the money they lent to an average tenant farmer should be

$= 2.05 \times 122$ or $= (1.05 \times 122) + 122$ for shail credit

$= 250$ per cent.

The difference between this calculated rate of interest and the actual rate of interest charged by shail merchants of 726 per cent per annum is very great and the residual i.e. 476 per cent far exceeds the sum of the other components namely risk, opportunity cost and administration charges. The calculated rate of interest would in fact be less than 250 per cent per annum because we assumed that all of the credit due to delay in payments for family expenses and purchases of assets came from the shopkeepers who are, implicitly, assumed to be

shail merchants. In fact many of the shopkeepers do not lend on shail basis and even those dealing in shail make smaller levies against such loans.

Above normal gains greater than the sum of the other three cost components of the rural rate of interest have been suggested by research workers like Chandavarkar (1965) and Nisbet (1967) for other parts of the world.

In addition to their credit services, the shail merchants in the Geżira Scheme provide some social services. However, a charge ought not to be made for these social services when calculating the interest rate that would cover the shail merchants' costs of lending. The same applies to the shail merchants' marketing activities. In the first area, as was mentioned earlier, it is not only the shail merchant but all members of the community who participate in social occasions and the shail merchants, as members of the community benefit from other people's help in emergencies and from other gifts that take the form of reciprocal credit in their happier events. Quantification of these forms of assistance, is socially unacceptable. The poor tenant farmers whose farm income is not sufficient to cover their needs, supplement such income by their off farm earnings and particularly by receiving social transfers. Transfers were made by members of the family working in town or having permanent jobs and such members are socially obliged to help their parents and other members of their extended family who need help. The very poor tenant farmers also benefit from donations associated with religious affairs like the tax on farm produce (zakat) and tax to be paid before the first Eid. On religious grounds, it is even preferred for the one paying these taxes to select the beneficieries down the ladder of kinship with

the close poor relatives preferred to the poor distant relatives. There is no difference between the shail merchants and other members of the community as far as these religious affairs are concerned. In their business activities, the shail merchants are more concerned with the expected returns on their funds and not greatly concerned with non monetary considerations. A case was told by a shail merchant of a tenant farmer who borrowed some money from him against the dura crop. Before harvest, the merchant came to know that the farmer borrowed money from other shail merchants against the same crop and that his expected total production was low. At harvest time, the shail merchant went directly to the farm to collect his loan and there found another three lenders. The produce was not enough and the four merchants divided it between themselves on the ratio of the money lent by each, without leaving the borrower any of the crop for his subsistence, and reached agree ment with him on how to repay from his groundnut and wheat crops. But this example does not rule out the possibility that some of the shail merchants offer services to some of the poor tenants in a charity form or give them free loans

Regarding the marketing system, it was mentioned earlier, that the shail merchants are primarily marketing agents with their lending activities disguised in and firmly linked to their marketing activities. It was also mentioned that the village traders are the main marketeers. However, some of the village traders did not practise lending and made their purchases at harvest time when the prices offered by them, by shail merchants and by outsiders were very similar. Although the profits these village traders made, having incurred similar

costs, could be due to the large quantities they handle, this also implies that the shail merchants with their multiple roles are making profits out of their marketing activities and hence the inclusion of a marketing charge in the interest they should charge would not be justified.

6.7 Factors Favouring Monopolistic exploitation by Shail Merchants

Comparing what the shail merchants should charge as interest to what they actually did charge; the actual rate of interest went far beyond the real cost of the services they provide. This was made possible by many factors acting in favour of the shail merchants.

6.7.1 Geographical Location

Little information is available on the number of shail merchants in each village in the Gezira Scheme because of the secrecy surrounding the shail merchants' activities. The number of village traders in the villages covered in this study ranged between one and four. The number varied with the size of the village. Whereas in small villages like 'Ihamir' in Tunsa Block and 'Rafa' in Wad Abid Block, a single shail merchant was known to operate, the number reached four in big settlement areas like 'Azaza' in Tayiba Block and 'Wad Hussien' in Madina Block.

The rural credit market of the shail merchant in his own village and may extend to cover a rural neighbourhood where there is no shail merchant, particularly the labourer village (Kambo) situated near the main village. In no case studied did a shail

merchant operate by himself or through an agent of his in another village where there happened to be a shail merchant in that village. The shail merchants normally confine their shail credit activities to their own villages and the tenant farmers, on the other hand, are traditionally dependent on the shail merchants in their villages and some were compelled by virtue of existing debt, trading relations, family ties and physical distances to deal with the shail merchants in their villages. An attempt by an indebted tenant to seek loans from a lender other than the one to whom he is indebted would deprive him of the credit services provided by his traditional financier.

The shail merchant in a village knows virtually all the shail merchants in the neighbouring villages. Territorial boundaries of the area within which each merchant operates are well observed with no merchant entering the territory of another. Among the two to four merchants in a village, the traditional clienteles of each are known sometimes even by all members of the community. No explicit and formal collusion was observed between the shail merchants in the Gezira Scheme but collaboration was implicit in the development of a common policy which increases the profits of all. In this way, the shail merchants obligopolistic position resembles monopoly to a great extent, with the borrower confronted by the same price for his standing crop, and yet a price higher than he would receive if he moved outside his traditional market. Table 6.3 shows the prices received for the standing crop in six of the villages studied and the variation in this price with time. Though the Gezira Scheme covers an area of 2½ million acres and the distance between some of these villages is approximately 100 miles, the

Table 6-3
Variation in prices offered by shail merchants for dura (in ardabs), groundnuts (in kantars) and wheat (in tonnes) according to time and locality (in Ls.)

Time	Dura Locality						Groundnuts Locality						Wheat Locality					
	(a)	(b)	(c)	(d)	(e)	(f)	(a)	(b)	(c)	(d)	(e)	(f)	(a)	(b)	(c)	(d)	(e)	(f)
June 1st half																		
2nd half			3.00															
July 1st half			4.00															
2nd half			4.00															
August 1st half					3.00													
2nd half		4.00	4.00								0.80							
			(3.75)															
Sept- 1st half			4.00	4.00	4.00	3.50	0.75		0.80									
ember 2nd half		4.00	4.00								0.80							
		(3.5)									(0.70)							
October 1st half			4.00	4.00		4.00	0.75		0.90	0.70					30	35	30	
			(3.7)				(0.65)								(28.3)			
2nd half			4.00		4.00				1.00	0.80				30		35	30	
									(0.85)							(32.5)		
November 1st half			4.00	4.00	4.00	4.00	0.90		1.00	0.90				30	35	35		
			(3.9)		(3.5)										(33)	(33.3)		
2nd half			5.00						1.00		0.80				40	35	30	
December 1st half					4.00										40		30	
2nd half							1.00			0.80				40			30	
January 1st half											1.00			40	40		40	
															(39.2)			
2nd half														40		35		

Table 6-3

Time	Dura Locality (a)	(b)	(c)	(d)	(e)	(f)	Groundnuts Locality (a)	(b)	(c)	(d)	(e)	(f)	Wheat Locality (a)	(b)	(c)	(d)	(e)	(f)
February 1st half										0.80			40	40	40 (39.6)	35		
2nd half														50 (43.7)	50	40	50	
March 1st half													50	50	50 (49.3)	50 (45)	50	
2nd half															50	50 (47)	50	
April 1st half																		
2nd half																		
May 1st half																		
2nd half																		

Figures in brackets denote the average price received by the tenant in the sample if different from the ruling shail price in the village.

(a) Wad Lamied village
(b) Sivieha village
(c) Azaza village
(d) Kafi village
(e) Wad Hussein village
(f) Wad Abid village

figures in Table 6.3 show that prices offered by shail merchants at any one time are, more or less, similar. In addition to influencing prices to their advantage, the data in Table 6.3 shows that the shail merchants maintained the same price for longer periods. Their respect for the geographical territories can also be shown by the example of the tenant farmer who obtained part of the loan he needed, to cover the debt to the SGB from the previous season's wheat crop in order to be allowed to cultivate wheat in the current season, from the shail merchant in his village and was refused the rest. He resorted to a shail merchant in a neighbouring village some five miles away, who refused at first. But, with the borrower's clear desperation, the other village trader offered him the loan and valued his wheat crop at Ls.25/tonne at a time the ruling shail price in both villages was Ls.35/tonne. The higher rate of interest might be charged by the other village trader to allow for any additional risk resulting from lack of knowledge but the practice helps the shail merchants in limiting the alternatives for borrowers and in confining the borrowers to their traditional lenders.

6.7.2 Barriers to Entry

The high profits which the traditional shail merchants obtained, did not attract other financiers into the field. Competition from outside the village is ruled out because of the very many barriers to entry. Such obstacles include tradition, trading relations, family ties, indebtedness and lack of know ledge by outsiders of the villagers. Because of the above reasons, neither the shail merchants nor the villagers would be ready to provide the outsider with such information. A similar situation has been noted by Bell and Tai (1968) in Malaysia

where the Chinese community form the main middlemen moneylenders. The main obstacles to entry by the local members of the village include lack of sufficient funds, lack of skill and managerial ability in addition to borrowers' debt. But some of the villagers, particularly women, did enter the market on a very limited scale. However, the funds available to women are small and represent only their few ornaments. They sell these to jewellers at the beginning of the shail season and use the money received to raise their living standard and purchase new ornaments. Others like tailers infront of the village shops do sometimes lend on shail basis but the tenant farmers rarely take the risk of destroying their relations with their traditional lender and of depending on an unreliable source like a tailer.

The question of credit rationing has been raised in recent discussions on credit policies and monetary affairs. Credit rationing was divided into two types, internal and external. Both types exist in agriculture and both act as barriers to transfer of capital into agriculture. External capital rationing means that additional credit is not available at the going rate of interest because of limitations imposed by the lenders; while internal capital rationing means that the additional credit is available but the farmer elects not to use it. External capital rationing is known to be widespread in low income countries as a response to uncertainty over the managerial ability, integrity and honesty of borrowers.

In the Gezira Scheme, some of the shail merchants ration credit to certain borrowers mainly to check on how desperately the credit is needed so that they may bleed the borrower to the

limit. Information about the borrower, even his personal circumstances, are common knowledge in the village and the skilful shail merchants are well aquainted with such circumstances. But occasions arise when a tenant's needs are not so apparent and some shail merchants resort to capital rationing in order to gain an idea about such needs. A typical example is of a tenant farmer approaching the shail merchant to borrow against a standing crop and the shail merchant accepting the offer and fixing the price but apologising for not having the money. Then he would ask the borrower to come at a certain date or time to collect his loan. The earlier the borrower came, the more certain will the shail merchant be of the urgency of his needs, new terms will be agreed upon and the price taker (the borrower) collects his loan. A similar example was given by Apaya (1971) when the shail merchant also accepts the offer of purchasing a tenant's produce in advance but apologising for not having the money. In this case he gave the borrower a goat valued at Ls.5.00 on credit, so that the borrower might sell it in his own way and raise the funds he needed. The borrower did not find buyer and returned back to the lender who bought the same goat for Ls.3.00 from the tenant."

The foregoing discussion is intended to show that the shail merchants have misused their position and that they have exploited the situation to appropriate monopoly gains for their credit services. The conditions on which they granted credit took away the tenant farmers' means and incentive to invest in farming and raise their income and standard of living. However investment was undertaken by the shail merchants. Most of the shail merchants employed their own funds but the value added was transferred by some, particularly the commission agents, from

the rural areas to the urban areas. Shail merchants in the Gezira invested in different activities such as farm machinery, including tractors and self propelled combine harvesters. The number of privately owned tractors now exceeds one thousand. They also invested in transport like lorries, rollies and buses, in shopkeeping and other businesses like flour mills. Also part of their profits is put into building good houses and in raising their standard of feeding and clothing. A very few of the shail merchants invest part of their profits in the urban sector and in building modern houses in the town and these few include some of the big merchants in the rural towns.

6.8 Direction of Relationship of Variables Influencing the Rural Rate of Interest

In our earlier discussion of the causes of the high rate of interest charged by the shail merchants in the Gezira Scheme we made several assumptions about the functional relationship of the variables we considered with the rate of interest. The functional relations we postulated could be summarised in the relation between rural rate of interest and the probability of recovery, farm income, size of loans, duration of loan, number of loans granted to a borrower, type of crop against which loan was extended, kinship and credit need.

In this final section we shall test the assumptions made in formulating these functional relations. Together with the above variables, we will try to investigate the relationship between the rate of interest and the value of assets of the borrowers, their off farm incomes, their profits and appreciation from the previous seasons' cotton crop and the borrowers' out

standing debts to the shail merchants. Multiple regression was used with the variables included in the model presented in Appendix 6.b and the results obtained presented in Table 6.4.

Though the variation explained by our variables is low (R^2 = 47 per cent), it is clear from Table 6.4, that our assumptions about the type of relationships between the dependent (interest rate) and the different explanatory variables are broadly confirmed by the empirical test.

The relationship between farm income and the rate of interest is not statistically significant. However, the negative sign of the coefficient confirms our assumption about the inverse relationship between interest rate and farm income. The negative regression coefficient can be explained by the fact that as the farmer's income rises, his repayment capacity rises and this may reduce the risk of default in lending to him; he is therefore more likely to be charged a lower rate of interest. This confirms our assumption that the rate of interest is directly related to the probability of default (q) or inversely related to the probability of recovery (P).

The relation of the size of loans and the duration of loans with the rate of interest are both statistically signifi cant at 2 and 5 per cent levels respectively. That of the interest rate and number of loans the borrower received was just significant at 25 per cent level. The inverse relation between each of these three variables and the rate of interest also confirms our earlier assumption that the larger the size of the loan, the longer the duration of the loan and the greater the number of loans, the less is likely to be the administrative cost to the lender and hence the lower the rate of interest.

Table 6-4
Relationship between interest rate charged by the shail merchants and variables influencing the rate of interest

Variable name (X)	Regression Coefficient (B)	Standard error of regression coefficient S.E.	Computed T value	Level of significance of T value %
X1 Assets value	2.2166 E-3	1.71 E-3	1.29	25
X2 Farm income	-8.1002 E-4	1.28 E-3	-0.63	N.S.
X3 Off farm income	-2.2837 E-3	2.04 E-3	-1.12	N.S.
X4 Profits and appreciations	1.9453 E-3	3.17 E-3	0.61	N.S.
X5 Kinship	-4.5586 E 0	5.58 E-1	-8.16	0.1
X6 Type of crop	-2.4368 E 0	7.57 E-1	-3.22	0.2
X7 Size of loan	-7.7899 E-2	3.24 E-2	-2.40	2
X8 Starting date of loan	3.1535 E-1	1.03 E-1	3.06	1
X9 Duration of loan	-1.5594 E-1	7.58 E-2	-2.06	5
X10 Outstanding debt	3.8300 E-2	1.55 E-2	2.48	2
X11 Number of	-2.9783 E-1	2.14 E-1	1.39	25
X12Max. credit need	-2.3803 E-3	1.84 E-3	1.30	25

Intercept A = 11.713 S.E. = 1.46

Analysis of variance

	DF	SS	MS	F. Value
Regression	12	1245	103.757	14.47
Residual	167	1198	7.172	
Total	179	2443	13.647	

Multiple correlation coefficient X^2 = 47.4%

The type of crop in this model is represented by a system of dummy variables, as can be seen in Appendix 6.B, with dura and groundnuts having a value of zero and loans against wheat having a value of one. The variable is statistically signifi cant at 0.2 per cent level with a negative coefficient confirm ing our assumptions that the greater the certainty about the future price of the commodity against which a loan is granted, the lower is the risk due to price fluctuation and this might reduce the rate of interest to be charged.

A high level of significance was also obtained for the relationship between kinship and the rural rate of interest. Kinship was also represented by dummy variables of zeros and ones for no blood relationship and for blood ties respectively. The relationship is statistically significant at the level of 0.1 per cent and with a negative slope indicating that the closer the borrower to the lender, the more likely he is to be charged lower rate of interest.

In our earlier discussion, it was also pointed out that the shail merchants maintain their prices for longer periods and hence the earlier the loan is granted, the lower would be its cost. To test this assumption, the starting date when the loan was granted was included in our model, loans extended in the first half of June were assumed to be extended at period 1, those in second half of June, in period 2 and those in the first half of November, in period 11 and so on. The variable was significant at 1 per cent level and its positive slope also confirms our assumption.

The relationship between off farm income and interest rate was not significant but the negative coefficient might indicate

the lenders knowledge about the borrowers financial circumstances and that if his farming failed, he can repay cash so there is less risk in lending to him.

The interest rate falls when the maximum credit need rises which might be due to some elements of charity. The relation ship of interest rate with outstanding debt was positive and significant at 2 per cent level.

Interesting are the relationships between the value of assets and the tenants' proceeds from the previous seasons' cotton crop with the rate of interest. The first variable is just significant at 25 per cent level and the other variable is statistically non significant. The positive coefficient in the case of assets may be due to the lenders' difficulty in realizing assets as security since assets were not offered as security and their confiscation is socially unacceptable. The positive sign in the case of profits and appreciations could be due to the fact that most of them were received before December and after that date, the tenant farmers who had much profits borrow less and for short duration. This coupled with the low price, as shail merchants maintain these low prices for longer periods, would increase the rate of interest.

Though these variables explain less than half of the total variation in the interest rate, the direction of their relation ship with the rate of interest lent some support to the assump tions on which our calculations of the components of the interest rate charged by shail merchants was based. Such a rate was seen to be far below the actual rate the shail merchants' charge due to monopoly exploitation.

Chapter VII

7. Economic rationale of the tenant farmers and shail merchants

7.1. Setting:

Farm practice in the Gezira Scheme has developed partly in response to SGB directives on permissible crop rotations and partly to economic incentives to individual tenant farmers. The efficiency with which resources are allocated is examined in this chapter by means of production functions related to aggregate data and by linear programming models related to specific resource situations. Any inefficiencies, indicated by marginal revenues being less than marginal costs, would provide a prima facie case for reorganising farming rotations or practices in order to raise farm incomes. Special attention is paid to the productivity of working capital, to the effect on farm income of varying the amount of working capital and the interest rate at which it is made available, and to the composition of the resultant crop output. These calculations give some insight into the rationality of the tenant farmers' decisions at the present rate of interest and of the shail merchants' in setting their interest rate.

The main hypothesis to be tested in this investigation is that the tenant farmers in the Gezira Scheme are profit maximisers. However, peasant farmers are known to have other goals to maximise, like family security, and community commitments. In view of the empirical evidence gathered from previous production response investigations and attitude tests (i)

(i) See the Village Farming Experiment at Wad El Naim, full report and recommendations by a working party for the Sudan Gezira Board January 1970, pp.10, Also see Thornton (1972).

that the tenant farmers in the Gezira Scheme are strongly motivated for higher income, our proposition that the tenant farmers are profit maximisers is thought to be plausible. However, the tenant farmers' other goals of production, like the satisfaction of subsistence requirements were also incorporated into our LP models as constraints.

The test of the hypothesis that the tenant farmers are profit maximisers has necessitated the choice of a maximizing technique in spite of obvious imperfections in the knowledge of the future production environment, which would cause some differences to arise between what actually happened and the maximizing results. The omission of uncertainty was due to two reasons. Firstly, the irrigated nature of farming in the Gezira Scheme in addition to the well established methods of production and fair degree of pests and disease control, reduce the importance of uncertainty. Secondly, the consideration of uncertainty by means of the theory of games within a LP framework or methods including sensitivity analysis, requires time-series data on yields and prices. While information about cotton gross margins in the Gezira Scheme is available for a number of years, such information for other activities is scanty.

The discussion in this chapter is divided into three main sections. In the first section, production functions (PFs) were estimated to reflect on aggregate resource productivity. The results achieved by the estimation of PFs were, however, subject to serious specification and estimation problems. For this reason, the question of allocative efficiency was further discussed and the profit maximizing situation was investigated

by LP. Linear programming was considered appropriate for the following reasons; firstly, the structure of farming in the Gezira Scheme and the pattern of crop production and rotation is imposed by Government regulations. This greatly reduced the heterogenety of farming which distinguishes the Gezira tenant farmers from those in non-irrigated areas. Moreover, the relative homogenety of farming makes it possible to investigate a limited number of situations based on our farm groups. Secondly, to study the effect on farm income and crop combinations of varying the amount of working capital and the interest rate at which it is made available necessitates the parametrication of working capital and interest rate within a LP framework. Furthermore, LP was used in this investigation because of its flexibility in handling varying complex situations and because of the practical insight given by its by-product calculations which makes it eminently suitable as a diagnostic and to a less extent prescriptive tool. Following our investigation on the tenant farmer's rationality, the rationality of the shail merchants will be discussed in the third section also using parametric linear programming.

7.2. The aggregate approach to resource productivity:

The purpose of the investigation in this section is to calculate the marginal value productivities (MVPs) of land, labour and capital by the estimation of production functions (PFs) from the cross-sectional data discussed in chapter 2, and compare them with their market costs. The whole sample of 90 tenant farmers was used because of the small number of observations ir some groups. A theoretical discussion on the important statistics to be derived from the PF is given in Appendix 7A. A cobb-douglas PF linear in logarithms, also

discussed in Appendix 7A, was selected mainly because of compulational ease, diminishing marginal returns (DMR) and adequacy of fit in many practical situations. However, as mentioned earlier, the numerous assumptions and compromises made in the estimation of PFs in general, and the cobb-douglas PF in particular, often result in specification errors which might affect the validity of the derived estimates. These specification errors are summarised below:

a) The estimation of PF is limited in the range or number of variables that can be included in the model. Attempts at wide disaggregation by using a large number of variables often leads to statisticalproblems such as multi-collinearity, auto-correlation and lack of degrees of freedom which affect the validity of the derived estimates. To circumvent this problem, a compromise is often made by aggregating inputs and by omitting some variables. The aggregation however, often results in a bias in the estimates of returns scale as the individual elasticities of the micro variables are not the same. The omission of a variable, on the other hand, often biases at least one of the coefficients of the variables included because there is almost always some correlation among the factors of production.

b) The sum of the regression coefficients gives an indication of returns to scale which could be decreasing, constant or increasing. This is valid only when no relevant variable has been excluded and perfect aggregation of inputs is used. These are difficult conditions to meet and often result in specification errors that limit the usefulness of this return to scale statistic.

c) The estimates of factors elasticities in the Cobb-Douglas PF remain constant, a feature which does not accurately reflect the real situation. Therefore when considering the implications of the elasticities, it is always assumed that we are talking of incremental change at the gemetric mean input level.

d) The Cobb-Douglas PF is unsatisfactory in describing the situation when there are both negative and positive elasticity coefficients.

In the following discussion, we propose to start by describing the statistics provided by the fitted function. We then use these statistics in the calculation of the MVPs of the factors of production before considering allocative efficiency by the calculation of efficiency indices for these factors.

Using the Cobb-Douglas PF described in Appendix 7A, the following equation was obtained:

$$Y = \underset{(0.429)^*}{-0.615} + \underset{(0.302)}{0.100x_1} + \underset{(0.161)^*}{0.412x_2} + \underset{(0.283)^3*}{0.631x_3}$$

$R = 76\%$ $\quad$ F - value = 39.126**

$R^2 = 58\%$

$\bar{R}^2 = 57\%$

Where Y = Gross farm output measured in Ls.

X_1 = Area of cultivable land in feddans

X_2 = Total labour in man-hour equivalents

X_3 = Total working capital in Ls.

Level of significance:

** Coefficient is statistically significant at 0.1%

* Coefficient is statistically significant at 5%

Coefficient with no subscript is not statistically significant.

The estimated elasticity coefficients of labour and capital are statistically significant at 1.2% and 2.8% respectively. Land was not statistically significant. With individual coefficients less than unity, the marginal returns for each factor decreases as more of it is used, while the total sum of elasticity coefficient was 1.14 showing an increasing return to scale.

Total working capital generated a greater output response than the other two variables with an increase in capital by 1% raising farm output by 0.63%. Working capital was also the most highly correlated input factor with gross farm output as can be seen from Table 7-1 below.

Table 7-1

Correlation coefficient between gross farm output (Y) and land (X_1), labour (X_2) and working capital (X_3)

	X_1	X_2	X_3
Y	0.70	0.67	0.74
X_1		0.71	0.94
X_2			0.75

However, among the individual variables a high correlation exists between land and capital because the proporation of the holding devoted to cotton and wheat and the techniques used for their production are fixed by the SGB.

With this extreme multi collinearity (0.94), it may not be possible to invert the correlation matrix of the independent variables, thus leaving no acceptable way to perform regression analysis using the given set of independent variables. Under such conditions, only one of the following two actions can be

taken:

(1) to create a new variable which is a compromise scale of the set of highly inter-correlated variables and use the new scale variable in the regression equation in place of its components

or

(2) use only one of the variables in the highly correlated set to represent the common underlying dimension . In the present investigation we are interested in the efficiency of resource use which can be calculated by relating its MVP to its MC. This limits our choice to the second course of action because no cost can be computed for the common scale variable. Of the two highly correlated independent variables ie. land and capital, land was removed for the following reasons:

i. Treating these factors separately, land was found to explain less of the variation in gross farm output than capital as can be seen below:

a) land $Y = 1.51 + \underset{(0.11)*}{1.049}\ X_1$ $R^2 = 50\%$

b) capital $Y = 0.74 + \underset{(0.096)*}{0.983}\ X_3$ $R^2 = 54\%$

ii. Land did not add much to the variation explained by capital when both variables are used, and was statistically non-significant as can be seen below:

$$Y = 0.819 + \underset{(0.311)}{0.155X_1} + \underset{(0.278)**}{0.854X_3} \quad R^2 = 54$$

iii. Using the standardised regression coefficients (B1) to assess the relative importance of the individual variables when all were included in the model, capital explained 42% of the variation in output, followed by labour 15% while land assumed the least importance ($B_1 = 7\%$). Again having the three factor inputs in the model, land was the only non-

significant variable, as was seen earlier.

iv. In addition to these statistical arguments, land was also removed on computational grounds. The object of estimating the elasticity coefficients is to calculate the MVPs by relating these betas to the geometric mean of the input factors and the dependent variable. To calculate the efficiency with which a resource is used, the MVP is divided by the corresponding MC to obtain an efficiency index. But, it is very difficult to estimate a price for land in the Gezira Scheme. However, we are interested more in the services of land in a year and a price can be estimated from the system of sub-letting (Dangada) referred to earlier. Yet such a price varies considerably with the crop to be cultivated on that piece of land and the type of crop to be cultivated, as was seen earlier, depends upon the rotation. The spreading WaKhiel (agent) system in cotton is a crop sharing system and very little dura and wheat is rented on dangada. Most of the dangada occurs in groundnuts and vegetables but a high price is often paid for land to be cultivated with vegetables.

For these reasons, the land factor was removed. This omission, as was mentioned earlier, biases the most correlated variable i.e. capital. Thus the following discussion relates only to labour and the combined land/capital input factor. When gross farm output was regressed on labour and capital, the following results were obtained.

$$Y = 0.17 + \underset{(0.16)^{**}}{0.52X_2} + \underset{(0.15)^{**}}{0.69X_3}$$

$R = .74$ F-value = 54**

$\underline{R}^2 = .55$

$R^2 = .54$

Both labour and capital are positively correlated with gross farm output and their elasticity coefficients indicate that an increase in labour by 1% raises the gross farm output by 0.52% while a 1% increase in capital raises gross farm output by 0.69% The elasticity coefficients also indicate that, holding either of the labour or capital input factors constant, the marginal returns to the other input factor decreases as more of it is used ie. DMR because each of the betas is less than unity. The sum of the elasticity coefficients (ie. 1.21) indicates an increasing return to scale.

Following this description of the statistics provided, we now move to investigate the efficiency of resource use. The estimated production coefficients, as was stated in Appendix 7A, are used directly in the computation of the MVPs of the individual resources. The MVPs are calculated at the geometric mean of all variables, dependent and independent. The MVPs of input factors, as was mentioned earlier, were related to their MC to obtain the efficiency index of the resource use. Factor costs are represented by the market price. In the case of labour, an average price of Ls.0.07 per man-hour equivalent was calculated. The credit market, as was seen earlier, is non-competitive and different rates of interest prevail. The rate of interest of 7% per annum charged by the institutional sources was taken as the price of credit in these calculations. This is because, firstly, on the average more than three quarters of the credit obtained by the tenant farmers was provided by the SGB and secondly, because approximately two thirds of the SGB credit was advanced in kind and directly used on the farm. In this way, the tenant farmer making use of a Ls.1.0 for a whole year should repay

Ls.1.07 at the end of the year to cover the principal plus the interest charges.

Having a geometric mean of gross farm output equal to Ls.657.51, the calculated geometric mean, MVPs, MCs and efficiency indices of the input factors can be seen in Table 7-2 below:

Table 7-2

Geometric mean, MVP, MC and Efficiency Index of labour and Working Capital

Input factor	Labour	Capital
Geometric mean (1)	2748.53	130.71
Elasticity of production	0.52	0.69
MVP in Ls.	0.12	3.47
MC in Ls.	0.07	1.07
Efficiency Index	1.71	3.24

(1)= Geometric mean of labour in man-hour equivalents - that of capital in Ls.

With efficiency indices of both labour and capital above unity, maximum efficiency would require the use of more labour and capital. While a moderate increase in labour is needed, the high efficiency index of capital suggests that working capital is the more important constraining resource.

The production function estimated in this section showed possible disequilibrium in the use of labour and working capital at the present time. However, this conclusion can only be taken within the limits of statistical reliability resulting from the specification errors encountered in the estimation of PFs and the bias resulting from the omission of the land input factor.

For these and other reasons mentioned earlier, the question of allocative efficiency will be discussed further using LP technique.

7.3. Linear programming approach:

The discussion in this section falls into two parts. In the first part, the question of allocative efficiency will be explored using an LP approach. As a profit maximizing technique, LP will show the best combination of enterprises under given conditions, that will give the maximum profit. This situation when compared to the actual situation revealed by our tabular analysis will show the best use of the resources available and give an insight into the possibilities open to the tenant farmers to increase their farm incomes or maintain the same level of income from fewer resources by the better allocation of these resources, given the present state of the arts. In the second part, the effect or farm income of varying the working capital constraint and its effect on the crop combination will be examined using parametric linear programming (PLP). But first we begin by a brief description of the matrix used in this study.

7.3.1. Matrix construction:

The validity of the solutions obtained by LP depends both on the accuracy of data and the specification of a realistic model. The data used in this investigation was collected by the farm level survey described in Chapter 1. The relationship between resources and enterprises on the farm was characterised in a matrix of 250 activities subject to 200 constraints. Due to the lack of space, only selected features of this matrix will be discussed here particularly the situations

that have not been incorporated in a LP matrix before. These include the special credit arrangements in the Gezira Scheme, the hire of seasonal cotton picking labour and its transfer and the hire of contract services, and other important situations, like the rotations, on which our discussion in the subsequent sections elaborate.

a) Working capital and credit arrangements:

Working capital was incorporated into this matrix in the conventional way by the use of transfer activities. Tenant farmers' cash in hand at the start of the agricultural year was incorporated as the level of working capital at the first of June. Thereafter, the input/output coefficents were included at each half a month giving 24 working capital input/output coefficients for the activities using and/or providing capital. The capital requirements of the activities represent constraints on the farming system that have to be satisfied by other activities, cash in hand or by borrowing. Transfer activities were used, as can be seen in Table 7-3, to transfer the surplus working cash from one period to another during the year but not between years ie. no transfer of capital was allowed from the second half of May to the first half of June.

The Gezira tenant farmers obtain credit from two sources, the SGB and the private sector and these two sources, as was seen earlier, vary in their methods of operation. The SGB credit was provided for the production and marketing of the cotton and wheat crops. While the SGB completely monopolises cotton marketing, it controls the marketing of a quantity of wheat sufficient to cover its debts. The use of funds borrowed from shail merchants was not specific to certain crops nor was

its amount limited to the area or yield of certain crops as with the SGB credit. In this way, it relaxes all the working capital constraint. Another feature of shail credit relates to flexibility in repayment. However, failure to repay at a certain period would mean more to be repaid in the next and subsequent periods due to the compound rate of interest charged.

These credit arrangements vary considerably from the borrowing and repayment transactions usually incorporated in LP. Borrowing is usually incorporated in the matrix by deducting the available credit from the capital requirements at that time or adding it to any capital in hand depending on the way working capital was incorporated. If transfer activities were used, the level of capital in other periods remain the same since the transfer activities passes any additional surplus capital. If cumulative capital balances were used, the amount borrowed should be adjusted in subsequent periods. Working capital was incorporated in this matrix, as stated earlier, by the use of transfer activities. While borrowing from the SGB can be included in the conventional way by deducting the available credit from the capital requirements of cotton and wheat at that time, borrowing from shail sources cannot be handled in this way because, as was stated earlier, its use is not specific to certain crops. Also the other method of adding credit to the cash in hand cannot be used with shail credit because the amount to be borrowed was only constrained by the interest rate.

Repayment can also be treated in either of two ways, by deducting both principal and interest calculated for a whole

year from the net revenue or by referring to the solution. In the second case, if credit of Ls.1000 was available from the start of the year and the solution showed surpluses of Ls.2400, Ls.600, Ls.0.0 and Ls.1700 in each quarter, then compared with the Ls.1000 credit, the figures show that Ls.400 and Ls. 1000 were borrowed in the second and third quarters of the year while none was borrowed in the first and last quarters because cash availability in these two quarters exceed the credit allowed by Ls.1400 and Ls.700 respectively (i). However, repayment for both SGB and shail merchants' borrowed funds cannot be treated in this way. Repayment for the SGB borrowed funds took place at cotton and wheat harvest time and was deducted from the value of sales of these two crops. In the case of shail credit, interest was paid on the outstanding sum of capital, but failure to repay at a certain period will mean more to be repaid in the next and subsequent periods. The difference represents the interest on the principal and on the interest for the previous periods. The following discussion shows how these credit arrangements were incorporated in the matrix.

SGB Credit:

The SGB credit, as was mentioned earlier, was provided for the production and marketing of the cotton and wheat crops. While the SGB monopolises cotton marketing, it contr the marketing of the proportion of wheat crop sufficient to cover its debts. Because of the complexity in the SGB credit to cotton crop and the delay in repayments that make these transactions continue for two years, the no. credit situation was considered with the tenant selling his cotton crop at the first

(i) See Barnard and Nix (1970).

half of April. Credit from the SGB to the cotton crop was deducted from the capital required by this crop at the exact time when SGB credit was provided. At the time of sale, all SGB credit was recovered together with an annual rate of interest of 7%. As with the no credit situation, the value of sale was computed using the net producers' price. In another part of the matrix, hire of machinery was included. However, in the case of cotton and wheat all the contract work provided by the SGB was not included since its cost is included as credit from the SGB. The same treatment was followed in wheat with SGB credit deducted from the working capital requirement and the amount advanced plus an annual rate of interest of 7% recovered from the sale value of wheat.

Shail credit:

Due to the flexibility in shail credit by not being limited to specific uses, borrowing from shail sources at any period relaxes the working capital constraints in that period and in subsequent periods due to the capital transfer mechanism as shown in Table 7-3. The tenant farmer can repay whenever his farming and selling activities generate a surplus that is not needed by other activities selected by the LP. Thus repayment activities ie. of positive sign (+1) were included, as shown in the first half of Table 7-3, covering both recovery of the principal and an interest rate of 10% every half a month. The interest was included with a time lag of half a month ie. for loans advanced in the first half of June, an interest rate of 10% per half a month will first be charged for these loans in the second half of June. Because of the carryover of debts, an interest rate of 10% was charged in the first half of June on

debts not recovered by the end of the previous agricultural year.

In the second part of Table 7-3, outstanding debt was calculated with borrowing and repayment included. The amount borrowed will add to the debt and the amount repaid, deducted leaving the outstanding debt to be transferred to the next and subsequent periods as can be seen by the coefficients under the debt columns. An interest rate of 10% was charged on the outstanding debt in each period. To calculate the total interest charges, the total debt at each half a month is multiplied by the interest rate to obtain the interest charges in that period and the sum of these give the total interest charges for a whole year. The interest rate, as a price of credit, can also be included in the objective function row, but this makes it impossible to parametrize on interest rate for 24 periods at one and the same time. Accordingly the final row and column were introduced to permit this facility. Also the inclusion of the total debt row and total interest column makes it easier to calculate the interest charged for the whole year by multiplying the total debt by the interest rate of 10%.

Due to lack of space, only four points were selected and presented in Table 7-3 to illustrate the way these credit arrangements were included in the matrix. Following this procedure, the repayment of both principal and interest charges were forced in the solution and the final net revenue figure is net of the principal and interest charges of both the SGB and shail merchants' credit.

Table 7-3

The Incorporation of Shail Credit in LP "An Illustration"

				BORROWING				REPAYMENT				DEBT				TRANSFER CAPITAL			TOTAL INTEREST
				Cotton	Dura	June 1	June 2	July 1	July 2	June 1	June 2	July 1	July 2	June 1	June 2	July 1	July 2	1 - 2	2 - 3	3 - 4	
Objective function		Ls.		8	-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-0.1
Constraint	Unit	level	sign																		
W-K (1)	June 1	Ls.25	≥	Cij	Cij	-1				1								1			
W-K	June 2	Ls.0	≥	Cij	Cij		-1				1			0.1				-1	1		
W-K	July 1	Ls.0	≥	Cij	Cij			-1				1			0.1				-1	1	
W-K	July 2	Ls.0	≥	Cij	Cij				-1				1			0.1				-1	
O/S (2) debt	June 1	Ls.0	≥	0.0	0.0	1				-1				-1							
O/S debt	June 2	Ls.0	≥	0.0	0.0		1				-1			1	-1						
O/S debt	July 1	Ls.0	≥	0.0	0.0			1				-1			1	-1					
O/S debt	July 2	Ls.0	≥	0.0	0.0				1				-1			1	-1				
Repay debt		Ls.0	≥	0.0	0.0	1	1	1	1	-1	-1	-1	-1								
Total debt		Ls.0	≥	0.0	0.0									0.1	0.1	0.1	0.1				-1.0

(1) = W-k = Working Capital
(2) = O/S debt = Outstanding Debt

(b) Labour

Labour in the Gezira Scheme can be divided according to its source into family labour, casual hired labour and migrating labour. While the second source of labour is available at all times, the migratory labour is only available during the cotton picking season ie. second half of December to the first half of April. Both family and casual hired labour were incorporated in the conventional way through 24 half monthly constrains on family labour available and 24 activities for hiring labour each half a month at a cost per man-hour equivalent of Ls:0:12 during the cotton picking season:

To finance a man-hour equivalent of casual hired labour, say in December 2, a requirement of Ls.0.12 of the working capital was included as can be seen in Table 7-4.

The seasonal cotton picking labour is available in the period second half of December to the first half of April on completely different basis from the casual labour. In this situation, the services of a man are hired for the whole picking season and the tenant farmer provides him with food and accommodation during the whole period and pays him in cash for any weight of seed cotton picked. Under the cotton watering system during the picking season, the field is irrigated every two weeks and at this period no crop can be picked. Arrangements are always made between the tenant farmers to transfer their migratory labour to other tenants if their own cotton field is under irrigation. The other tenant making use of the migratory labour should provide them with food and pay them in cash for the cotton they picked. This system was treated in our LP in this way:

i) During the cotton picking season, the tenant farmer, on the average, work for seven hours a day. A migratory labourer works an hour more thus supplying 124 man-hour equivalents every half a month. This high rate of work was due firstly to the residence of the migratory labour in the field and secondly, to the desire of these labourers to earn the maximum in the short cotton picking season before going home. The cost of the migratory labour for the whole cotton picking season was Ls.70.84. In other words, if the tenant farmer hired one migratory labourer and made use of all his services, he will pay him Ls.70.84 or Ls.8.855 every half a month during the picking season as can be seen in the third part of Table 7-4. But, as was seen earlier, the tenant farmer does not normally use all his migratory labourers services and transfer is a common practice. To include such a transfer, the tenant was allowed to rent out the extra man-hour equivalents of his migratory labour and get a return of Ls.0.07 for each hour. In this way, if he used a maximum of half a man he will pay him the full rate of a man ie. Ls.70.84, but by renting out the extra hours at Ls.0.07, he is actually paying Ls.0.0735 for every hour he rented the migratory labourer. The tenant farmer pays a little more ie. Ls.0.0035 per man-hour equivalent, for the privilege of having first claim on the time of a seasonal worker. It is also essential that the credit be less than the cost to avoid creating an unconstrained hiring activities. Accordingly eight credit picking labour activities were added in the matrix and eight constraints. The migratory labourer will supply the credit labour constraint and the family labour constraint with 124 man-hour equivalents every half a month. Suppose in the

Table 7-4

The Incorporation of Family, Casual and Migratory Labour in LI

						CASUAL HIRED LABOUR										CREDIT PICKING LABOUR								
					Cotton	Dura	December 2	January 1	January 2	February 1	February 2	March 1	March 2	April 1	Seasonal Labour	December 2	January 1	January 2	February 1	February 2	March 1	March 2	April 1
Objective functio	Ls.				8.0	-10.0	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.84	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Constraint	Unit	Level	Sign																				
Family December 2	Hours	335	≥	cij	cij	-1									-24	1							
labour January 1	"	262	≥	cij	cij		-1								-24		1						
" January 2	"	262	≥	cij	cij			-1							-24			1					
" February 1	"	245	≥	cij	cij				-1						-16				1				
" February 2	"	245	≥	cij	cij					-1					-16					1			
" March 1	"	262	≥	cij	cij						-1				-24						1		
" March 2	"	335	≥	cij	cij							-1			-24							1	
" April 1	"	262	≥	cij	cij								-1		-120								1
Credit Pick Labour	Dec.2	Ls.0	≥	0.0	0.0										-24	1							
" " "	Jan.1	Ls.0	≥	0.0	0.0										- 24		1						
" " "	Jan.2	Ls.0	≥	0.0	0.0										- 24			1					
" " "	Feb.1	Ls.0	≥	0.0	0.0										- 16				1				
" " "	Feb.2	Ls.0	≥	0.0	0.0										- 16					1			
" " "	Mar.1	Ls.0	≥	0.0	0.0										- 24						1		
" " "	Mar.2	Ls.0	≥	0.0	0.0										- 24							1	
" " "	Apr.1	Ls.0	≥	0.0	0.0										-120								1
Working	December 2	Ls.25	≥	cij	cij	0.12									9.037	-0.07							
Capital	January 1	Ls.0	≥	cij	cij		0.12								9.037		-0.07						
"	January 2	Ls.0	≥	cij	cij			0.12							9.037			-0.07					
"	February 1	Ls.0	≥	cij	cij				0.12						8.454				-0.07				
"	February 2	Ls.0	≥	cij	cij					0.12					8.454					-0.07			
"	March 1	Ls.0	≥	cij	cij						C.12				9.037						-0.07		
"	March 2	Ls.0	≥	cij	cij							0.12			9.037							-0.07	
"	April 1	Ls.0	≥	cij	cij								C.12		8.746								-0.07
Max.hired labour	Mar 2		≥	0.0	0.0										1								

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second half of December. the tenant used only 62 man-hour equivalents, the excess amount of seasonal labour will be taken from the availability represented by +1.0 under the activity 'credit picking labour December 2' and the 'family labour December 2' row. Also the extra hours were taken from the credit labour December 2 row to be rented and bring the tenant farmer returns of Ls.0.07 per man-hour equivalent. This will, however, add to the working capital and hence presented by Ls.0.07 in the working capital December 2 row.

Because the supply of migratory labour is limited, its availability was constrained. This was calculated from the number of migratory labour hired by the tenants. In the example shown in Table 7-4, the tenant farmer can hire a maximum of two migratory labourers.

Another type of labour relates to herdsmen. These are specialised people herding the tenants' animals and are paid at the beginning of each month. This labour is treated in the normal way of having hiring activities supplying labour used for herding animals and the cost representing a requirement on working capital at the start of each month.

(c) Contract services:

Mechanised field operations in the Gezira Scheme are carried out by the SGB, private contractors and machinery co-operative societies financed by the Agricultural Bank of Sudan. These operations include:

i. Cultivation of fallows preceeding cotton, performed by the SGB Ploughs Section and charged to the joint account.

ii. Cultivation of cotton, especially ridging of land, performed by the SGB or private contractors hired by the SGB and

the cost debited to the joint account.

iii. Cultivation of wheat land performed by SGB as credit in kind to tenant farmers and also by private contractors.

iv. Cultivation of other crops and harvesting of dura and wheat performed by private contractors and co-operative societies.

Due to the seasonality of farming these operations are carried out in few weeks of the year and the machines stay idle for longer periods. Accordingly a higher cost per hour worked would be charged to cover the high fixed costs. Also, as would be expected, the higher the rate of working, the lower would be the impact of costs per unit of work done.

Table 7-6 shows the way tractors and combines were characterised in the matrix. The following discussion relates to the way costs and work rate were calculated.

Costs:

A tractor or combine harvester was assumed to work for ten years. The price of a new tractor with the essential ploughs is Ls.4000 covering also the duty charges. The price of a self-propelled combine harvester also including duty charges is Ls.10,000. The depreciation, using the straight line method, would be Ls.400 and Ls.1000 per annum for the tractor and the combine harvester respectively. Other costs include profits for the contractor, interest on the money to cover risk, operating expenses and driver's salary as can be seen below.

Table 7-5

Annual fixed and operating costs of a tractor and a self propelled combine harvester in Ls.

	Tractor and Ploughs	Combine Harvester
Depreciation	400	1,000
Salary of drivers	360	360
Other operating expenses (One third of fixed costs)	133	333
Profits of contractor (10%) of fixed cost)	40	100
Interest on capital invested	(8%)32	80
Total cost	965	1,873
Cost per half a month	40.21	70.04

Rate of work:

A high rate of work of 2400 hours per annum was assumed because of the high seasonality of work, with tractors working for more than 15 hours a day in peak periods. Accordingly the rate of work would be 100 hours every half a month reduced to 90 hours during the rainy season, July to September inclusive due to the difficulty of movement.

The device outlined in Table 7-6 would enable calculating both the number of tractors required and the cost per hour done by relating the number of hours needed to the work rate and total cost in that period. In this way, the lower the number of hours needed, the higher would be the cost per hour performed and vice versa.

Table 7-6

The Incorporation of machine contract services in LP (An Illustration)

					Cotton	Dura	Tractor	Combine Harvester
Objective function					8.00	-10	-965	-1873
Constraint		Unit	Level	Sign				
Working capital	June 1	Ls.	25	≥	cij	cij	40.21	70.04
" "	June 2	Ls.	0	≥	cij	cij	40.21	70.04
" "	July 1	Ls.	0	≥	cij	cij	40.21	70.04
" "	July 2	Ls.	0	≥	cij	cij	40.21	70.04
Tractor	June 1	hours	0	≥	cij	cij	-100	
"	June 2	"	0	≥	cij	cij	-100	
"	July 1	"	0	≥	cij	cij	-90	
"	July 2	"	0	≥	cij	cij	-90	
Combine Harvester	June 1	"	0	≥	cij	cij		-100
" "	June 2	"	0	≥	cij	cij		-100
" "	July 1	"	0	≥	cij	cij		-90
" "	July 2	"	0	≥	cij	cij		-90

(d) Rotations:

Farming in the Gezira follows a prescribed rotation for reasons of soil fertility and phytosanitation. Two rotations were included in the matrix. The first rotation considered in this chapter relates to the present rotation followed in the Gezira Main with allowance of flexibility. Another recommended rotation was used when trying other innovations in the next chapter.

In both situations rotation was included by imposing constraints on the individual crops concerning maxima and minima which are stated as absolute values. Considering the present 8-course rotation in the Gezira Main of - Cotton, Wheat, Fallow, Cotton, Phillipsara/Fallow, Dura, Groundnuts/Lubia, Fallow, the following proportions were calculated:

a. Cotton occupies 2/8th of the cultivable land = 25%.

b. A minimum of 5/16 of the cultivable land is left fallow = 31.25

c. Wheat occupies 12.5% of the cultivable land. However, being a cereal, it can also occupy the dura land. In 1973/74 extra wheat was allowed in the Phillipesara half. Thus wheat can occupy a maximum of 31.25% of the cultivable land.

d. Dura - a minimum dura acreage was prescribed to satisfy the family subsistence requirement and is based on the annual household requirement and the yield per feddar.

e. Groundnuts - Lubia - and Phillipesara are legumes and any of these crops can occupy the whole area left for legumes ie. each can occupy a maximum of 3/16 = 18.75% of the cultivable land.

				Cotton	Ground-nuts	Lubia	Phillip-esara	Vegetables	Wheat	Dura	Fallow
Objective function				8	6	-2	-2	25	20	-10	0
Constraint	Unit	Level	Sign								
Land	feddar	40	≤	1	1	1	1	1	1	1	1
Max. Cotton	"	10	≤	1							
Max.Groundnuts	"	7.5	≤		1						
Max. Lubia	"	7.5	≤			1					
Max.Phillipesara	"	7.5	≤				1				
Max. Vegetables	"	5	≤					1			
Max. Wheat	"	12.5	≤						1		
Min. Dura	"	5	≥							1	
Min. Fallow	"	12.5	≥								1
Max. legumes and veg.		7.5	≤	0	1	1	1	1			
Max. Cereals		12.5	≤						1	1	

f. Vegetables were allowed to occupy half the groundnut/lubia land and the phillipesara half thus occupying 12.5% of the cultivable land.

However, cereals should not exceed a maximum of 31.25% while the legumes and vegetables are constrained to a maximum of 18.75% of the cultivable land.

Having an annual family requirement of 8 ardabs of dura and a yield of 1.66 ardabs per feddan and assuming storage losses of 20% per annum, then a minimum of 5 feddans should be cultivated with dura. Again, having a holding of 40 feddans, the rotational constraint was included in this matrix in the following way (see over).

(e) Subsistence requirements:

The tenant farmers in the Gezira Scheme cultivate dura and keep livestock to satisfy their subsistence requirements. In the case of dura, a minimum feddarage was included in the matrix to be cultivated with this crop as outlined over. However, their lack of liquidity often compels tenant farmers to sell part of their dura crop cheaply after harvest and purchase dura later on at a high price. These sale and purchase activities were also included in the matrix as can be seen in Table 7-7 (a).

The tenant farmers' requirements of 8 ardabs per annum was divided on quarterly basis at 2 ardabs each quarter. The yield per feddar was 1.66 ardabs and the storage losses were 5% every three months (ie. approximately 20% in a year). Activities were also included to transfer the surplus dura between quarters. Purchases of dura, as was seen earlier, represent requirements of working capital ie. +1 and sales supply capital ie. -1.

To supply the family need for milk, the tenant farmer can raise livestock and/or purchase milk. He can also raise more

Table 7-7

The Incorporation of subsistence requirements in LP Matrix

a) Dura

				Dura	Buy Dura				Sell Dura				Transfer Dura			
					I	QI	QT	QR	QRI	QRII	QRIII	QRIV	1-2	2-3	3-4	4-1
					I	II	III	IV								
Objective function				-10.0	-11	-13	-8	-10	8	9	7	7	0	0	0	0
Constraint	Unit	Level	Sign													
Min. Dura	Fedd.	5			1											
Supp.QRI	Ardab	2			-1				1				1			-0.95
" QRII	"	2		1.66		-1				1			-0.95	1		
" QRIII	"	2					-1				1			-0.95	1	
" QRIV	"	2						-1				1			-0.95	1
W.K. June 1	Ls.	25			11				-8							
" Sept.1	Ls.	0				13				-9						
" Dec.1	Ls.	0					8				-7					
" March 1	Ls.	0						10				-7				

Table 7-7 (continued)

b) Milk

Constraint	Unit	Level	Livestock Equivalents	Buy Milk June 1	Buy Milk July 1	Buy Milk August 1	Sell Milk June 1	Sell Milk July 1	Sell Milk August 1	Herd Labour June 1	Herd Labour July 1	Herd Labour August 1	Dura	Buy Dura St June 1	Sell Dura St June 1	Transfer Dura Straw June 1 July 1	Transfer Dura Straw July 1 Aug.1
Objective function Ls.				-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-8	-11	0	0	0
Mff June 1	Lb	60=	42	-1			1										
Mff July 1	Lb	60=	42		-1			1									
Mff Aug. 1	Lb	60=	42			-1			1								
HL June 1	Hrs.	0 ≥	4.85							-1							
HL July 1	Hrs.	0 ≥	4.85								-1						
HL Aug. 1	Hrs.	0 ≥										-1					
FDS June 1	Pile	0 ≥	0.32										(Nov)-.7	-1	1	1	
FDS July 1	Pile	0 ≥	0.32													-1	1
FDS Aug. 1	Pile	0 ≥	0.32														-1
WK June 1	Ls.	25 ≥		.05			-.04			.04				+11	-10		
WK July 1	Ls.	0 ≥			.05			-.04			.04						
WK Aug. 1	Ls.	0 ≥	-9			.05			-.04			.04					

Mff= Milk for family
HL = Herd Labour
FDS= Feed Dura Straw

livestock and sell their milk product. The family requirements for milk should be satisfied every day. Due to the difficulty of introducing these parameters on daily basis in the LP, the monthly totals were calculated. The total milk yield per cow equivalent was also calculated every month. In addition to its milk it was assumed that a cow gives birth every year and needs to be replaced every four years, so only three quarters of calves could be sold if four lactations were assumed. The sale of a four year cow was also assumed to exactly offset the value of calves reared for replacement. Hence for a cow worth Ls.20, the annual returns will be Ls.5.00 introduced in the objective function row. The way family requirements for milk were included in the matrix can be seen from Table 7-7 (b).

7.3.2. Allocative efficiency

The question of allocative efficiency is explored further in this section by analysing the optimum plans for six of our farm groups - excluding Group III which has not got an opposite number among the vegetable growers - and comparing these results with the actual situation. Such a comparison will throw light on the possibilities open to the tenant farmers to increase their farm income by adjusting the use of their resources.

Income:

The normative income capable of achievement with optimal resource allocation is approximately twice the income obtained by the tenant farmers at the present time as can be seen from Table 7-8.

Table 7-8

Comparison (1) of the present and optimum income by Farm Group in Ls.

Farm Group No.	Level of Income	
	Present	Optimum
I- NV LAS FY	101.90	211.43
II- NV MAS FY	189.49	454.28
IV- NV HAS FYT	132.76	291.71
V- VG LAS FY	225.17	396.97
VI- VG MAS FYT	278.16	492.32
VII- VG HAS FYT	275.81	677.79

(1)- This is based on comparing the income to be achieved on a weighted average resource situation with the weighted average actual income.

The reasons for this considerable rise in income are discussed below:

Land Use and Productivity:

The comparison of land use under these two situations revealed that land was underutilized by the tenant farmers. Though the same rotational constraints and fallow land were allowed for, yet none of the tenant farmers in these groups cultivated a holding equal to the optimum. The marginal productivity of land for most of the tenant farmers ranged between Ls.11.00 and Ls.19.00 and with some tenant farmers still left some land idle in addition to the fallow in the rotation. Though it is difficult to compute a price for land in the Gezira Scheme, for the reasons stated earlier, yet it is highly unlikely that the productivity of land far axceeds the current rent. Considering Groundnuts and Vegetables among which the dangada system is commonly practiced an average rent of

Ls.12.00/feddan was calculated for groundnut land. The average price for a feddan of vegetables was nearly Ls.25.00. However, vegetable producers showed marginal productivities between Ls.24 and Ls.40 per feddan of vegetables, so it would pay them to rent land from other farmers who had more than they wished to cultivate. Another way would be by reducing the land under fallow. However, both possibilities are limited by the rotational constraint. The marginal producitivity of land under other crops is low ranging between zero and Ls.7.00 per feddan.

Within the individual crops, and apart from vegetables, the actual and optimum area are not greatly different. Cotton and wheat still assume the greatest importance with the area under cotton, slightly less than that actually cultivated and the area under wheat in most cases exceeds the actual cultivated area. For all farm groups the cultivation of an extra feddan of dura reduces the tenants' profits by up to Ls.22.00 so that the opportunity cost greatly exceeds the variable costs of Ls.10.00 required by a feddan of dura. If the tenant farmers could be assured of regular and sufficient supplies of dura, their profits could be increased by switching to other crops. In fact, at the present time almost all the tenant farmers supplement their subsistence requirements by purchases of dura as can be seen in Table 7-9 where the optimum area under dura to give self-sufficiency exceeds the actual area. for most of the farm groups and very few tenants like those in Group VI cultivate a dura holding higher than the optimum.

Labour Use and Productivity:

Regarding the total labour used, the actual situation is consistent with the normative situation. However, considering

Table 7-9

Comparison of actual and optimum area under each crop and total cultivated area by farm group (in feddans).

Farm Group No.		Cotton	Wheat	Groundnuts	Dura	Vegetables	Total
I-NV LAS FY	Actual	7.07	2.52	2.67	3.59		15.85
	Optimum	5.83	2.98	4.81	5.88		19.50
II- NV MAS FY	Actual	11.80	5.13	4.10	5.50		26.43
	Optimum	7.51	8.18	7.10	6.57		29.36
IV - NV HAS FYT	Actual	7.50	6.88	3.75	3.75		21.88
	Optimum	8.13	6.04	4.06	4.12		22.35
V - VG LAS FY	Actual	7.09	4.13	1.29	3.68	1.98	18.17
	Optimum	6.30	3.86	1.78	4.00	3.54	19.48
VI- VG MAS FY	Actual	9.67	4.00	2.33	5.00	1.67	22.67
	Optimum	7.05	8.45	2.50	4.05	5.00	27.05
VII- VG HAS FYT	Actual	10	6.08	3.00	5.00	1.75	25.83
	Optimum	10	5.77	-	6.73	5.00	27.50

the labour source, the available family labour is severely under utilized by all farm groups as can be seen from Table 7-10.

Table 7-10

Comparison of the actual and optimum labour use by source and by farm group (in man-hour equivalents)

Farm Group No.		Family Labour	Hired Labour	Total Labour
I- NV LAS FY	Actual	607	2170	2857
	Optimum	2403	2	2405
II- NV MAS FY	Actual	459	4620	5079
	Optimum	4646	618	5264
IV- NV HAS FY	Actual	164	2538	2701
	Optimum	2917	23	2940
V- VG LAS FY	Actual	497	2863	3360
	Optimum	3613	92	3705
VI- VG MAS FY	Actual	274	3820	4094
	Optimum	3251	583	3834
VII- VG HAS FYT	Actual	208	4597	4805
	Optimum	3997	1287	5284

Even at the lowest hiring rate of Ls.0.07 per man-hour equivalent, it can be seen that the tenant farmers can save nearly Ls.150, Ls.350, Ls.175, Ls.190, Ls.225, and Ls.245 by farm groups I, II, IV, V, VI and VII respectively if they used their own family labour and resorted to hired labour at peak periods only. The amounts spent on hiring labour, if added to the tenant farmers actual income will give incomes similar to those to be obtained by the normative solution. Under the present technology, the maximum income can be achieved if the tenant farmers used more of their available family labour.

Under the normative solution, July and August, and February and March gave the peak labour requirements just as they do under the present situation. This results from the consistency of the present cropping system with the optimum. Labour productivity varies between these two periods. While a high marginal productivity of labour ranging between Ls.0.15 and Ls.0.36 for the farm groups was obtained in the first period, the marginal productivity of labour of Ls.0.07 in the second period only equalled the marginal cost of labour at that time. In most of the other periods, apart from dura harvesting in October and November, the available family labour is in excess supply, so having a marginal productivity of zero. The hired labour requirement by time period and by farm group and the marginal productivity of labour are presented in Table 7-11.

Capital Use and Productivity:

The optimum amount of credit obtained from shail merchants by most farm groups is lower than the actual maximum credit requirement after allowance for SGB credit as can be seen from Table 7-12 and 7-13. This is mainly due to the less hired labour employed.

Table 7-12

Comparison of the optimal maximum credit requirement from shail merchants and the actual maximum credit requirement after allowance to SGB credit by farm group in Ls.

Farm Group No.	Actual	Optimum
I- NV LAS FY	78.97	70.08
II- NV MAS FY	237.88	165.82
IV - NV HAS FYT	252.96	59.23
V- VG LAS FY	159.71	237.39
VI- VG MAS FYT	107.88	166.04
VII- VG HAS FYT	106.96	5.87

Table 7-11

Marginal Productivity of labour in Ls. and hired labour in man-hour equivalents by time period and by Farm Group

Time period		Group I NV LAS FY	Group II NV MAS FY	Group IV NV HAS FYT	Group V VG LAS FY	Group VI VG MAS FYT	Group VII VG HAS FYT
June	1st half	0	0		0	0	0
	2nd half	0	0		0	0	0
July	1st half	0	0		0	0	0
	2nd half	0	0.36(31)		0	0.24(232)	0
August	1st half	0	0.24(183)		0.28(41)	0	0.07(329)
	2nd half	0	0.22(12)		0	0	0
September	1st half	0	0		0	0	0
	2nd half	0	0		0	0.19(89)	0
October	1st half	0	0		0	0	0
	2nd half	0	0		0	0	0
November	1st half	0	0		0	0.08(27)	0
	2nd half	0	0		0	0	0.04(294)
December	1st half	0	0		0	0	0
	2nd half	0	0.11(219)		0	0.12(100)	0
January	1st half	0	0		0	0.10(74)	0.07(113)
	2nd half	0	0.11(96)		0	0.09(22)	0.07(138)
February	1st half	0	0	0.08(6)	0	0	0.08(216)
	2nd half	0.07(1)	0.36(220)	0.08(10)	0.11(44)	0.09(36)	0.07(194)
March	1st half	0	0	0.07(11)	0	0	0
	2nd half	0	0	0.08(69)	0	0	0
April	1st half	0	0	0	0.07(7)	0	0
	2nd half	0	0	0	0	0	0
May	1st half	0	0	0	0	0	0
	2nd half	0	0	0	0	0	0

Figures in brackets indicate hired labour in man-hour equivalents.

The marginal productivity of capital ranges between Ls.0.21 for the rich tenant farmers in Group VII and Ls.4.56 for the poor tenant farmers in Group V. Compared to the cost of Ls.0.10 every half a month, the marginal productivity of capital is extremely high for the poor tenant farmers and those earning predominantly from the farm as can be seen from Table 7-14. The marginal productivity of capital, as would be expected, diminishes when some of the activities bring cash returns. However, none of the farm groups apart from Group VII can reach the maximum income to be achieved under the normative solution without borrowing before the end of March. The extremely high productivity of working capital indicates that, if informal credit was available at cheaper rates and in the absence of risk, it would be profitable for the tenant farmers to borrow more funds from the shail merchants. Compared to the actual situation, the similar or higher maximum optimum amount of funds to be borrowed from the private sector indicates that borrowing at the present high rate of interest is still profitable, and that there are either less funds with shail merchants at the present time or they practice capital rationing due to risk. Moreover, the simple average rate of interest of 10% on loans extended for a duration of half a month may not be realistic and more credit may be needed if it became available on cheaper terms. For this reason, normative solutions will be drawn up under different rates of interest in the final section. This will also throw light on the shail merchants' rationality by testing whether they charge the maximum rate of interest the tenant farmers can afford to pay.

In the light of the foregoing discussion which ignores risk, it is seen that the current farm practice and resource utilization, apart from family labour, is consistent with the normative

solution and that there are substantial possibilities for the tenants to increase their farm incomes by the better utilization of the available family labour resource. Also the availability of credit on reasonable terms would enable the tenant farmers to increase the productivity of other resources and substantially raise their incomes. There is also scope for increasing farm income by the adoption of proven innovations. This will be discussed in detail in the next chapter.

7.4. Rationality of the tenant farmers

The tenant farmers in the Gezira Scheme follow a prescribed rotation imposed by the SGB in their farm production. Their family labour and land constraints are also similar but the amount of capital at their command, although limited, is highly variable. This section investigates the tenant farmers' decisions at different levels of working capital and at the present private rate of interest of 10% every half a month. Parametric linear programming was used to assess the effect of variable capital constraints on farm income and crop combination. Due to the unavailability of a suitable computer programme, discrete arbitrary levels of working capital restrictions were used. These levels range between zero and Ls.500 at constant intervals of Ls.50, giving eleven plans for each farm group.

The criterion employed in this investigation is that the optimum plan for each level of initial working capital is the one that gives the highest ratio of income to total capital used. Whenever an optimum plan has a zero marginal productivity of capital, increase in farm income must be constrained by resources other than capital. Since in addition to relaxing the initial working capital constraint, flexibility in working capital was

Table 7.13.

Optimum amount of funds borrowed from and repaid to shail merchants by time period and by Farm Group in Ls.

Time Period		Group I NV LAS FY (1)	(2)	(3)	Group II NV MAS FY (1)	(2)	(3)	Group IV NV HAS FYT (1)	(2)	(3)
June	1st half									
	2nd half	1.97		1.97						
July	1st half	9.86		11.83						
	2nd half	4.85		16.68	13.69		13.69			
August	1st half	6.98		23.66	30.17		43.86			
	2nd half	9.93		33.59	22.21		66.07			
September	1st half	15.20		48.79	22.94		89.01			
	2nd half		1.62	47.17	3.14		92.15			
October	1st half	14.44		61.61	19.23		111.38	1.98		1.98
	2nd half	5.74		67.35	23.04		134.42		1.98	
November	1st half	11.73		79.08	31.40		165.82	24.15		24.15
	2nd half		2.45	76.63		24.74	141.08		21.58	2.57
December	1st half		52.42	24.21		23.42	117.66		2.57	
	2nd half		7.79	16.42		11.83	105.83	4.52		4.52
January	1st half		16.42			87.07	18.76	11.56		16.08
	2nd half	5.86		5.86	22.42		41.18	11.80		27.88
February	1st half	14.81		20.67	20.14		63.60		26.19	1.69
	2nd half	0.86		21.53	22.48		86.08		1.69	
March	1st half	12.60		34.13		45.16	40.92	18.89		18.89
	2nd half		34.13				40.92	40.50		59.39
April	1st half					40.92			59.39	
	2nd half									
May	1st half									
	2nd half									

(1) Amount borrowed per half a month
(2) Amount repaid
(3) Cumulative balance of shail credit

Table 7.13. (Continued)

Time period		Group V VG LAS FY (1)	(2)	(3)	Group VI VG MAS FY (1)	(2)	(3)	Group VII VG HAS FYT (1)	(2)	(3)
June	1st half									
	2nd half				13.50		13.50			
July	1st half	4.50		4.50	27.12		40.62			
	2nd half	6.45		10.95	13.32		53.94			
August	1st half	8.25		19.20	47.29		101.23			
	2nd half	8.45		27.65	21.81		123.04			
September	1st half	17.41		45.06	35.75		158.29	5.87		5.87
	2nd half		5.30	39.76	7.75		166.04		5.87	
October	1st half	10.93		50.69		15.16	150.88	5.63		5.63
	2nd half	14.48		65.17	9.23		160.11		5.63	
November	1st half	12.99		78.16		8.61	151.50			
	2nd half	15.31		93.47		29.31	122.19			
December	1st half		0.93	92.54		12.55	109.64			
	2nd half		10.37	82.17		84.64	25.00			
January	1st half	85.95		168.12	11.43		36.43			
	2nd half	27.06		195.18	16.19		52.62			
February	1st half	19.16		214.34		52.62				
	2nd half		0.95	213.39						
March	1st half	24.00		237.39	16.28		16.28			
	2nd half		215.50	21.89	22.35		38.35			
April	1st half		21.89			38.63				
	2nd half									
May	1st half									
	2nd half									

Table 7.14.

Marginal Productivity of Capital by Farm Group (in Ls.)

Time Period		Group I NV LAS FY	Group II NV MAS FY	Group IV NV HAS FYT	Group V VG LAS FY	Group VI VG MAS FY	Group VII VG HAS FYT
June	1st half	4.42	3.49	1.53	4.56	4.35	0.21
	2nd half	4.42	3.49	1.53	4.56	4.35	0.21
July	1st half	3.92	3.49	1.53	4.56	3.86	0.21
	2nd half	3.92	3.49	1.53	4.56	3.42	0.21
August	1st half	3.48	3.08	1.53	3.59	3.02	0.21
	2nd half	3.07	2.71	1.53	3.59	2.65	0.21
September	1st half	2.70	2.37	1.53	3.17	2.32	0.21
	2nd half	2.36	2.06	1.53	2.79	2.02	0.10
October	1st half	2.06	1.78	1.53	2.45	1.74	0.10
	2nd half	1.78	1.53	1.29	2.13	1.50	
November	1st half	1.53	1.30	1.14	1.85	1.27	
	2nd half	1.30	1.09	0.94	1.59	1.07	
December	1st half	1.10	0.90	0.77	1.35	0.87	
	2nd half	0.90	0.73	0.61	1.14	0.70	
January	1st half	0.73	0.57	0.46	0.94	0.54	
	2nd half	0.57	0.43	0.33	0.77	0.41	
February	1st half	0.46	0.30	0.21	0.61	0.28	
	2nd half	0.33	0.30	0.21	0.46	0.28	
March	1st half	0.21	0.21	0.10	0.33	0.21	
	2nd half	0.10	0.21	0	0.21	0.10	
April	1st half		0	0	0.10		
	2nd half		0	0	0		
May	1st half						
	2nd half						

also allowed for by borrowing from the private sector, then the working capital requirement presents the total of the cash in hand and the maximum level of credit obtained.

The marginal productivity of capital and the income capital ratios are presented in Table 7.15. As would be expected, the MP of capital diminishes with successive income optima as more working capital is made available. It can also be seen that when the income/capital ratio reaches its highest level, the MP of capital falls to zero. At this level the fixed land input became limiting. The levels of cash in hand at which the income/capital ratio reaches the maximum level vary between about Ls.100 for the tenant farmers in Groups I, IV and V cultivating the small holdings to about Ls.150 for those in Groups II, VI and VII cultivating the largest holding. However, with none of the farm groups having initial cash in hand equal to these amounts, apart from Group VII, the plan that gives the maximum income/capital ratio or a zero marginal productivity of capital can not be reached. This further shows that working capital is the most important limiting constraint.

The increase in farm income with more initial cash available is due to both the cultivation of high income crop combinations and the lower interest charges. The last becomes clear by examining the level of income obtained by the tenant farmers in Group VII. While the area under all crops remained the same with a moderate reduction of 0.21 feddans in dura when the cash in hand rose from nil to Ls.50, the income rose by Ls.238.5 from Ls.276.18 to Ls.514.68. At the same time the amount borrowed from shail dropped by Ls.233.91 and the interest charges by Ls.236.41. By adding the interest charges saved to the income when no cash

Table 7.15.

Variation in income/capital ratio, interest charges and marginal productivity of capital and land with variable working capital by Farm Group

Initial Cash in Hand Ls.	Income/ Capital Ratio	Marginal Productivity of Capital Ls.	Marginal Productivity of Land Ls.	Marginal Productivity of land Cotton Ls.	Dura Ls.	Groundnuts Ls.	Interest Charges Ls.
Group I- NV LAS FY							
0	1.80	5.73	13.90	0	0	0	83.65
50	3.91	1.20	11.98	1.14	0	0	12.96
100	3.31	0.13	11.28	6.73	-15.98	0	0.71
150	2.36	0	11.28	6.64	-16.35	0	0
200	1.77	0	11.28	6.64	-16.35	0	0
250	1.42	0	11.28	6.64	-16.35	0	0
300	1.18	0	11.28	6.64	-16.35	0	0
350	1.01	0	11.28	6.64	-16.35	0	0
400	0.88	0	11.28	6.64	-16.35	0	0
450	0.79	0	11.28	6.64	-16.35	0	0
500	0.71	0	11.28	6.64	-16.35	0	0
Group II - NV MAS FY							
0	0.71	5.32	0	0	0	0	226.61
50	1.97	3.69	0	0	0	0	119.45
100	2.78	1.85	0	0	-13.88	0	53.90
150	3.20	0.85	6.43	0	-18.16	0	11.08
200	3.20	0	14.32	0	-15.50	1.82	0
250	2.56	0	14.32	0	-15.50	1.82	0
300	2.13	0	14.32	0	-15.50	1.82	0
350	1.83	0	14.32	0	-15.50	1.82	0
400	1.60	0	14.32	0	-15.50	1.82	0
450	1.42	0	14.32	0	-15.50	1.82	0
500	1.28	0	14.32	0	-15.50	1.82	0

Table 7.15. (Continued)

Initial Cash in Hand Ls.	Income/ Capital Ratio	Marginal Productivity of Capital Ls.	Marginal Productivity of Land: Land Ls.	Cotton Ls.	Dura Ls.	Vegetables Ls.	Interest Charges Ls.
Group VI- VG MAS FY							
0	1.93	5.44	0	0	0	44.14	199.01
50	3.60	2.45	0	0	-19.56	31.96	82.23
100	3.99	1.03	4.00	0	-22.97	30.02	23.22
150	3.70	0.33	7.16	0	-20.99	37.99	8.27
200	3.56	0	7.90	1.59	-18.48	43.98	0
250	2.85	0	7.90	1.59	-18.48	43.98	0
300	2.37	0	7.90	1.59	-18.48	43.98	0
350	2.03	0	7.90	1.59	-18.48	43.98	0
400	1.78	0	7.90	1.59	-18.48	43.98	0
450	1.58	0	7.90	1.59	-18.48	43.98	0
500	1.42	0	7.90	1.59	-18.48	43.98	0
Group VII- VG HAS FYT							
0	0.64	5.73	0	5.51	0	87.60	400.67
50	2.10	3.59	0	11.40	-2.54	73.10	164.26
100	3.69	1.36	14.97	0	-5.96	57.14	35.20
150	4.27	0.21	11.03	8.17	-9.43	62.81	1.85
200	3.40	0	19.83	0	-16.46	54.84	0
250	2.72	0	19.83	0	-16.46	54.80	0
300	2.26	0	19.83	0	-16.46	54.80	0
350	1.94	0	19.83	0	-16.46	54.80	0
400	1.70	0	19.83	0	-16.46	54.80	0
450	1.51	0	19.83	0	-16.46	54.80	0
500	1.36	0	19.83	0	-16.46	54.80	0

Table 7.15. (Continued)

Initial Cash in Hand Ls.	Income/ Capital Ratio	Marginal Productivity of Capital Ls.	Marginal Productivity of Land				Interest Charges Ls.
			Land Ls.	Cotton Ls.	Dura Ls.	Groundnuts Ls.	
Group IV- IV LAS FYT							
0	-	-	-	-	-	-	-
50	0.80	2.80	11.77	7.88	-19.60	0	99.79
100	2.20	0.74	11.58	5.99	-25.09	0	9.76
150	2.12	0	11.76	5.70	-23.64	0	0
200	1.59	0	11.76	5.70	-23.64	0	0
250	1.28	0	11.76	5.70	-23.64	0	0
300	1.06	0	11.76	5.70	-23.64	0	0
350	0.91	0	11.76	5.70	-23.64	0	0
400	0.80	0	11.76	5.70	-23.64	0	0
450	0.71	0	11.76	5.70	-23.64	0	0
500	0.63	0	11.76	5.70	-23.64	0	0
Group V- VG LAS FY						**Vegetables**	
0	-	-	-	-	-	-	-
50	4.07	2.04	18.02	4.99	0	15.03	37.80
100	5.44	0.21	20.80	6.29	0	21.59	0.69
150	3.82	0	21.33	6.32	-4.63	23.53	0
200	2.86	0	21.33	6.32	-4.63	23.53	0
250	2.29	0	21.33	6.32	-4.63	23.53	0
300	1.91	0	21.33	6.32	-4.63	23.53	0
350	1.63	0	21.33	6.32	-4.63	23.53	0
400	1.43	0	21.33	6.32	-4.63	23.53	0
450	1.27	0	21.33	6.32	-4.63	23.53	0
500	1.14	0	21.33	6.32	-4.63	23.53	0

in hand is available, the new income achieved at Ls.50 cash in hand is only Ls.2.09 more due to the reduction in the dura land by 0.21 feddans because the cost of producing a feddar of dura is Ls.10.00 for this farm group. When the area under dura was fixed at 6.73 feddans, the rise in income from Ls.514.68 at Ls.50 cash in hand to Ls.643.71 when Ls.100 are available was only due to the reduction in interest charges by Ls.129.06. However, for most of the remaining farm groups, the increase in income also resulted from the cultivation of high income crops like cotton and wheat. The area under these two crops increased, for most of the farm groups, when more working capital is made available. The increase in area under the crops, and consequently in the farm income, took place at the expense of the less profitable dura crop, as can be seen from Table 7-16. and Figure 7-1. While the MP of a feddan of dura was zero at low levels of capital, an increase in the area of dura by one feddan reduces the tenants' income by up to Ls.23 when more cash in hand became available. The high area under the less profitable dura crop when less cash is available is due to two reasons: firstly, the high demands of the most profitable crops on the very scarce working capital resource and secondly, the tenants' lack of liquidity and the high interest rate. Since dura is the first crop to be harvested, the results indicate that it is more profitable for the tenant farmers to cultivate more dura and sell the crop rather than borrow at the prevailing high rate of interest.

These calculations show that the Gezira tenant farmera are prevented from achieving the maximum income by their lack of cash.

Table 7.16.

Variation in Income and Crop Combination with Working Capital by Farm Group

Farm Plan No.	Cash in Hand Ls.	Maximum Borrowing Ls.	Total Working Capital Ls.	Area in feddars under Cotton	Groundnuts	Wheat	Dura	Vegetables	No.of livestock in cow equivalent	Income Ls.
Farm Group I-NV LAS FY										
.1	- 0	96.83	96.83	5.83	4.82	2.40	6.47		-	174.61
.2	- 50	33.69	83.69	7.10	3.55	5.07	3.79		-	327.06
.3	-100	7.09	107.09	7.10	3.55	5.32	3.54		-	354.36
.4	-150	-	150	7.10	3.55	5.32	3.54		-	355.31
.5	-200	-	200	7.10	3.55	5.32	3.54		-	355.31
.6	-250	-	250	7.10	3.55	5.32	3.54		-	355.31
7	300	-	300	7.10	3.55	5.32	3.54		-	355.31
8	350	-	350	7.10	3.55	5.32	3.54		-	355.31
9	400	-	400	7.10	3.55	5.32	3.54		-	355.31
10	450	-	450	7.10	3.55	5.32	3.54		-	355.31
11	500	-	500	7.10	3.55	5.32	3.54		-	355.31
Farm Group II- IV MAS FY										
1	0	304.50	304.50	7.04	5.36	1.97	12.79		-	218.80
2	50	169.35	219.35	7.51	6.17	7.61	7.14		-	433.65
3	100	104.18	204.18	9.65	6.89	8.67	6.08		-	566.83
4	150	46.26	196.26	9.76	7.94	8.67	6.08		-	628.61
5	200	-	200	8.85	8.85	8.67	6.08		-	641.62
6	250	-	250	8.85	8.85	8.67	6.08		-	641.62
7	300	-	300	8.85	8.85	8.67	6.08		-	641.62
8	350	-	350	8.85	8.85	8.67	6.08		-	641.62
9	400	-	400	8.85	8.85	8.67	6.08		-	641.62
10	450	-	450	8.85	8.85	8.67	6.08		-	641.62
11	500	-	500	8.85	8.85	8.67	6.08		-	641.62

Table 7.16.(Continued)

Farm Plan No.	Cash in Hand Ls.	Maximum Borrowing Ls.	Total Working Capital Ls.	Area in feddars under Cotton	Groundnuts	Wheat	Dura	Vegetables	No.of livestock in cow equivalent	Income Ls.
Farm Group IV- NV HAS, FYT										
1	0	0	0	-	-	-	-	-	-	-
2	50	201.90	251.90	8.13	4.06	6.03	4.12		2.21	200.56
3	100	38.26	138.26	8.13	4.06	6.03	4.12		-	304.69
4	150	-	150	8.13	4.06	6.03	4.12		-	319.17
5	200	-	200	8.13	4.06	6.03	4.12		-	319.17
6	250	-	250	8.13	4.06	6.03	4.12		-	319.17
7	300	-	300	8.13	4.06	6.03	4.12		-	319.17
8.	350	-	350	8.13	4.06	6.03	4.12		-	319.17
9	400	-	400	8.13	4.06	6.03	4.12		-	319.17
10	450	-	450	8.13	4.06	6.03	4.12		-	319.17
11	500	-	500	8.13	4.06	6.03	4.12		-	319.17
Farm Group V- VG LAS FY										
1	0	0	0	-	-	-	-	-	-	-
2	50	78.02	128.02	7.09	1.78	3.24	3.34	3.54	3.22	520.94
3	100	5.04	105.04	7.09	1.78	3.27	3.31	3.54	1.35	570.90
4	150	-	150	7.09	1.78	3.41	3.37	3.54	1.35	572.21
5	200	-	200	7.09	1.78	3.41	3.37	3.54	1.35	572.21
6	250	-	250							
7	300	-	300							
8	350	-	350							
9	400	-	400							
10	450	-	450							
11	500	-	500							

Table 7.16. (Continued)

Farm Plan No.	Cash in Hand Ls.	Maximum Borrowing Ls.	Total Working Capital Ls.	Area in feddars under Cotton	Groundnuts	Wheat	Duca	Vegetables	No.of livestock in cow equivalent	Income Ls.
Farm Group VI- [illegible] AS FY										
1	0	207.84	207.84	6.39	2.50	6.80	5.71	5.00	-	401.27
2	50	114.62	164.62	7.68	2.31	8.45	4.05	5.00	-	593.31
3	100	67.34	167.34	10.00	-	8.45	4.05	5.00	-	667.71
4	150	40.13	190.13	10.00	-	8.45	4.05	5.00	-	705.53
5	200	-	200	10.00	-	8.45	4.05	5.00	-	711.80
6	250	-	250	10.00	-	8.45	4.05	5.00	-	711.80
7	300	-	300							
8	350	-	350							
9	400	-	400							
10	450	-	450							
11	500	-	500							
Farm Group VII- VG HAS FYT										
1	0	429.13	429.13	10.00		5.56	6.94	5.00	-	276.18
2	50	195.22	245.22	10.00		5.77	6.73	5.00	-	514.68
3	100	74.26	174.26	10.00		5.77	6.73	5.00	-	643.71
4	150	9.29	159.29	10.00		5.77	6.73	5.00	-	677.09
5	200	-	200	10.00		5.77	6.73	5.00	-	680.31
6	250	-	250							
7	300	-	300							
8	350	-	350							
9	400	-	400							
10	450	-	450							
11	500	-	500							

Furthermore, with the present credit arrangements, most of the income realized was absorbed through the charge of a high rate of interest. Under the present working capital constraints and the omission of risk and non-quantifiable variables, our calculations showed that the present farm practice is consistent with the normative solution. The variation in income was mainly due to the less family contribution to farm work. This is thought to be a problem of lack of liquidity among the poor tenant farmers which compels them to look for off-farm income opportunities. Partial confirmation also came from the normative solution when no or very low cash in hand was allowed. Under such conditions the tenant farmers would cultivate more of the less profitable dura crop, sell the quantities in excess of their needs while foregoing the cultivation of the more expensive and highly profitable crops. Among the rich tenant farmers, the less family participation was due to the high off-farm income opportunities.

In the light of the above calculations, it could be assumed that the Gezira tenant farmers do not behave irrationally.

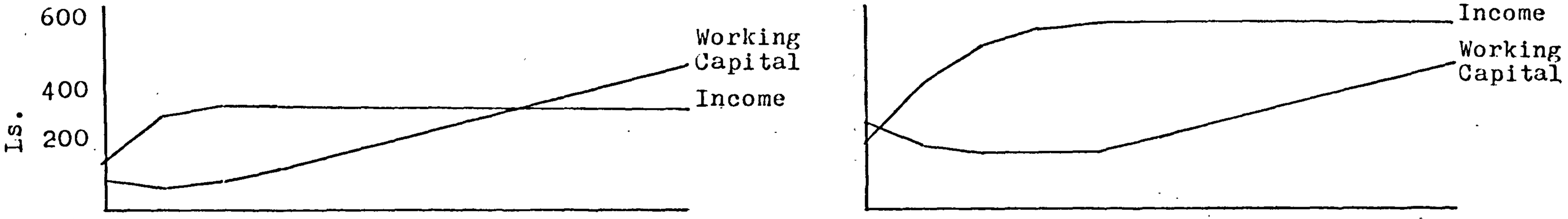
The problem of lack of liquidity can be overcome by providing the tenant farmers with credit at a cheaper rate than at present. But, even if the lack of working capital was solved by making more credit available at a low cost, the tenant farmers will still be prevented from achieving higher income by the fixed land resource, as can be seen from Table 7.15, when there is surplus cash. More land can be brought under cultivation by reducing the fallow. This will, however, both reduce the soil fertility and increase the demand for labour. To restore the soil fertility by the use of more fertilizers and to reduce the demand for

Figure 7-1 Variation in income, working capital and crop combination with variable cash in hand.

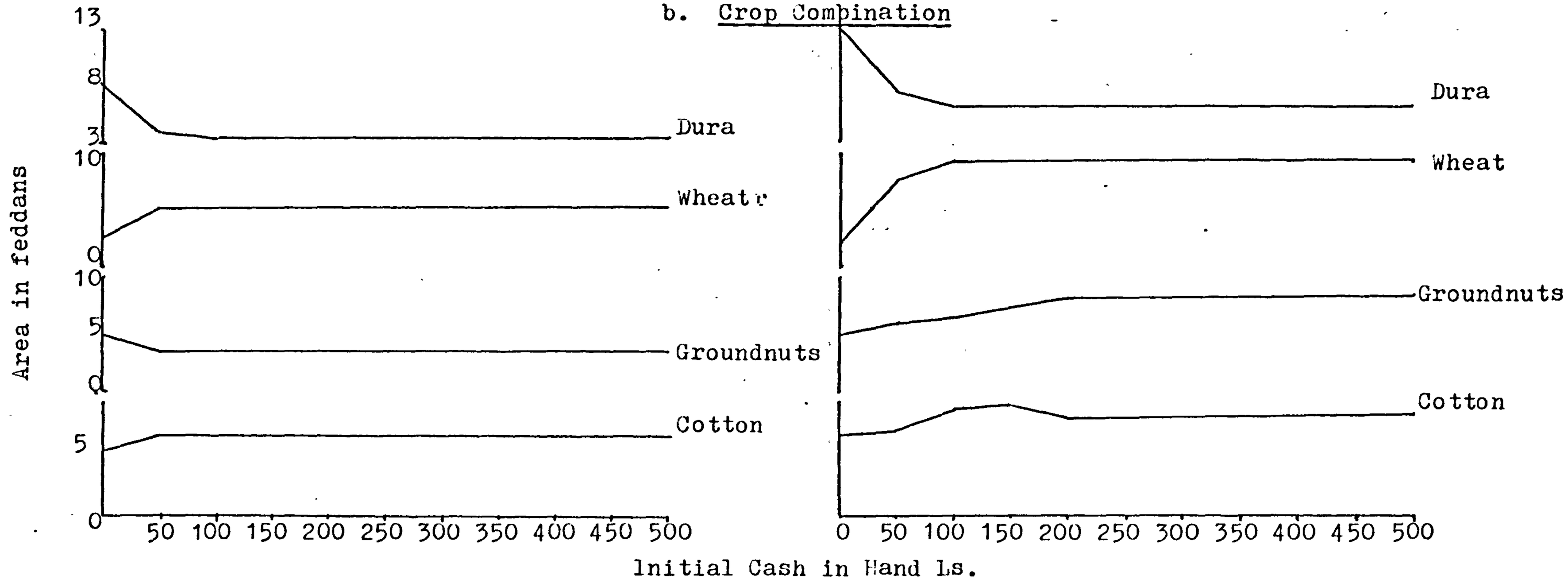
Group I- NV LAS FY

Group II- NV MAS FY

a. Income and Working Capital



b. Crop Combination



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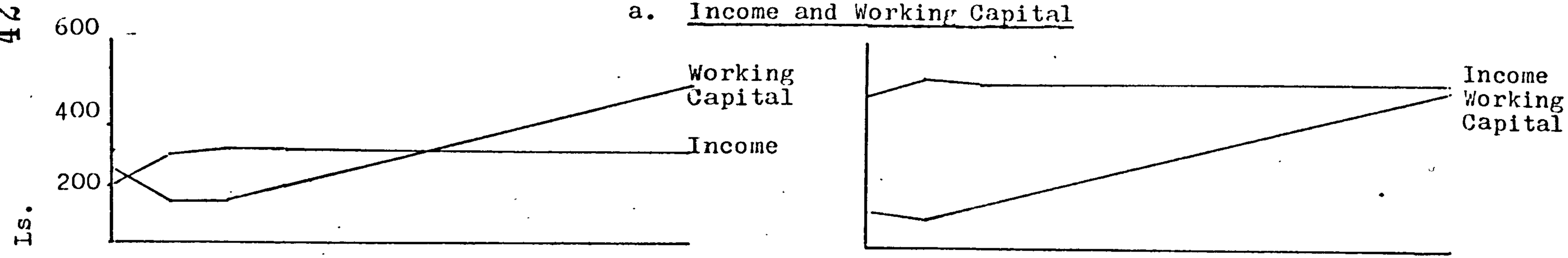
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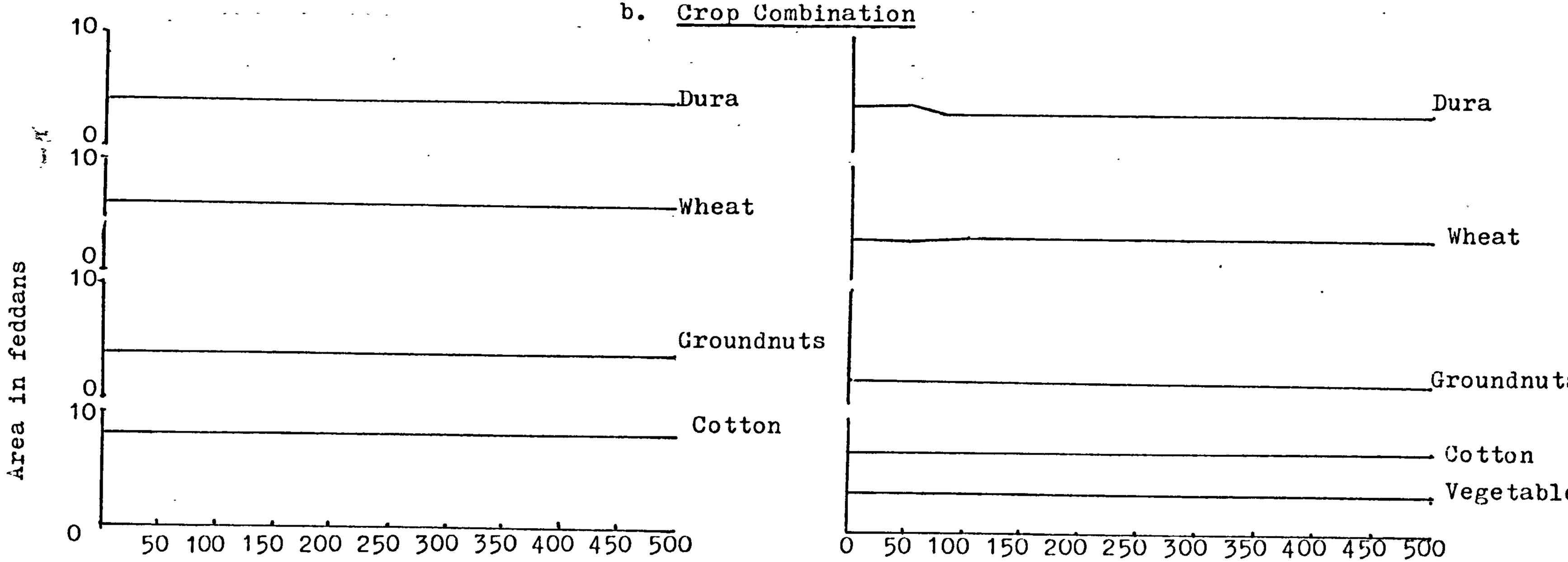
Group IV- NV HAS FYT

Group V- VG LAS FY

a. Income and Working Capital



b. Crop Combination



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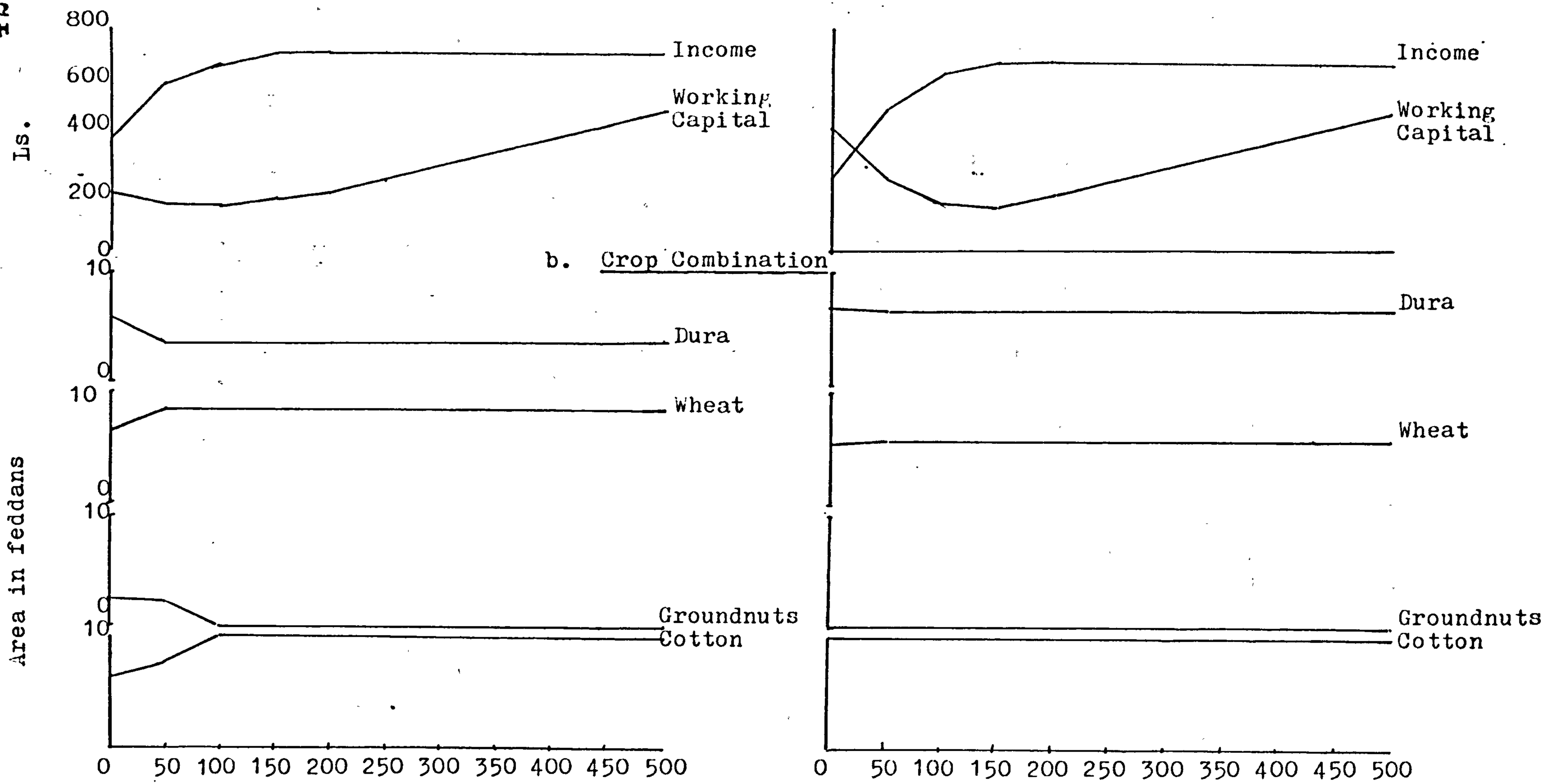
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Group VI- VG MAS FY

Group VII- VG MAS FYT

a. Income and Working Capital

b. Crop Combination



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labour by increasing mechanization, more capital at a low cost may be needed. This hypothesis will be tested in the next chapter.

7.5. Rationality of the Shail Merchants:

The discussion in this section is devoted to the rationality of the shail merchants when setting interest rates. It will be postulated that the Shail Merchants maximize their profits by charging the maximum rate of interest the tenant farmers can afford to pay. The variable rate of interest will also throw light on the tenant farmers decisions in cultivating of different crop combinations to maximize their profits.

Two main criteria were employed in this investigation. The first relates to the maximum rate of interest the tenant farmers can afford to pay. The second criterion relates to the maximization of the Shail Merchants' profits. In these calculations, as was mentioned earlier, repayment of both principal plus interest charges was forced into the solution and the income figure is net of these deductions. In addition to dura and milk, the tenant must satisfy his other living expenses. When his income exceeds his living expenses, the tenant farmer can afford to pay more than the on-going rate of interest. The maximum rate of interest he can afford to pay in order to maintain the SGB rotation and his family subsistence would be the one that would equate his income and his living expenses. Hence the ratio of income to living expenses forms our first criterion. In the other case, the higher the rate of interest the Shail Merchant would charge, the more would be his profit. However, a certain level of interest rate would be reached, beyond which the tenant farmer would not borrow more. This would be the same rate of interest

that equates the tenant income with his living expenses while maintaining the SGB rotation. At rates higher than this, the tenant farmer would presumably maintain his subsistence and sacrifice the SGB rotation. Under such a situation, he would be evicted and the farm lending activities of the Shail Merchant would cease. If the opportunity cost of the Shail Merchants funds at the maximum rate of interest the tenant farmer can afford to pay is higher than what the Shail Merchant could achieve by employing his funds in other activities, then further increase to his cost of lending would reduce his income. However, the opportunity cost of the Shail Merchants funds when employed in lending to the tenants is unlikely to be equal to or less than what the Shail Merchant could obtain from using his funds in other ventures. Hence, the maximum rate of interest the tenant farmer can afford to pay would also be the interest rate that maximizes the Shail Merchants' profits.

The question of Shail Merchants' rationality was approached in this investigation by the use of price variable programming. Seven optimum plans were obtained for each farm group by varying the interest rate from 3% to 21% per half a month in constant steps of 3%. Since the variable rates of interest used were arbitrary discrete points, the maximum rate of interest the tenant can afford to pay will lie between two levels if less than 21% per half a month.

The variation in the level of income and interest charges with the rate of interest obtained by the normative solution can be seen in Table 7.17. These, together with the tenant living expenses, were plotted in Figure 7.2. The variation in optimal crop combination with interest rate by farm group was also how

Table 7.17.

Variation in Crop Combination, Income, Interest Charges and Living Expenses with the Rate of Interest by Farm Group

	Rate of Interest per Half month (%)						
	3	6	9	12	15	18	21
Group I- NV LAS FY							
Area of cotton (Feddans)	7.10	6.10	5.88	5.83	5.83	5.56	5.56
Area of groundnuts "	3.55	4.54	4.75	4.82	4.82	5.08	5.08
Area of wheat "	4.53	4.53	2.97	2.97	2.97	2.97	2.97
Area of dura "	4.34	4.34	5.90	5.88	5.88	5.89	5.89
Livestock in cow equivalents	-	-	-	-	-	-	-
Income Ls.	289.49	247.22	217.75	199.65	182.88	170.44	158.86
Living expenses	173.15	173.15	173.15	173.15	173.15	173.15	173.15
Shail Interest Charges Ls.	44.65	58.21	70.47	76.65	79.51	80.77	83.26
Ratio of Income to Living expenses	1.67	1.43	1.26	1.15	1.06	0.98	0.92
Group II- NV MAS FY							
Area of cotton (Feddans)	8.85	9.13	7.51	7.51	7.51	7.27	7.19
" " groundnuts "	8.85	6.97	7.17	5.18	5.15	5.00	4.52
" " wheat "	8.67	8.67	8.45	8.16	8.13	7.74	7.64
" " dura "	6.08	6.08	6.30	6.59	6.62	7.01	7.01
Livestock in cow equivalents	-	-	-	-	-	-	-
Income Ls.	573.08	510.43	467.06	434.14	407.14	382.70	359.65
Living Expenses	378.59	378.59	378.59	378.59	378.59	378.59	378.59
Shail Interest Charges	67.88	99.52	108.89	110.48	134.39	144.01	153.27
Ratio of Income to Living Expenses	1.51	1.35	1.23	1.15	1.08	1.01	0.95

Table 7.17. (Continued)

	Rate of Interest per half month (%)						
	3	6	9	12	15	18	21
Group IV- MV LAS FYT							
Area of Cotton (Feddans)	8.13	8.13	8.13	8.13	8.13	8.13	7.98
" " Groundnuts "	4.06	4.06	4.06	4.05	4.07	4.06	4.20
" " Wheat "	6.04	6.04	6.04	6.01	6.04	6.04	6.04
" " Dura "	4.12	4.12	4.12	4.12	4.12	4.12	4.12
Livestock in cow equivalents	-	-	-	-	-	-	-
Income Ls.	308.59	300.02	293.42	288.72	234.69	280.69	275.82
Living Expenses	362.82	362.82	362.82	362.82	362.82	362.82	362.82
Shail Interest Charges	9.02	14.92	16.66	17.00	20.03	24.03	25.32
Ratio of Income to Living Expenses	0.85	0.83	0.81	0.80	0.78	0.77	0.76
Group V- VG LAS FY							
Area of Cotton (Feddans)	7.09	7.09	6.44	6.30	5.97	6.30	7.09
" " Groundnuts "	1.78	1.71	1.78	1.73	1.33	0.79	-
" " Wheat "	3.18	3.24	3.75	3.87	4.00	3.82	3.74
" " Dura "	3.67	3.90	3.98	4.00	4.00	4.04	4.11
" " Vegetables "	3.54	3.54	3.54	3.51	3.54	3.54	3.54
Livestock in cow equivalents	3.35	3.36	3.48	3.51	3.98	4.22	4.25
Income Ls.	516.84	464.92	413.64	363.77	316.70	272.18	229.40
Living Expenses	253.53	253.53	253.53	253.53	253.53	253.53	253.53
Shail Interest Charges Ls.	51.96	102.87	150.46	199.13	228.54	260.29	279.90
Ratio of Income to Living Expenses	2.04	1.83	1.63	1.43	1.25	1.07	0.90

Table 7.17. (Continued)

	Rate of Interest per half month (%)						
	3	6	9	12	15	18	21
Group VI- VG EAS FY							
Area of Cotton (Feddans)	10	10	9.77	9.27	6.78	6.83	6.85
" " Groundnuts "	2.50	2.50	2.50	2.50	-	-	-
" " Wheat "	8.45	8.45	8.45	8.45	8.01	7.70	7.85
" " Dura "	4.05	4.05	4.05	4.05	4.49	5.00	4.64
" " Vegetables "	5.00	5	5	5	5	5	5
Livestock in cow equivalents	-	-	-	-	-	-	-
Income Ls.	617.02	555.76	507.63	462.28	422.44	385.80	353.35
Living Expenses	304.30	304.30	304.30	304.30	304.30	304.30	304.30
Shail Interest Charges Ls.	87.51	103.76	140.37	177.21	185.53	203.52	227.01
Ratio of Income to Living Expenses	2.03	1.83	1.67	1.52	1.39	1.27	1.16
Group VII- VG HAS FYT							
Area of Cotton (Feddans)	10	10	10	10	10	10	10
" " Groundnuts "	-	-	-	-	-	-	-
" " Wheat "	5.77	5.77	5.77	5.77	5.77	5.77	5.77
" " Dura "	6.73	6.73	6.73	6.73	6.73	6.73	6.73
" " Vegetables "	5	5	5	5	5	5	5
Livestock in cow equivalents	-	-	-	-	-	-	-
Income Ls.	679.37	678.47	677.90	677.55	677.21	676.85	676.52
Living Expenses	393.09	393.09	393.09	393.09	393.09	393.09	393.09
Shail Interest Charges Ls.	0.94	1.13	1.04	1.38	1.73	2.07	2.42
Ratio of Income to Living Expenses	1.72	1.72	1.72	1.72	1.72	1.72	1.72

presented in these tables and graphs.

The maximum rate of interest the tenant farmer can afford to pay varies, as would be expected, with the cash at his command, the type of crops he cultivated and his living expenses.

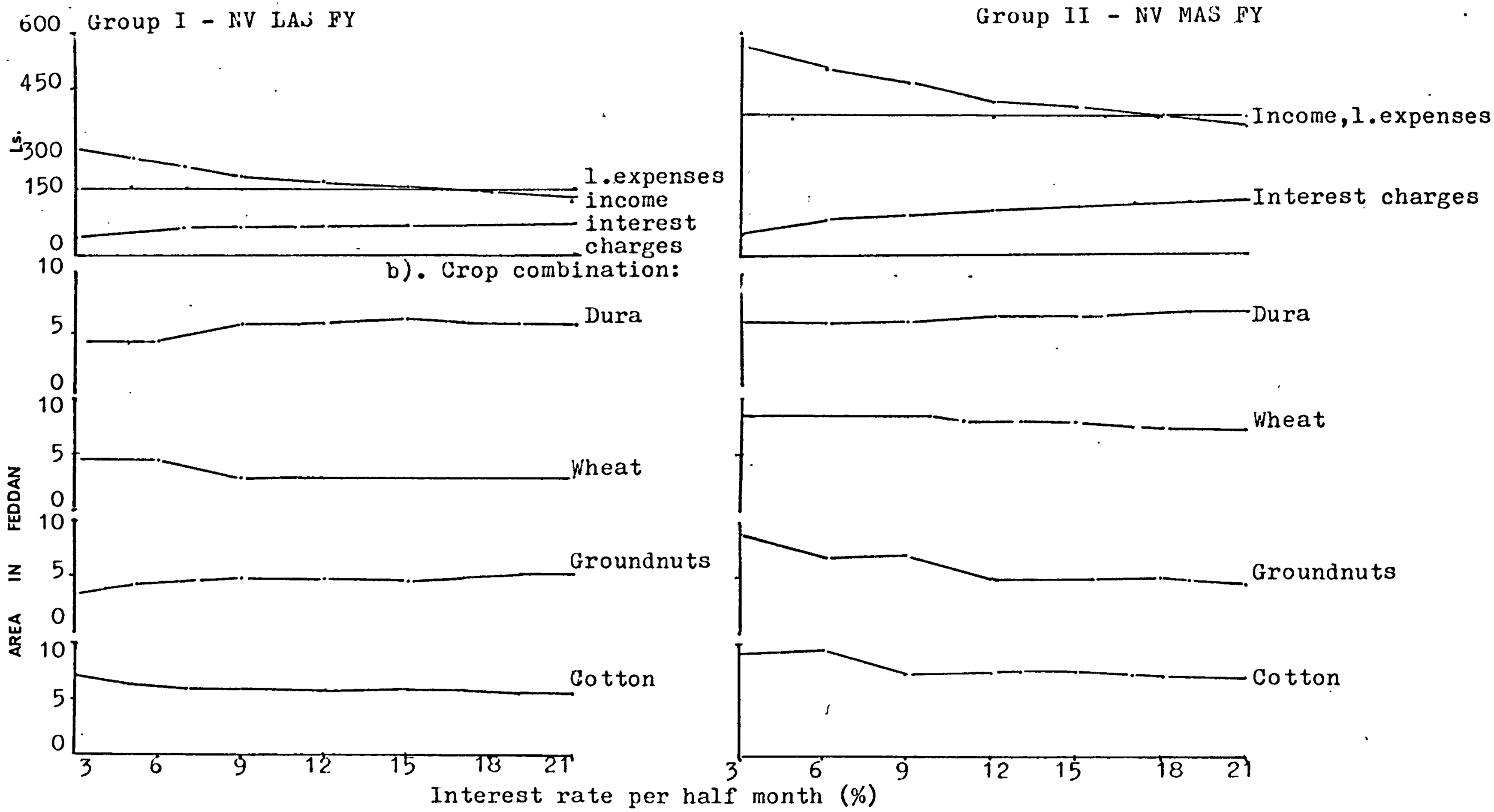
For the rich vegetable growers in Group VII, the fall in income when the cost of credit rises was due only to the high interest charges. The area under each crop at different rates of interest remained the same. Due to their high cash in hand, large cultivable area and the cultivation of vegetables which bring returns for longer periods, these tenant farmers can afford to borrow at an interest rate higher than 21% per half a month or a compound rate of interest of more than 8,000% per annum. The same is true with the tenant farmers in Group VI, having a relatively high cash in hand, large cultivable area and cultivating vegetables. The fall in income with the interest rate in the case of the rich tenant farmers in Group IV was also due only to the hi h interest charges. However, at no level of interest rate would these tenant farmers obtain an income sufficient to cover their living expenses ie. the ratio of income to living expenses would always be less than unity. This is expected with these rich tenant farmers whose production is limited more by the small size of holding. Also, because they are Shail Merchants they do not borrow from shail and depend on their earning from other off-farm activities to supplement their farm income.

With the poor tenant farmers earning predominantly from farm, the decline in income with higher rates of interest was due both to the high cost of credit and the cultivation of the less profitable crops like dura, requiring less working capital

Figure 7-2

Variation in income, interest charges, living expenses and crop combination with the rate of interest

a). Income, living expenses and interest charges:



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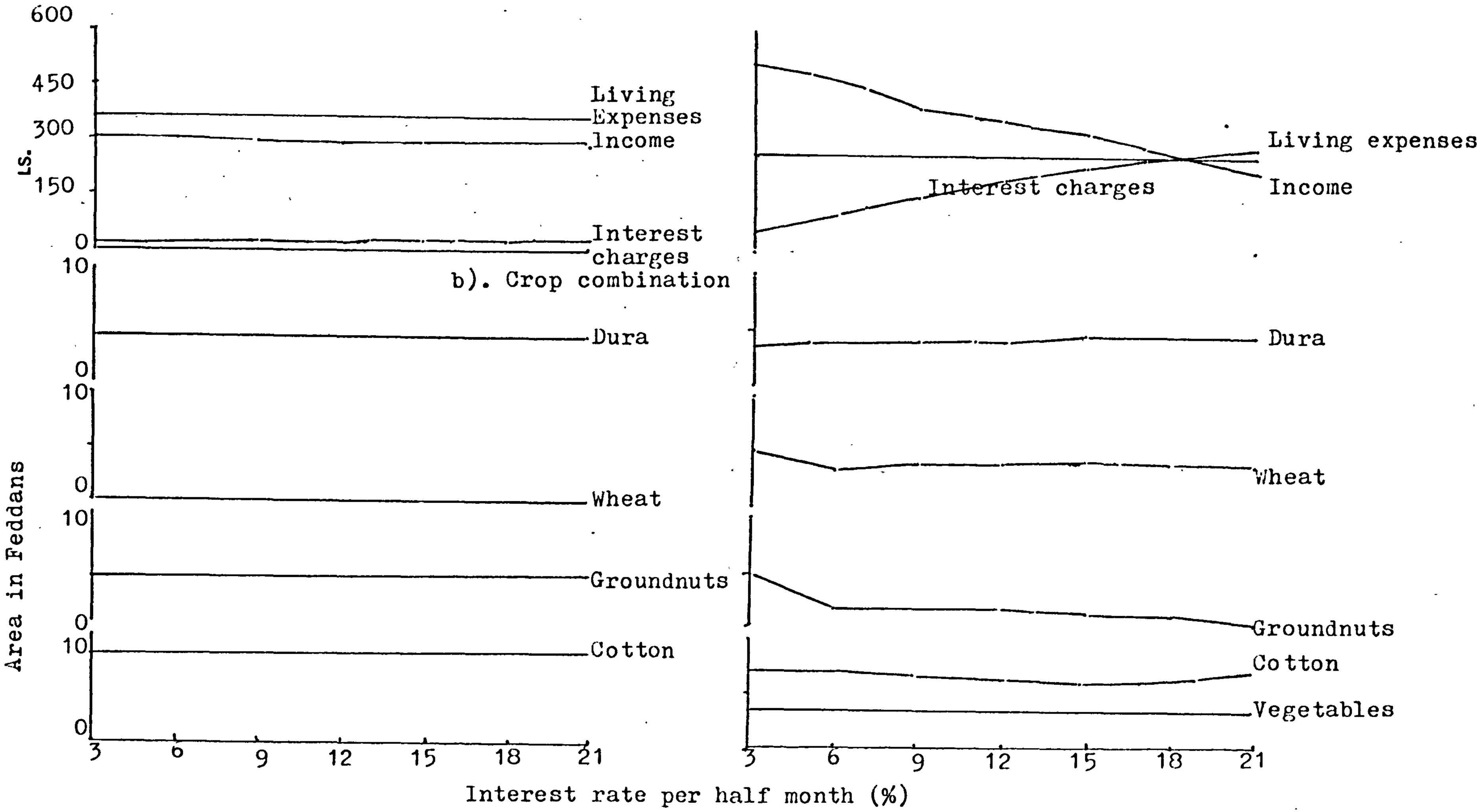
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Group IV - NV HAS FYT

Group V - VG LAS FY

a). Income, living expenses and interest charges:



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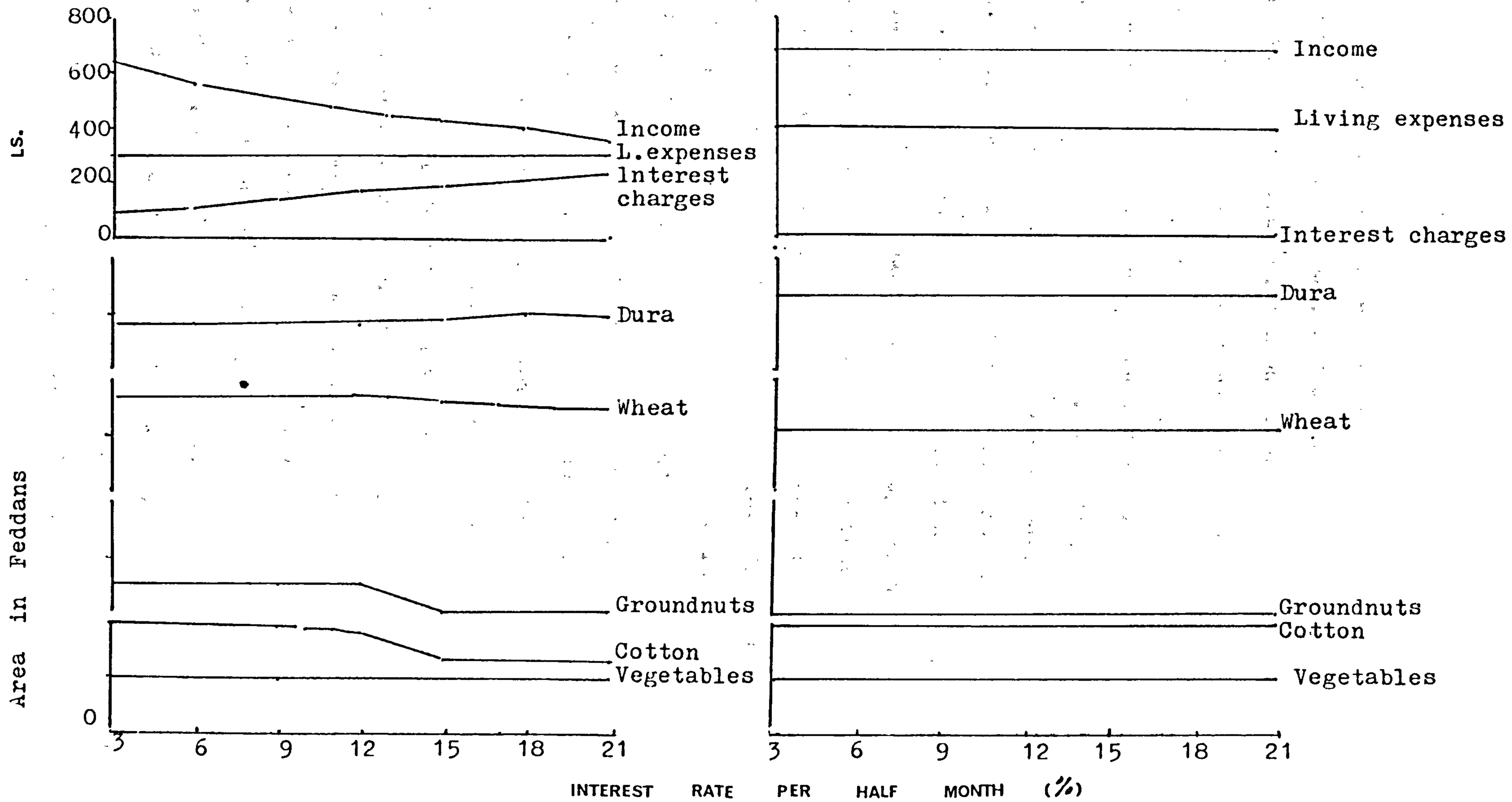
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Group VI - VG MAS FY

Group VII - VG HAS FYT

a). Income, Living expenses and interest charges



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and giving early returns, thereby relieving part of the tenants' lack of liquidity. Among these farm groups the tenant farmers can afford to pay maximum rates of interest of 15% per half a month. The high rate they can afford to pay was due to two reasons; firstly, the very low living expenses of these tenant farmers and secondly, the fact that these are average farms. While the use of weighted average among the groups for the Gezira tenant farmers would not affect the validity of the solutions obtained with regard to crop combination and level of resource use due to the prescribed rotating established cultural practices and similar resources, the interest rate charged by the Shail Merchants varies considerably with non-quantifiable variables like kinship and other social factors, as was seen in Chapter 6, where some tenant farmers pay interest rates of more than two thousands per cent per annum. The actual level of living expenses, on the other hand, could be due to the hard bargain the Shail Merchants derive through the charge of a high rate of interest with the poor tenant farmers compelled to sacrifice some of the essential elements. This becomes clearer if we considered the weighted average living expenses of all tenant farmers of Ls.240 per annum. To achieve this level, the poor tenant farmers in Group I cannot afford to pay more than 7-8% per half a month.

At the present rate of 10% per half a month, the opportunity cost of the Shail Merchants funds exceeds the 26% per annum calculated in Chapter 6. This, as was seen earlier, exceeds the interest rate on government bonds and bills of discount.

The 10% per half a month being, in most cases, the highest rate the poor tenant farmers can afford to pay, indicates that most of the tenants' value added was absorbed by the Shail

Merchants. Since, on the other hand, the shail merchants maximize their profit at this rate and that their opportunity cost exceed what could be obtained from other ventures, it may be assumed that they behave rationally.

The investigation in this chapter showed that both the tenant farmers and Shail Merchants in the Gezira Scheme behave rationally at the present time. It also showed that higher incomes could be achieved if credit was made available at costs lower than those charged at the present time. There is also scope for further increments by the modernization of farming particularly at this stage where the Gezira Scheme has virtually reached its limits of horizontal expansion. However, the modernization of farming will still require more capital at cheaper rates. These issues form the subject of our discussion in the next chapter.

Chapter VIII

Farm Modernization

8.1. Introduction:

Some of the important conclusions drawn from the investigation on the static and conditionally normative situations discussed in the previous chapters include:

a) The operations of the dual credit and commodity markets in the Gezira Scheme had reduced the tenant income to a low level and deprived him of the incentive to invest in farming and increase his farm income. While the producers' price for cotton, relative to domestically consumed crops is unduly depressed by the Sudan Government and the SGB, the value added generated by other crops is absorbed by the shail merchants through the charge of exorbitant rates of interest.

b) The productivity of the resources of land, labour and capital already in use is high and the tenants can achieve higher income by the better allocation of these resources and by making credit available at cheaper rates.

c) The Gezira Scheme has reached its maximum extent of horizontal expansion as determined by the cultivable land that can be watered by the existing canalization system.

Given these conclusions and facts, it is necessary to explore the possibilities that would increase the benefit from the Gezira Scheme, the amount of capital required and the cost at which it could be provided and examine the technical questions these possibilities will bring about on the cropping pattern and the present organizational structure of the Gezira Scheme.

Among the many and varied opportunities available, most attention is given to the adoption of certain proven innovations.

However, with the adoption of innovations, still more credit is needed. Besides the availability and terms of credit, there are also other institutional constraints, mainly organizational, emanating from the unique characteristics of the Gezira Scheme and its command structure. Some of these organizational constraints include the cotton sharing system, the highly centralized decision-making process of the SGB and the relationship between the tenant farmers and the SGB supervising staff. To advance the tenant's status as a farmer, improve decision-making and consequently increase organizational constraints also need to be relaxed. The likely changes these innovations would bring in the structure of the Gezira Scheme will be highlighted in this chapter, and the organization of the Gezira Scheme will further be discussed in the next chapter. The discussion in the present chapter is divided into four sections:-

1. Exploring the possibilities open to the tenant farmers to increase farm income by the adoption of certain proven innovations.

2. Assessing the amount of credit needed for the realization of these opportunities.

3. Determining the maximum rate of interest which could be charged and yet leave an acceptable level of tenant income, an incentive to the tenants to invest in farming and yet cover the real cost of making working capital available.

4. Assessing the impact of technological change and level of interest rate on crop combination and organization of the Scheme.

In addition to technological change and credit availability, change in the cropping pattern is also influenced by changing relativities in the prices of the Gezira products and input factors.

Difficulty arises in the computations when the price of the products and inputs and the price of credit plus the working capital constraint are allowed to vary. Because some of these important aspects are neglected, the conclusions reached in this investigation are tentative and only serve as first approximations.

The direction of our investigation in this chapter changes from the static and conditionally normative situations so far discussed to a completely normative situation. For this purpose, LP is used and the cost of credit and the working capital constraints are allowed to vary simultaneously along the following arbitrary discrete points: a) working capital varies from zero to Ls.500 at Ls. 50 intervals, b) interest rate varies from zero to 50% per annum at constant intervals of 10%.

With innovations also in the matrix, two modifications were made. Firstly, it was assumed that credit would be available at a uniform rate regardless of source and without conditions as to its use. Secondly water was assumed to be limiting since improved farming systems and the proposed degree of multiple cropping depend on water being available in the right periods and quantities.

For lack of space, only one farm group was used for illustration - Group I (NV LAS FY) was selected for two reasons; firstly, the number of tenants in this group represents nearly 53% of all tenants and secondly it is the group of the poorest tenant farmers with the smallest farm size, less cash in hand and less farm income and who borrow more from shail merchants. Hence it represents the most adverse situation among the different farm groups and the majority of tenants.

8.2. Proven Farm Innovations:

There are numerous opportunities for farm improvements open to the Gezira tenant farmer to increase his farm income and improve his standard of living. Two recent sources, namely the five year plan (1970/71 - 1974/75) and the Working Party on Wadel Naem Village Farming Expreiment (W/N V.F.E.) have specified these opportunities.

The five year plan proposed an increase in the cropping intensity from 65.1% in the Gezira Main and 67% in the Managil Extension to about 80% by reducing the fallow and increasing the fertilizer application. Other measures include propogation of HYVs, better pest control and more use of machinery. In their evaluation of the W/N V.F.E., the authors of the Working Party Report stated that "there are very substantial possibilities for raising the productivity of the land, water and labour resources already in use. Moreover, there is a scope for further increments by the judicious use of more capital in such forms as improved seeds, more fertilizers, plant protection material and increased mechanical power and machinery. There are equally promising opportunities in a re-examination of detailed cropping patterns and marketing procedures."

These improvements stem chiefly from the agronomic research work that has been going on in the Gezira Research Station for nearly half a century. The performance of such innovations on scientific research plots differs from performance under field production mainly because scientific research concentrates on one or a limited number of variables in an otherwise controlled environment and because some of the important constraints in commercial production are avoided in research, particularly

shortage of working capital, of labour at peak times and of managerial competence.

Because of this expected variation in performance, pilot projects were established in the Gezira Scheme with the following objectives in mind:-

1. To carry out trials in order to test conclusions reached in research about cultural operations and new inputs.
2. To introduce tested and feasible innovations into commercial production.
3. To examine how best these innovations may be adapted to field conditions.
4. To act as demonstration farms.

The first pilot scheme in the Gezira was established in Suriba village in 1950. The experiment failed for many reasons including the proximity of the village to Wad Medani with its stimulating off-farm income opportunities, lack of co-operation and, later on, reliance on hired labour rather than on work by the actual tenant farmers. The Suriba pilot project was abandoned and replaced by the W/N V.F.E. in the early 1950s. Work in the W/N V.F.E. continued for 17 years. In this period the W/N V.F.E. successfully bridged the gap between scientific research work and commercial scale production. It also provided reliable information on how these innovations could be adapted to field conditions and on the consequent improvement in performance. After the experiment ceased in the late 1960s, new techniques were tested in research and recommended by the Husbandry Committee for field application. To include these techniques in our calculations, two stages were followed; firstly, the ratio between yields in research and in the W/N prior to 1970 was established and secondly, these ratios were

used to estimate the likely performance, under field conditions, of the new techniques developed after 1970.

In the present study, the same promising innovations suggested by the authors of the Working Party and also listed by Thornton (1972) will be considered. These innovations include:

1. Introduction of high yielding varieties
2. Use more fertilizers, pesticides, and other crop pests and disease control measures.
3. Improved cultural practices
4. Increased mechanization
5. Modify cropping patterns.

In the following discussion these innovations will be considered in relation to each crop separately. All proposed improvements relate to the present farm crops or to crops allowed in the current rotation which the tenant farmers elected not to cultivate. This approach was followed because no crops apart from rice were developed and established in recent research. Even in rice, experiments started too recently for data to be available.

The important role that these promising innovations could play in the transformation process depend, as stated by Collinson (1970), upon their feasibility and their acceptability to the farming community. However, the ample evidence gathered from production response investigations and attitude tests, referred to earlier, indicated that the tenants were strongly motivated for higher income, were technically knowledgeable in relevant fields and were thoroughly price conscious.(i)

(i) Thornton (1972).

8.2.1. The Derivation of Crop Yields from Innovations under Field Conditions.

In this section a summary of the innovations with regard to each crop is given first and the resultant output after their adoption is estimated. The requirements per feddan for each crop of the labour, working capital and machine hours resulting from the adoption of innovations and the yield to be obtained are compared to the actual situation.

Cotton:

Breeding and agronomic research on the various aspects of cotton production has been going on for nearly half a century and standard practices for the production of extra long staple (ELS) cotton have been established. Because of the importance of cotton to the Sudan economy and because of the strict supervision on cotton production, improved techniques are introduced into the field as soon as they are proven. Agronomic research is being concentrated, at the present time, on improving the variety by breeding for resistence to the black-arm and leaf curl diseases, improving limit quality and studying the response of the new varieties to fertilization, and on other agronomic factors known to be affected by fertilization such as spacing, sowing date, irrigation and weeding.

a. Varieties:

In 1970, a new variety 'Barakat' was released and tried on a limited scale in the field. At the present time, 'Barakat' is the main variety under cultivation in the Gezira Scheme. Because the variety is virtually immune to blight disease, its release made it easier to cultivate the crop early (second half of July) and led to high production in the better quality grades.

b. Fertilization and Spraying:

Cotton in the Gezira Scheme responds favourably to fertilizer application and this response varies inversely with insect infestation. At the present time, the crop receives six sprays of very potent insecticides which is considered satisfactory. At this level higher yields can be achieved if the fertilization level is raised to 3N. (1N = 40 lbs. of nitrogen = 52.kgs of urea.)

c. Mechanization:

i. Machine planting:

Machine planting, in addition to enabling the operation to be carried out at the optimum time, also ensures precise spacing between plants, correct and optimum plant population, saves seed and increases yield.

ii. Cultivation:

Basic cultivation of fallow preceeding cotton and ridging has long been mechanized. The post-sowing cultivation by a wider 'A' hoe improves seed bed, water distribution, reduces cost by reducing the number of ridging operations and contributes to higher yield by removing more than 50% of the weeds, thus reducing the demand on hired labour at this peak period.

iii. Fertilizer Distribution:

Uneven distribution of fertilizers in the Gezira Scheme does not allow full utilization of this nutrient. Mechanical distribution by the Vicon spreader was found very successful in Wadel Naem and resulted in even distribution.

d. Weedicides:

Very little research work was carried out in order to test chemical control of weeds. The results achieved so far indicated no role for chemicals in the post emergence stage of the crop.

Table 8-1

Comparison of the labour, working capital and machine requirements per feddan of cotton, by time period at the present time, with its requirements following the adoption of innovation*

Time Period		Actual Requirements			Requirements with adoption of innovations		
		Labour (Man-hour/ Equivalents)	Working Capital Ls.	Tractor (Hours)	Labour (Man-hour/ Equivalents)	Working Capital Ls.	Tractor (hours)
June	1st half	0.53	0.64				
	2nd half	0.37	1.83	0.43			
July	1st half	5.54	0.31	0.05	5.54	2.12	1.20
	2nd half	7.62	4.25	0.01	1.91	6.13	0.65
August	1st half	31.03	1.05	0.01	7.76	0.36	0.33
	2nd half	16.62	1.22	0.04	4.56	0.84	0.58
September	1st half	17.41	0.95	0.01	23.44	1.23	
	2nd half	8.71	0.64	0.09	11.73	2.31	1.18
October	1st half	16.91	0.62		4.23	1.20	
	2nd half	5.40	1.05		1.35	1.49	0.22
November	1st half	5.28	2.05		1.32	1.47	
	2nd half	1.11	1.87		1.11	1.26	
December	1st half	1.64	1.88	0.06	1.64	1.18	
	2nd half	1.49	2.04		1.49	1.23	
January	1st half	18.09	0.84		24.37	1.50	
	2nd half	31.62	1.22		42.59	3.02	
February	1st half	33.27	2.10		44.82	3.11	
	2nd half	38.17	2.14	0.20	51.42	3.82	0.60
March	1st half	34.09	1.09		46.73	3.69	
	2nd half	17.56	1.20		23.64	1.57	
April	1st half		-42.70			-65.85	
	2nd half		0.14				
May	1st half	19.20	3.96		25.86	2.35	
	2nd half	19.20	3.30	0.30	25.54	12.60	

* Data after innovations was made up by relating data obtained from research and reports in the W/L V.F.E. to the actual data for the farm group.

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With existing labour conditions in the Gezira Scheme, hand hoeing proved to be far less expensive than chemicals at the pre-emergence stage, even if there were no hazards associated with chemicals. In fact, clear superiority of mechanical weed control to chemical was established.

Accordingly, the new innovations used in this investigation with regard to the cotton crop include: The cultivation of Barakat variety at a fertilizer level of 3N and the mechanization of planting, fertilizer distribution and weeding operations.

Comparing yields in research with those obtained in W/I in the period 1965/66 - 1967/68, the average yield of the variety BAR 41 at a fertilizer level of 2N in W/I was 4.71 Kantars per feddan (K.P.F.). With the same treatment, an average yield of 6.33 K.P.F. was obtained for this variety in research blocks -ie. the performance of the variety in W/I was 74% of that in research. Using the same ratio with Barakat variety at 3N, the expected yield in the field would be 6.54 K.P.F.

With the adoption of these innovations and the high yield to be obtained, the working capital, tractor hours and labour requirements per feddan of cotton will increase as can be seen in Table 8-1 and a summary is given in the table below.

Table 8-2.

Comparison of the per feddan cotton requirement of labour, working capital and tractor hours at the present time with its requirement following adoption of innovations.

	Labour Man-hour Equivalent	Working Capital Ls.	Tractor Hours	Output Ls.
Actual	331.67	38.73	1.20	42.70
With innovations	351.05	52.18	4.76	65.95

The relative increase in labour requirements is due to the high yield of 6.54 K.P.F. More labour is required during the cotton picking season and the marginal productivity of labour rises from Ls.0.12 to Ls.0.19 which further exceeds the unit cost of labour of Ls.0.07 per man-hour equivalent. The increase in the marginal productivity of labour is due to the rapid growth of capital inputs embodied in fertilizers and machines. The working capital requirements per feddan rose from Ls.39 to Ls.52. With an increase in output from Ls.42.70 to Ls.65.95, the value of the marginal product of capital input rises from Ls.1.10 to Ls.1.26. The MVP estimate is based on the present market price of both cotton and input factors. Any change in prices, as was mentioned earlier, will change both MVPs and economic optima.

Wheat:

Wheat production in the Gezira Scheme started in the mid-1960s but agronomic research started a long time before that date. Similarly to other crops, research on wheat concentrated on improving the variety, breeding for resistence to rust disease and for good baking quality and on the response of wheat to fertilization.

a. Variety:

Different varieties, like Gabo, H.164 and Mexicani in addition to Giza 155, which is under current cultivation, were tested in research and Mexicani and Giza 155 proved to be superior to the other two varieties. Both varieties are resistent to rust disease and of high gluten content which gives good baking quality; but Mexicani out-yields Giza by 20% due to its high number of tillers, responds to higher levels of fertilizers and tolerates slight departures from the optimum sowing date. Yields in research plots

under 2N fertilizer level were 1.19 and 1.34 tonnes feddan for Giza and Mexicani respectively. Raising the fertilizer level to 2½ N increase Giza yield by 0.3% and Mexicani by 9%. Using the current prices, an Ls.0.82 increase in fertilizers, raises Giza output by Ls.0.22 only, while the increase in the output of Mexicani rises by Ls.7.65.

b. Cultural Practices:

Wheat is sensitive to the date of sowing, particularly under the Gezira conditions where the wheat growing season is short. The second half of October was recommended by research and is currently followed. Early sowing increases the competition for water at the peak demand period of October-November while late sowing subjects the crops to the high temperature at the grain filling stage which shrivels the seeds and reduces their number.

The normal practice is dressing seeds with chemicals against termites and spraying the crop against aphids when wheat reaches the milky stage.

c. Mechanization:

Wheat requires less labour than other crops under current conditions, because it grows quickly and smothers the weeds. Most of the cultural operations are mechanized. Disc ploughs are used for seed-bed preparation and for levelling, and the efficient self propelled Claas combine is used for harvesting.

In the W/N V.F.E., other machines were tried and some operations like sowing and fertilizer distribution were performed successfully by machines and resulted in higher yields as a result of greater timeliness in sowing, more accurate seed rate, sowing depth, and plant population and more even distribution of fertilizers. These operations were also, economically, less expensive since final seed-bed preparation, sowing and fertilizer distribution were

carried out as one operation.

In the case of wheat, the promising innovations considered in our calculations include the cultivation of Mexicani at 2½N and the mechanization of sowing and fertilizer distribution by attaching seed boxes and fertilizers distributors to MF 175 tractor as was used in the W/N V.F.E.

Comparing yields obtained in the pilot project with those obtained in research, Giza 155 gave 0.76 and 1.05 tonnes per feddan with 1N in W/N and in research plots respectively. Using the same ratio the research plot yield of 1.45 tonnes of Mexicani at 2½N would be reduced to an estimated 1.05 tonnes/feddan in the field.

With the introduction of these innovations, the labour requirement per feddan of wheat falls from 26.85 man-hour equivalents, at the present time, to 19.83 man-hour/equivalents as can be seen from Table 8-3. Due to the high returns per feddan following the adoption of innovations, the marginal productivity of both labour and working capital rises. The increase in tractor hours required by a feddan of wheat is not as high as in the case of cotton because wheat is already highly mechanized in the Gezira Scheme. With innovations wheat would require also 0.27 hours/feddan of combine harvesters but more tractor hours as can be seen from Table 8-4, due to the mechanization of sowing and fertilizer distribution.

Table 8-4

Comparison of Wheat Requirements of Labour, Working Capital and Tractor Hours per Feddan, at the Present Time with its Requirements following adoption of Innovations

	Labour Man-hour Equivalent	Working Capital Ls.	Tractor Hours	Combine Harvester Hours	Output Ls.
Actual	26.85	12.78	0.90	0.27	36.31
With Innovations	19.83	15.04	1.79	0.27	66.58

Table 8-3

Comparison of the labour, working capital and machine requirement per feddan of wheat, by time period, at the present time, and its requirements following the adoption of innovations

Time Period		Actual Requirement (1)	(2)	(3)	(4)	Requirements with the adoption of innovations (1)	(2)	(3)	(4)
June	1st half								
	2nd half								
July	1st half								
	2nd half								
August	1st half								
	2nd half								
September	1st half								
	2nd half		0.01						
October	1st half	0.50	0.30	0.18		0.50	1.43	1.04	
	2nd half	1.86	1.88	0.20		1.12	5.23	0.75	
November	1st half	6.09	3.03	0.21		2.12			
	2nd half	3.41	0.51	0.15		2.42			
December	1st half	5.03	0.25	0.15		3.72			
	2nd half	2.59	0.14	0.01		2.58	0.03		
January	1st half	2.80	0.42			2.80	0.06		
	2nd half	1.48	0.29			1.48	1.20		
February	1st half	1.71	0.18			1.71	0.04		
	2nd half	0.95				0.95	0.03		
March	1st half	0.38				0.38	0.02		
	2nd half	0.05	-3.12		0.27	0.05	-59.58		0.27
April	1st half		-20.83						
	2nd half		-5.36						
May	1st half								
	2nd half								

(1) Labour in man-hour/equivalents
(2) Working Capital in Ls.
(3) Tractors in hours
(4) Combine Harvester in Hours.

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Dura:

a. Variety:

Dura (Sorghum Vulgare), the main subsistence crop, has received relatively little development in the GRS. Slight modifications to the methods of growing the crop under rainfed agriculture have been made. The production of dura was characterised by mixed varieties and a high level of weed infestation resulting from poor cultural practices. Research workers have selected a single variety 'Dwarf White Milo' which compared to previous varieties is quick maturing, high yielding and less susceptible to dura midge and aphids. In addition to grain and straw yield, tenant farmers select varieties according to their taste. Varieties like Feterita, which is the highest yielding variety in terms of grains and straw and is of the highest nutrient value at 12.6% protein content, as compared to 6.9% for the variety under current cultivation, is not favoured by the tenants because its pericarp makes the flour brown. Another high yielding variety, tested in research, was Cross 3 (16/6) but was found to be more susceptible to dura stem borers. The average yields of the three varieties in 1970/71 in research were

	Grain Yield (Ardabs/feddan)	Straw Yield (Kg./feddan)
Dwarf White Milo	3.55	3600
Cross 3 (16/6)	4.07	3467
Feterita	4.36	5240

b. Fertilization:

Dura is very responsive to fertilization yet, at the present time, none is applied to the crop in the field. In research, the application of 1N increased the yield of Milo by 160% giving yields of 5.68 ardabs/feddan. The N/N V.F.E. yield per feddan with no

fertilization was 2.72 ardabs while that in research was 3.55 ardabs per feddan.

c. Mechanization:

In W/N it was found that good land preparation by discing the land in April to be followed by ridging in June - would reduce weeds appreciably. Also sowing by planters in June would enable the crop to be harvested by the end of October, making good use of the rains and not competing for irrigation water in the critical months of October and November. Early sowing was also found to reduce the incidence of stem borers.

The new techniques with regard to dura include:

1. Cultivation of the current Dwarf White Milo at 1N fertilizer level.
2. Ridging by machine for good seed-bed preparation and for improving irrigation.
3. Sowing in June
4. Planting by machine.

From the ratio of yields obtained in W/N to those obtained in research, the expected yield of Dwarf White Milo with 1N fertilizer level would be 4.35 ardabs/feddan.

Again, the adoption of these innovations would raise the labour, working capital and machine requirements per feddan. The increase in labour requirement is mainly due to crop harvesting following the high yields to be achieved. Dura harvesting using the self propelled combine harvester was not tried in the Gezira Scheme for two reasons; firstly, the lack of a combinable variety and secondly, the risk of destroying the dura straw thus making it difficult to store till the summer months. The tractor requirement is very high compared to the present time due to the disc

Table 8-5

Comparison of the labour, working capital and machine requirements per feddan of dura, by time period, at the present time and its requirements following the adoption of innovations

Time Period		Actual Requirements (1)	(2)	(3)	(4)	Requirements with adoption of innovations (1)	(2)	(3)	(4)
June	1st half		0.08	0.12			0.41	0.33	
	2nd half	0.84	0.60	0.21			1.61	1.28	
July	1st half	8.43	0.40	0.10			0.82	0.25	
	2nd half	9.0[illegible]	[illegible]	[illegible]		3.15	1.62		
August	1st half	17.96	1.27			4.90	0.32	0.25	
	2nd half	5.99	0.53			4.10		0.25	
September	1st half	1.84	0.12			1.81			
	2nd half	0.85	0.06			0.84			
October	1st half	0.89	0.02			35.78	1.05		
	2nd half	2.26	0.12			58.13	4.00		
November	1st half	11.30	0.98		0.22	1.76	-1.62		0.50
	2nd half	18.35	0.53						
December	1st half	5.06	-2.67						
	2nd half	0.41	-1.20						
January	1st half	0.33	-1.64						
	2nd half		-0.43						
February	1st half		-0.13						
	2nd half		-0.05						
March	1st half								
	2nd half								
April	1st half								
	2nd half								
May	1st half								
	2nd half								

(1) Labour in man-hour/equivalents
(2) Working Capital in Ls.
(3) Tractor in hours
(4) Combine Harvester in hours

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ploughing introduced for weed control. The per feddan requirement of these resources under both current situation and the situation with innovations can be seen in Table 8-5, and are also summarised below.

Table 8-6

Comparison of the per Feddan of Dura Requirements of Labour, Working Capital and Machines at the present time with its Requirements following adoption of Innovations

	Labour Man-hour Equivalents	Working Capital Ls.	Tractor Hours	Combine Harvester	Output Ls.
Actual	83.60	4.41	0.51	0.22	6.36
With Innovations	110.47	7.04	2.36	0.50	26.1

Groundnuts:

Though most of the pilot project emphasis was directed towards this crop, groundnuts have not received great attention in the GRS plots. Limited trials have been directed to establish some of the cultural practices for growing the crop like sowing date, seed rate, spraying and depth of sowing and their relation to yield. The five year plan (1970/71 - 1974/75) also ignored the crop and recommended the investigation of its marketing first. The difficulty in groundnut marketing arose from the Aflatoxim problem which tends to put Sudan at a relative disadvantage in the export market.

'Ashford', the variety recommended by research is the dominant variety in the Gezira Scheme at the present time. Though it has a long growing season and competes with wheat for water in November, it was preferred to the quick maturing variety 'Barbeton' because yields were more than double those of Barbeton. Another variety 'Libyan', tried in the pilot project showed the following:

high oil content (49%), high out-turn of kernels (75%), short maturing period and freedom from Aflatoxin. Compared to the Ashford yield of one tonne per feddan, Libyan gave 1.4 tonnes per feddan.

These very high yields of W/N relative to the overall Gezira average of less than half a tonne per feddan were due to good seed-bed preparation, mechanical planting and cultivation and proper post-harvest handling. Machine lifting and threshing were not recommended because they are very expensive. The response of the crop to fertilization was not fully investigated.

With the techniques tested and proven in W/N, more working capital is needed as a result of increased mechanization, as can be seen in Table 8-7. Labour requirements per feddan of groundnuts remain the same though differing in seasonal distribution because mechanical cultivation reduces labour requirements in July and August and because the high yield demands more labour for lifting and threshing the crop in January. The average requirement per feddan for labour remains at 54 man-hour/equivalents. Its requirement for working capital rises from Ls.3.08 to Ls.21.46 and for tractors from 0.59 hours to 2.17 hours while output rises from Ls.7.84 to Ls.49.44.

Livestock and Fodder Production:

Livestock trials have been few and not very successful, and animal production is still regarded as part of the subsistence sector. A little research on feeding sheep on the local diet was done in Nishieshieba and another station was recently opened in Wad Busari but no data are yet available.

The relative neglect of livestock is partly due to the complex technology involved in fodder preservation and partly to the

Table 8-7

Comparison of the labour, working capital and machine requirements per feddan of groundnuts, by time period, at the present time and its requirements following the adoption of innovations

Time Period		Actual Requirements			Requirements with adoption of innovations		
		Labour (Man-Hour Equivalents)	Working Capital (Ls.)	Tractor (Hours)	Labour (Man-Hour/Equivalents)	Working Capital (Ls.)	Tractor (Hours)
June	1st half	0.87	-0.11	0.20	1.35	0.40	0.25
	2nd half	4.67	0.57	0.39		0.72	0.61
July	1st half	5.97	0.36	0.01	1.35	6.50	0.25
	2nd half	9.22	0.27		0.10	0.40	0.33
August	1st half	6.5	0.96		2.02	0.24	0.20
	2nd half	2.45	0.04		0.16	0.64	0.53
September	1st half	1.66	0.03		3.61	0.25	
	2nd half	1.49			2.54	0.14	
October	1st half	1.72	0.03		2.68	0.11	
	2nd half	0.33	0.01		0.52	0.02	
November	1st half	0.22	0.06		0.35	0.01	
	2nd half	0.12			0.19		
December	1st half	3.47	0.10		2.40	0.30	
	2nd half	2.22	0.12		1.26	0.30	
January	1st half	6.92	-1.73		31.51	11.43	
	2nd half	5.84	-2.58		4.25	-49.44	
February	1st half	0.79	-1.66				
	2nd half		-0.89				
March	1st half						
	2nd half						
April	1st half						
	2nd half						
May	1st half						
	2nd half						

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radical change in attitude to livestock required by the switch from traditional to commercial production with its greater emphasis on quality than quantity. Another reason also stated in the report of the Working Party on the W/N V.F.E. was the low demand for animal products and hence low returns from livestock.

Fodder production was equally neglected in research. Before 1950, the tenants were allowed to cultivate lubia as a fodder for their animals and land was permitted for this purpose in the rotation but the actual area cultivated, diminished with time. Later on, with the introduction of groundnuts, most of the tenants abandoned lubia in favour of the cash crop. At the present time, very few tenants cultivate lubia for grazing by their animals in situ. Apart from dura straw (Gassab) which is stacked in the field, fodder conservation is not practiced in the Gezira.

In W/N, some emphasis was given to fodder production, particularly lubia and phillipesara. Encouraged by both the Inspector in Charge of the W/N V.F.E. and the Department of Social Development in the SCB, one private herd owner in W/N achieved great success in milk and fodder production. Good results were also achieved by another co-operative society in the pilot project. The results achieved in the W/N V.F.E. showed that both lubia and phillipesara are easy to cultivate, that they do not call on irrigation water essential for other crops and they can be supplemented whenever water is available.

Due to the serious lack of data on livestock production only these two crops were programmed in our investigation at performance levels indicated by the pilot project. With the following recommended programme of feeding, an average milk yield of 1700 lbs. per cow per annum was achieved by the private herd owner

and the co-operative society in the pilot project.

Table 8-8.

Programme of feeding for a dairy herd

Month	Way of feeding and type of food
June	Feeding on stored fodder; lubia, hay, dura stalks and concentrates
July	" " " " " "
August	" " " " " "
September	Grazing on fallow weeds
October	" " phillipesara
November	" " dura stubble and stalks
December	" " groundnut hay and stubble
January	" " lubia
February	" " "
March	" " "
April	" " "
May	" " Cotton

Source: The Village Farm Experiment at Wad el Naeim, full report with recommendations, by a Working Party for the Sudan Gezira Board, January 1970.

The per feddan requirements of labour, capital and machines for lubia and phillipsara were given in Table 8-9. Those for water for all crops are presented in Table 8-10. With these requirements, average yields were 50(i) Bales for phillipesara and 80 Bales for lubia. If sold green, the returns per feddan would be Ls.15 in the case of lubia and Ls.8.0 in the case of phillipesara.

8.2.2. Cropping Pattern:

Two rotations are now followed in the Gezira Scheme; an 8-course rotation in the Gezira Main and a 6-course rotation in the Managil Extension. With the introduction of wheat in some

(i) One Bale weighs about 30 Rottles (lbs.) = 13 1/3 kgs.

Table 8-9

Labour, Working Capital and Machine Requirement per feddan of Lubia and per feddan of Phillipesara by time period with adoption of innovations

Time Period		Lubia			Phillipesara		
		(1)	(2)	(3)	(1)	(2)	(3)
June	1st half					1.80	1.85
	2nd half					0.38	0.58
July	1st half				0.12	1.83	0.50
	2nd half				0.42	0.42	
August	1st half	1.15			0.42	0.42	
	2nd half		1.41	1.20	0.12	0.12	
September	1st half	2.30	1.29	0.58			
	2nd half	11.30					
October	1st half	6.30	0.75	0.25			
	2nd half	6.30	0.75	0.25			
November	1st half	6.30					
	2nd half	2.30					
December	1st half	2.30					
	2nd half	2.30					
January	1st half						
	2nd half						
February	1st half						
	2nd half						
March	1st half						
	2nd half						
April	1st half						
	2nd half						
May	1st half						
	2nd half						

(1) Labour in man-hour equivalents

(2) Working Capital in Ls.

(3) Tractor in hours.

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Table 8-10.

The Mean Water Requirement for Crops in the Gezira Scheme - planted for their recommended dates and grown to acceptable Standard of Husbandry. In cubic meters per feddan (cu.m.f.)(i) per day

Time		Cotton	Dura	Groundnuts	Wheat	Lubia	Phillipesara	Available Water (ii)
June	1 - 10	-	-	27.25	-	-	-	481.95
	11 - 20	-	-	27.25	-	-	-	481.95
	21 - 30	-	-	18.50	-	-	-	481.95
July	1 - 10	-	60.0	19.0	-	-	-	481.95
	11 - 20	-	18.20	19.50	-	-	-	481.95
	21 - 31	20.0	21.50	21.0	-	-	-	481.95
August	1 - 10	0	27.0	22.5	-	-	-	481.95
	11 - 20	13.8	30.3	25.0	-	-	-	481.95
	21 - 31	15.0	31.5	28.5	-	-	-	481.95
September	1 - 10	16.80	32.0	31.5	-	-	-	481.95
	11 - 20	18.90	32.0	32.0	-	-	-	481.95
	21 - 30	23.50	30.0	31.0	-	10.0	10.0	481.95
October	1 - 10	28.50	25.0	29.0	-	15.0	15.0	605.09
	11 - 20	30.3	17.8	24.5	25.0	15.0	15.0	605.09
	21 - 31	30.3	-	21.5	25.0	15.0	15.0	605.09
November	1 - 10	30.3	-	18.0	16.9	-	-	481.95
	11 - 20	30.0	-	15.0	21.8	-	-	481.95
	21 - 30	28.5	-	-	26.9	-	-	481.95
December	1 - 10	27.0	-	-	28.8	-	-	481.95
	11 - 20	26.0	-	-	29.2	-	-	481.95
	21 - 31	24.50	-	-	28.6	-	-	481.95
January	1 - 10	23.0	-	-	26.6	-	-	481.95
	11 - 20	22.3	-	-	24.7	-	-	494.69
	21 - 31	21.50	-	-	21.3	-	-	494.69
February	1 - 10	20.5	-	-	16.2	-	-	494.69
	11 - 20	20.0	-	-	14.2	-	-	494.69
	21 - 28	20.0	-	-	-	-	-	494.69
March	1 - 10	21.0	-	-	-	-	-	494.69
	11 - 20	22.40	-	-	-	-	-	494.69
	21 - 31	-	-	-	-	-	-	494.69

Source: H.G. Farbrother; Water Requirement of Crops in the Gezira In Cotton Research Reports, Republic of the Sudan 1972/73. Cotton Research Corporation, 12 Grosvenor Place, London. 1975.

(i) 4.2.cu.m.f. = 1 mm.

(ii) Available water calculated at a rate of 17 cu.m. per cultivable feddan per day (total cultivable for this farm = 28.35 fed.) and based on the engineer's assumption of half the cultivable land irrigated at any one time.Variation in availability depends on discharge from Sennar dam.

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parts of the Managil Extension, the rotation became, more or less, similar to that in the Gezira Main.

In addition to the cash crops (cotton, groundnut and wheat) the present rotation includes dura and fodder, with a large area left fallow. Dura and fodder were included to provide the local people with a supply of their subsistence crop and of animal fodder. Nearly one third of the cultivable land was left fallow for two reasons: firstly, the desire to maintain a certain level of fertility and phytosanitation and secondly, no more than 50% of the land can be irrigated at any one time given the capacity of the existing canals. While fertility and sanitation could be maintained by the application of more mineral fertilizers and chemicals, the water problem could only be overcome by improving the canalization system. Even before that, research work on the effect of more irrigation on the physical properties of the Gezira heavy clay soil would be needed. Unfortunately no programme was put forward for improving the carrying capacity of the Gezira canals apart from slight modifications to the sluices of Sennar dam. In addition to the canalization system, the Gezira Scheme will face competition for the available water with the development projects in the Rahad and Kenana which also depend on the Blue Nile. The construction of Jungli canal is hoped to solve this problem by increasing the Sudan share in the Nile Water.

In the meantime, the available water could be utilized more efficiently by using different rotations in the different parts of the Scheme depending on crop yields. For example, cotton and groundnut could be concentrated in the South and cotton could be replaced by other crops like wheat and vegetables in the North and North West where cotton yields are the lowest. This proposal

put by economists a long time (1) ago, was recently followed in the North and North west.

At the present time, the SGB and Sudan Government prefer to maintain the established rotation in favour of cotton. However, the yield of cotton in many parts of the Gezira Scheme is low and declining because in addition to varying suitability of these parts to cotton, the tenants' interest in producing cotton is very low due to: (1) the present cotton sharing systen acts harshly against the tenants with their actual share reduced to less than 15% of the F.O.B. price. (2) all charges for other crops are made against cotton, a system which makes them more attractive relative to cotton.

Different rotations were tried in the pilot project but the following rotation of Cotton- Wheat- Fallow- Cotton- Dura- Groundnut- Cotton/phillipesara- Fallow, proposed in the five year plan (1970/71 - 1974/75) and based on the Husbandry Committee recommendations, was selected for the following reasons:

(1) it is feasible within the limits of the water constraint
(2) it raises the cropping intensity to 80% and
(3) relative to other rotations it is more likely to be accepted by the SGB and the Sudan Government because it still maintains the high importance of cotton.

The selection of this rotation, however, does not reduce the importance and urgency of testing different rotations in the different localities. Furthermore, it allows a variable area of cotton to be grown and anything less than the maximum will indicate the need for changing cropping patterns and hence the present structure and organization of the Gezira Scheme.

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(1) Most notably Simpson (1970) and Thornton (1972)

8.2.3. Mechanization:

The effect of increasing machine power and machinery available is to speed up the tenants work, reduce dependence on hired labour and raise his income by the resulting increase in yield. In the following investigation, only mechanization of planting, fertilizer distribution and weed control were recommended in addition to current practices. Many other post harvest operations, manually performed, could be machanized but were not recommended because they are more expensive than if performed by manual hired labour, displace more labour particularly in the Gezira where the use of machinery had been accompanied by a fall in the work contribution of the tenants and their families and require more capital with its high foreign exchange components. This is specially true when expensive capital substitutes for relatively cheap labour.

8.3. Impact of Innovation, Cheap Credit and more Capital on Farming

8.3.1. Income and Credit:

The results obtained from the normative solution clearly demonstrate the considerable increase in income made possible by the adoption of innovations and greater availability of working capital. Compared to the actual situation and having an initial cash in hand of Ls.50, farm income would rise between Ls.477 and Ls.586 with the adoption of innovations and credit costing between 50% and zero percent per annum. The fall in income with high cost of credit is mainly due to the high interest charges. Also approximately twice the maximum amount of working capital needed at the present time would be needed if innovations were adopted as shown in Table 8-11.

Table 8-11.

Comparison of actual and normative farm income and maximum working capital requirement at different rates of interest and Ls.50 in hand

Group I - NV LAS FY

(in Ls.)

	Actual Situation	Normative Situation Interest rate per annum %				
	0.0	10	20	30	40	50
Income	101.90	688.9	661.11	637.02	615.08	595.95	579.14
Maximum working capital required	352.01	921.11	921.11	875.65	875.65	784.67	784.67
Interest Charges	23.46	-	26.98	49.70	71.64	81.29	97.17

Given the same rate of interest, farm income under the n normative situation rises, as would be expected, with more cash in hand due to the smaller loans and hence less interest charges and due to more use of the available land as can be seen in Figure 8-1.

The marginal productivity of capital, as noted in the previous chapter, diminishes with successive income optima when more cash in hand and cheap credit became available. This can also be seen from Table 8-12. With innovation, Ls.250 cash in hand and free credit would be needed to give a zero marginal productivity of capital. With costly credit, more cash in hand ,would be needed. Compared to the normative solution under the present state of the arts, discussed in the previous chapter where a zero marginal productivity of capital would be reached at Ls.150 cash in hand. In the normative situation with innovations more cash in hand and cheap credit would be needed. The sharp fall in the marginal productivity of capital with more cash in hand also suggests that

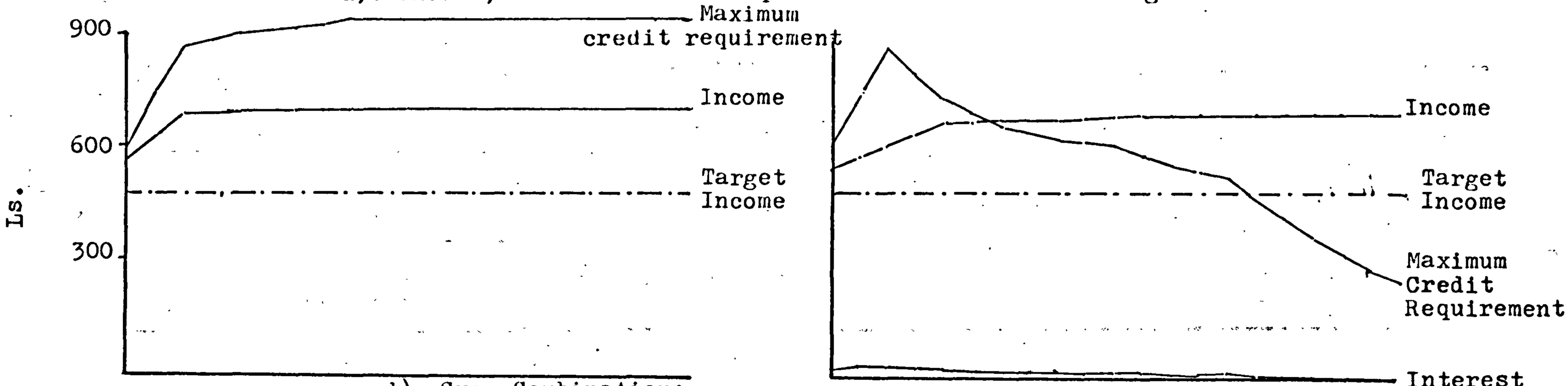
Figure 8-1

Variation in Income, Maximum Borrowing, Interest Charges and Cropping with Annual Rate of Interest and Cash in Hand for Group I - NV LAS FY

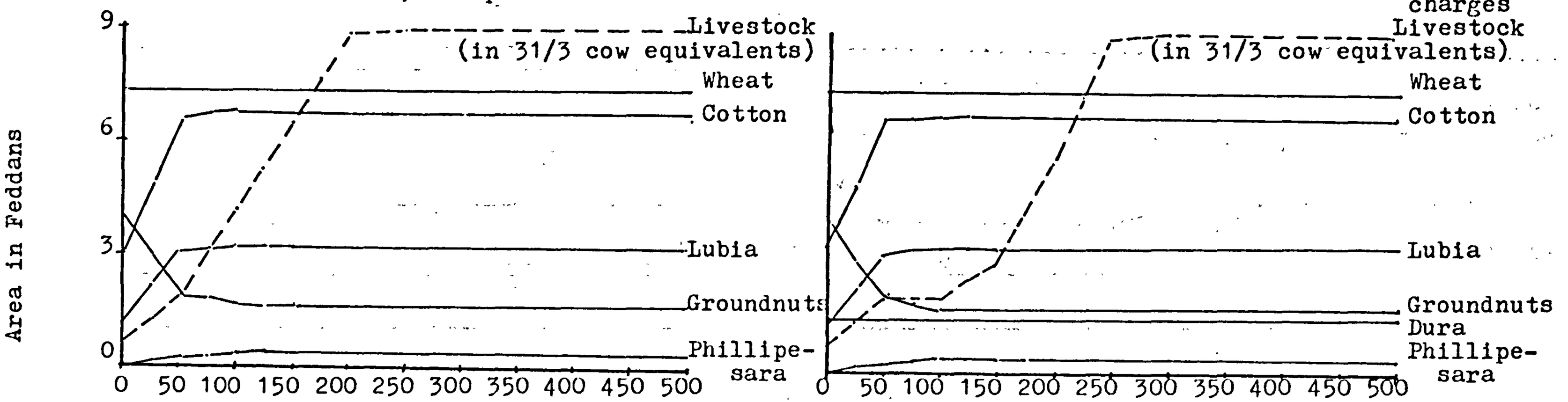
Rate of interest = 0%

Rate of interest = 10%

a). Income, Maximum credit requirement and interest charge:



b). Crop Combination:



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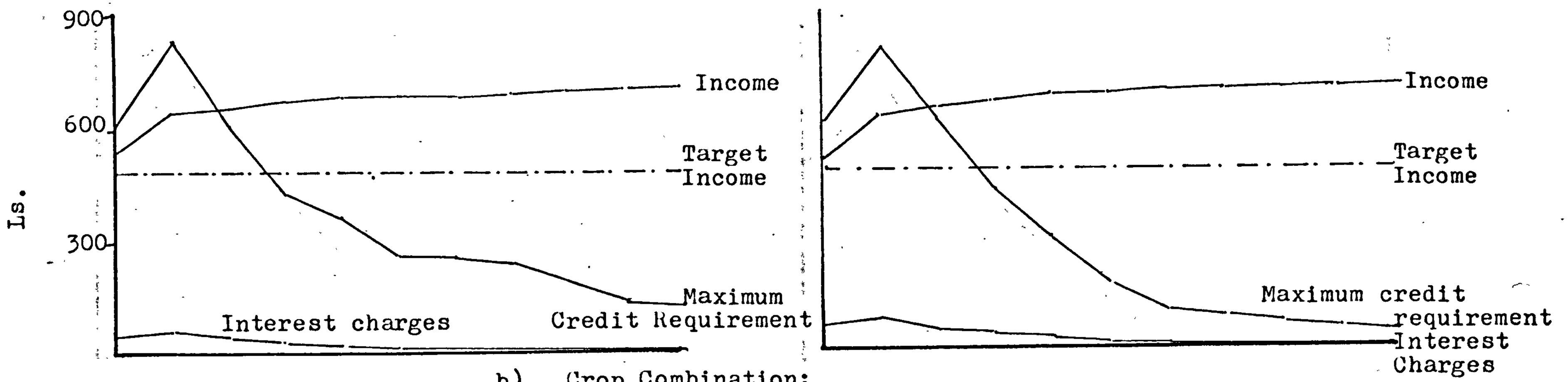
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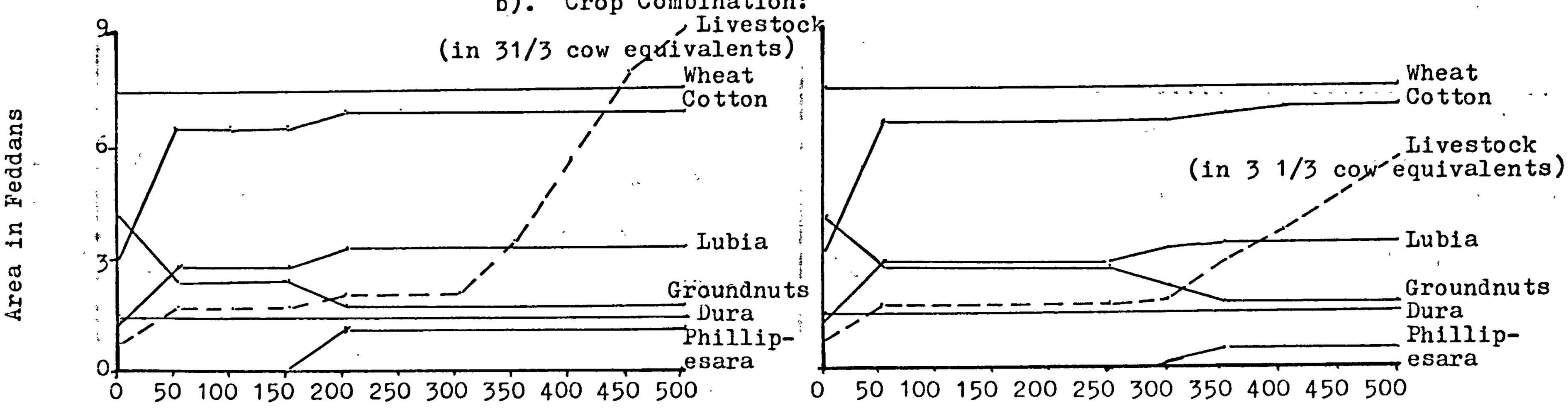
Rate of interest = 20%

Rate of interest = 30%

a). Income, Maximum credit requirement and Interest Charges:



b). Crop Combination:



Initial Cash in Hand Ls.

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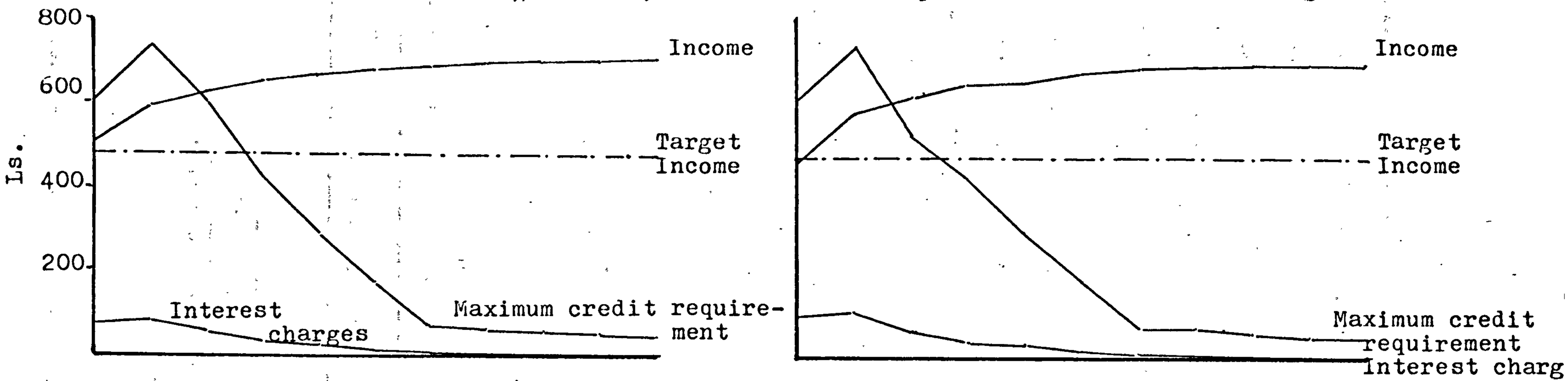
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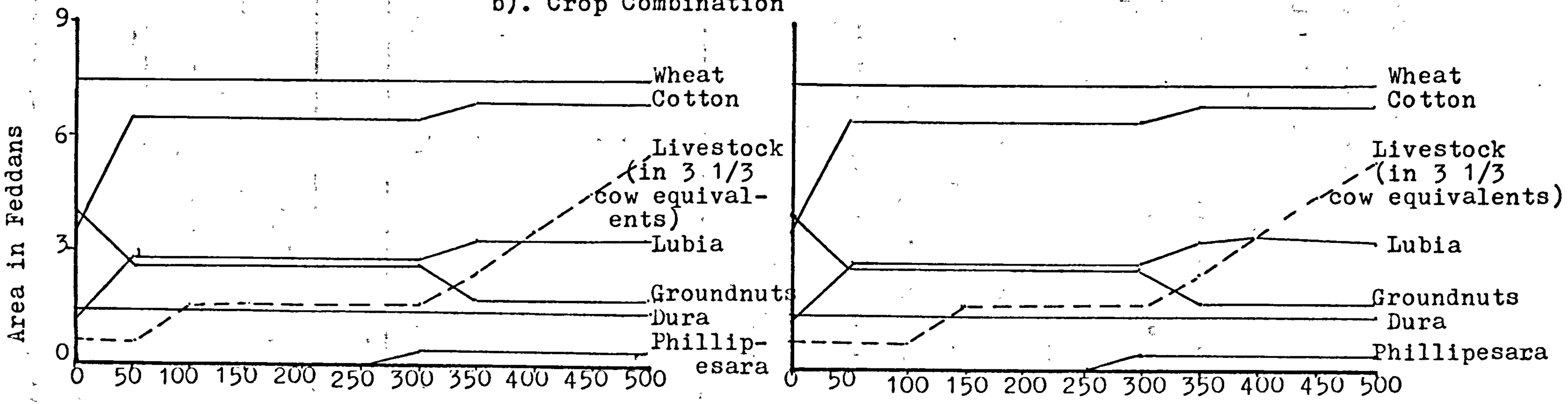
Rate of Interest = 40%

Rate of Interest = 50%

a). Income, Maximum Credit requirement and interest charges:



b). Crop Combination



Initial Cash in Hand Ls.

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other input factors, particularly water in October-November, is more limiting.

Table 8-12.

Variation in Marginal Productivity of Working Capital with Initial Cash in Hand and Interest Rate (in Ls.)

Cash in Hand Ls.	Interest Rate per annum % 0	10.	20.	30.	40.	50
0	11.91	11:40	10:92	10:49	10:09	9.71
50	0.24	0:24	0:35	0.50	0:64	0.78
100	0.10	0:13	0:31	0:45	0:57	0.69
150	0.10	0.11	0:19	0:27	0:35	0.42
200	0.10	0.10	0:12	0:18	0:23	0.28
250	0	0.09	0.12	0.18	0.23	0.27
300	0	0.06	0.10	0.13	0.13	0.16
350	0	0.06	0.06	0.06	0.06	0:06
400	0	0.05	0.05	0.05	0.05	0.05
450	0	0.04	0.05	0.05	0.05	0.05
500	0	0.04	0.04	0.04	0.04	0.05

8,3.2. Land Use:

If relevant innovations were adopted, more land should be brought into cultivation in order to maximize income with present assets. Practically the whole acreage would be required, a 26% increase on the present area, and the remaining 0.52 feddan would be used if initial assets were doubled at low rates of interest or raised sevenfold at high rates of interest as can be seen in Table 8-13.

In no combination of owned funds and interest rate did the normative solution give an area under cotton higher than the actual level. Given the present level of assets, the area under cotton fell from 6.69 to 6.45 feddans with a rise in the cost of credit. At an interest rate of 50% per annum, the land to be cultivated with cotton would be 1% less than the area currently

Table 8-13.

Variation in Land Use(i) with Initial Cash in Hand and Cost of Credit (in Feddans).

Initial Cash in Hand Ls.	Interest Rate per annum (%) 0	10	20	30	40	50
0	17.23	17.23	17.23	17.23	17.23	17.23
50	20.88	20.88	20.64	20.64	20.64	20.64
100	21.26	21.26	20.64	20.64	20.64	20.64
150	21.26	21.26	20.64	20.64	20.64	20.64
200	21.26	21.26	21.26	20.64	20.64	20.64
250	21.26	21.26	21.26	20.64	20.64	20.64
300	21.26	21.26	21.26	20.82	20.64	20.64
350	21.26	21.26	21.26	21.26	21.26	21.26
400	21.26	21.26	21.26	21.26	21.26	21.26
450	21.26	21.26	21.26	21.26	21.26	21.26
500	21.26	21.26	21.26	21.26	21.26	21.26

cultivated and nearly 27% less than the maximum of 8.86 feddans allowed in this rotation. Even at the extreme case of Ls.500 owned funds and free credit, still the area to be cultivated with cotton is 23% less than the maximum allowed by this rotation. This clearly indicates the insufficient incentive from present cotton prices.

The wheat feddanage would rise threefold to the maximum area permitted by the rotation at all levels of assets and interest rates. The advantages given by its low capital requirements and high productivity are suggested by the manner in which its patterns of water requirement supplement those of other crops. While the marginal productivity of land at different levels of owned funds and interest rate remained very low as shown in Table 8-14, October-November water had an extremely high marginal productivity (See Table 8-15).

(i) Actual land used = 16.34 feddans.

Table 8-14.

Variation in Marginal Productivity of land with Initial Cash in Hand and Annual Rate of Interest (in Ls.)

Initial Cash in Hand Ls.	Annual Rate of Interest (%) 0	10	20	30	40	50
0	2.32	2.24	2.14	2.06	1.99	1.92
50	0.34	0.34	0.36	0.39	0.41	0.44
100	0.31	0.33	0.36	0.39	0.41	0.44
150	0.31	0.33	0.35	0.38	0.40	0.42
200	0.31	0.33	0.34	0.35	0.37	0.38
250	0.30	0.32	0.33	0.35	0.37	0.38
300	0.30	0.31	0.33	0.33	0.34	0.34
350	0.30	0.31	0.32	0.32	0.32	0.32
400	0.30	0.31	0.32	0.32	0.32	0.32
450	0.30	0.31	0.32	0.32	0.32	0.32
500	0.30	0.30	0.31	0.31	0.31	0.31

Table 8-15.

Variation in Marginal Productivity of Water in October-November at different levels of owned funds and cost of credit (in Ls.)

Initial Cash in Hand Ls.	Annual Rate of Interest (%) 0	10	20	30	40	50
0	0	0	0	0	0	0
50	0.73	0.69	0.58	0.44	0.36	0.27
100	0.83	0.73	0.60	0.45	0.36	0.27
150	0.83	0.75	0.64	0.53	0.44	0.34
200	0.83	0.77	0.71	0.63	0.56	0.49
250	0.86	0.77	0.71	0.63	0.56	0.49
300	0.86	0.78	0.72	0.68	0.67	0.62
350	0.86	0.78	0.77	0.76	0.77	0.76
400	0.86	0.79	0.77	0.77	0.77	0.76
450	0.86	0.81	0.78	0.77	0.77	0.76
500	0.86	0.82	0.79	0.78	0.77	0.77

The area under forage and the number of livestock both increases at high charges for credit due to lack of liquidity, Livestock are less profitable than other crops but sales of milk and livestock provide cash and thus relax the working capital constraint. At low interest rates, of course, this shortage is not important. The area under dura remained at the minimum of 1.42 feddans prescribed for family subsistence as can be seen from Figure 8-1.

8.3.3. Labour Use:

The labour to be used under the normative situation is similar to that used at the present time except when in the situation with no owned funds, marginal productivity of labour then falls to zero because working capital becomes the most important constraint resulting in less use of the available land and hence less demand for labour.

Comparing the actual and normative situations at an initial cash in hand of Ls.50, Table 8-16 shows that there is no variation in total labour used.

Table 8-16.

Comparison of actual and normative total labour used by source at same level of owned funds and different rates of interest (in man-hour equivalents)

Actual Situation	Normative Situation Interest rate per annum %					
	0	10	20	30	40	50
Family Labour used	607.04	2527.80	2527.80	2485.95	2489.95	2489.95	2489.95
Hired Labour used	2250.84	359.74	359.74	331.57	331.57	331.57	331.57
Total Labour used	2887.54	2887.54	2887.54	2817.52	2817.52	2817.52	2817.52

Family labour, as was mentioned earlier, is greatly under-utilized at the present time. As much as a quarter of the increase in income would be due the less hired labour used.

The considerable increase in mechanization has not displaced labour when the total labour required is considered. However, because labour is time specific, increased mechanization will replace more of the labour at cultivation time in the first quarter of the year resulting in seasonal underemployment. This would have a social cost to the community but is on a very minor scale as shown in Figure 8-2.

8-4. Level of Interest Rate:

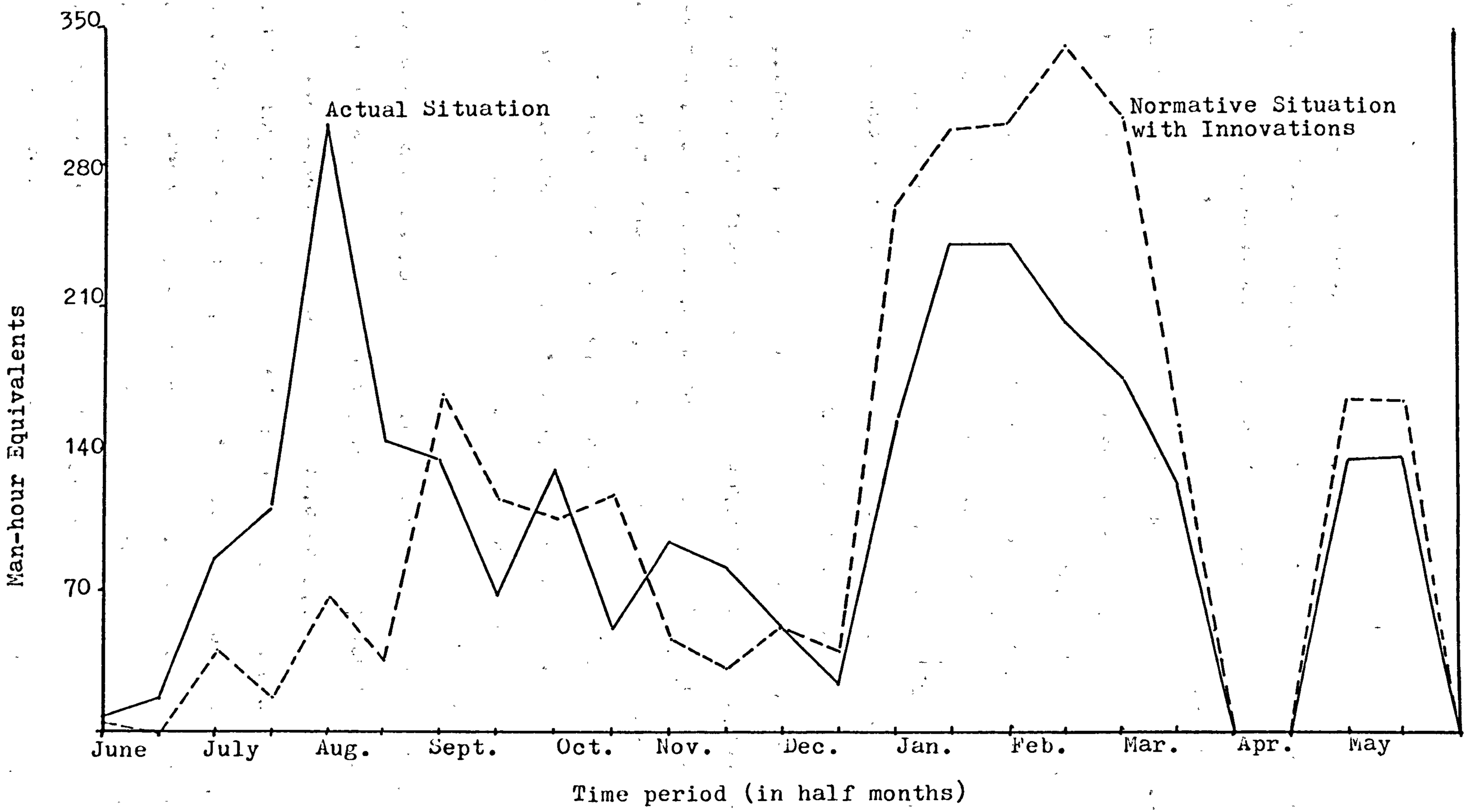
In this section, an attempt will be made to calculate the maximum rate of interest which would still leave farmers a certain postulated level of income after they had adopted the proposed innovations. This raises the question of whether subsidised or fully priced credit should be provided and the profitability of the innovations the tenant farmers would sacrifice if costly credit is made available. Other questions which the proven innovations and availability of more working capital would bring about on the cropping pattern and the present structural organization of the Gezira Scheme will be discussed in the final section. Selection of interest rate is made by imposing the target income on the net revenue curves obtained under different combinations of assets and interest rates.

Target Income:

An important goal of the tenant farmers in the Gezira Scheme shown by production response and attitude tests referred to in Section 8-2, is to increase farm income in order to raise standards of living and earn a surplus over current needs for investment in production.

Figure 8-2

Labour Profiles under the Actual and Normative Situations Following Adoption of Innovations



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Based on the average urban white collar income of Ls.40 per month, an annual income of Ls.480 is postulated for the average farmer in this group. This level of income is considered sufficiently attractive to raise the tenants' interest in his farming activities because, firstly, it is higher than the actual income at the present time and secondly, it is still higher than the real income of his counterpart in the urban sector after allowing for the higher urban cost of living. Based on the variation in living expenses, the target income for other farm groups can be adjusted.

The maximum rate of interest to be charged would be the one at which the income of the tenant, given his present level of liquid assets, is at least equal to the target income. At this high level of income the marginal farmer would accumulate capital in the long-run, and his capital might grow beyond the level needed to complement other Gezira resources. At that stage capital would have to be allocated according to priorities that give the highest social returns.

The level of income of Ls.480 per annum, as can be seen from Figure 8-1, can be achieved by different combinations of interest rate and initial cash in hand. For zero assets, a maximum rate of interest of 40% per annum would be charged. At rates higher than 40% per annum, Ls.50 cash in hand would be needed.

Having arbitrary discrete points, at an interest rate of 50% per annum (the maximum rate of interest used in our calculations), the tenant income would be Ls.475 and Ls.579, for zero and Ls.50 cash in hand respectively. Since an average tenant farmer in this group possesses Ls.7.19 cash in hand at the present time, then the maximum rate of interest he can afford to pay in order to

attain the target income of Ls.480 would be 50% per annum. With the tenant farmers in this group being the poorest and representing more than half the total population, the other six groups would be well placed if this group were catered for.

The high rate of interest of 50% per annum, as can be seen from Figure 8-1, would still enable the tenant farmer with his present liquid asset position, to make use of most of the promising innovations. Compared to the situation when credit was made available at no cost, the fall in income due to the opportunities foregone when credit at 50% per annum was available would only be Ls.11.78, the rest, ie. Ls.97.17, was due to the high interest charges. The sacrificed high yielding opportunities were cotton, livestock and fodder. Cotton area would fall by 4% and the area under fodder by 19% causing a fall in the number of livestock by 4.08 cow equivalents ie. 66%. Instead, the tenant farmer would cultivate more groundnuts which would be harvested early and relieve the tenant farmer's lack of liquidity. The area under groundnuts would rise by nearly one third of that when credit at no cost or highly subsidised price was made available as can be seen from Table 8-17.

Although the analysis did not go beyond an annual rate of interest of 50%, it may be inferred that the tenants might have little incentive to adopt the proven innovation at the present shail merchants' average rate of interest of 700% per annum. At this rate of 50% per annum compared to the shail merchants actual charge, the tenant farmers would have more incentive to adopt the proven innovations and increase their farm income. This in part justifies the charge of this low rate of interest. Another justification also comes from the decline in lending costs with

economic growth resulting from the adoption of innovations. All administrative charges, risk premia and opportunity cost of money would certainly be reduced. Savings in administration, as shown by our regression analysis in Chapter 6, would result from the increase in the size of loans. The premia for risk, on the other hand, fall with high productivity because, with the tenants' net income equal to or greater than the target income, there would be no reason, apart from unexpected exogenous factors like weather, illness and pests for default to occur. Again higher productivity would increase economic growth and open new avenues for investment. Seasonally loaned funds would lie idle for shorter periods, thus reducing the pure rate of interest. Evidence gathered from India and Latin America also shows a reduction in the cost of lending following the technological breakthrough.

Table 6-17

Comparison of Area under each crop at different rates of interest and Is.50 Cash in Hand.

Area under each crop in feddans	Interest Rate 10	10 - 30	30 - 50
Cotton	5.59	5.45	6.45
Wheat	7.45	7.45	7.45
Groundnuts	1.95	2.59	2.59
Dura	1.42	1.42	1.42
Lubia	3.11	2.73	2.73
Phillipesara	0.25		
Livestock (In cow equivalents)	6.21	5.46	2.13

However, this interest of 50% per annum far exceeds the charges of the institutional credit sources in Sudan and other developing countries. The average rate of interest of the commercial banks in Sudan is 12% per annum, that of the Agricultural Bank is 9% per annum and the opportunity cost of money as reflected by the interest charged by the Central Bank on Government Bonds and bills of discount is only 7% per annum. The World Bank also estimated the real cost of lending of an efficient rural credit institutional source in developing countries to be between 24% and 25% per annum. Given the full use the tenant farmers would make of the proven innovations with the availability of credit at 50% per annum, the considerable increase in tenants' income and the rising demand for working capital following adoption of innovations, grants and other highly subsidised loans are not required. Also given the Sudan's scarce capital resource, there is a strong case for providing credit on terms that reflect their true opportunity cost. The aggregate credit requirement of the Gezira tenant farmers would rise from the Is.28 millions at the present time to nearly Is.70 millions in the early years following the adoption of innovations. With this considerable increase in the demand for loanable funds, credit should be provided at realistic rates of interest because firstly, these terms would stimulatemore private savings in addition to Government savings; secondly they open up the possibility of using funds from the commercial sources thus expanding credit without much call on Government funds and thirdly, help break down the dualism in the rural credit market and accelerate the mobilization of agricultural resources.

Extension services:

With the adoption of these innovations, as stated earlier, the demand for credit would rise greatly. However, without education and effective extension, adoption would be slow until the demonstration effect could operate. Unfortunately, no efforts have been made to strengthen the extension services and this, besides the high cost of credit and the small proportion of final returns accruing to the tenant farmer, have deprived him of the production incentive to use these potentialities before. Considerable increase in income was obtained by Wadel Naem tenants after adopting innovations basically because of their better education, longer and more varied experience and effective advisory system. Rich tenants in other parts of the Scheme have also gained from the work at Wadel Naem. This is mainly due to the demonstration effect which, as was stated earlier, is a slow process.

Extension services would be essential if these innovations are to be adopted. The establishment of effective extension services needs more capital, especially at the early stages, but this might not be the case in the Gezira Scheme if certain improvements are made to the present organization of the Scheme as will be argued in the next chapter.

8.5. Possibilities of Diversification of Cropping Patterns within the Gezira Scheme:

The primary consideration in the Gezira Scheme has always been the welfare of the cotton crop. The calculations in this chapter were also based on a rotation that favours more cotton than at the present time with the maximum area allowed under cotton raised from 25% to 31.25% of the cultivable land. In this

way, as was stated earlier, any area under cotton less than the maximum allowed would provide a prima facie case for considering alternative crop patterns. The analyses clearly indicate the need for changing the cropping in order to achieve higher profits. The results obtained also indicate the need and urgency for diversifying the cropping pattern within the Gezira Scheme. This need is brought about by:

1. Water shortage
2. The heavy burden on foreign exchange due to increase in mechanization
3. The location of consumer markets.

The extremely high marginal productivity of water in October-November indicates the urgency for diversifying cropping pattern within the scheme. It also calls for further investigation and continued agronomic research to avoid competition at this critical period.

Considering the balance between manual labour and mechanical power, our calculations showed that mechanization would not affect labour requirement following the adoption of farm improvements. Decreases in the first quarter of the year (June-September) are offset by a marked increase in labour requirements during the groundnut harvesting and cotton picking season from December to April, as can be seen from Figure 8.2. The actual results obtained at Wadel Naeem, as stated by Thornton (1972), confirm this finding.

On the average, the calculations showed that one tractor per 10 farms and one combine per 60 farms would be needed. This would give an aggregate requirement of nine thousand tractors and 1500 combine harvesters. Both these totals are

nearly twice the number available at the present tine and scarce foreign currency would be required. The calculations in this chapter were based on the agronomic research finding and the performance of these innovations in W/N V.F.E. Further consideration of these innovations in different parts of the Scheme and the diversification of cropping patterns within the Scheme would extend the working season of machines and reduce their number. The present system followed by the private contractors in transferring their combine harvesters for dura harvesting in the mechanised crop production scheme after dura harvesting in the Gezira scheme, supports this recommendation. Further agronomic research and variation in cropping patterns between localities would increase the efficiency of machines' use, reduce the burden on foreign exchange and reduce the cost to the tenant farmers by utilization nearer capacity.

Other reasons for considering variation in cropping patterns, listed by Thornton (1972) arise from the tendency for the markets for Gezira's products to change relatively and from location of consumer markets, particularly for fodder, milk and vegetables. The variation in crop yields in the different localities could provide the basis for diversification of cropping patterns within the Scheme. Based on cotton yield, Thornton (1953) and (1972) suggested the concentration of cotton in the South and South-Centre of the Scheme and argued that cotton growing in other parts of the Scheme might not be worthwhile.

The investigation in this chapter has showed the considerable unrealised economic opportunities open to the Gezira tenants to increase their farm incomes and the need for regional differentiation in cropping patterns according to opportunities in each

region. It also estimated the increase in working capital which would be needed to make full use of these innovations and the maximum rate of interest the tenant farmer can afford to pay in order to attain a specified target income. However, the corresponding capital requirements cannot be handled by the present division in the rural credit market. The failure of the SGB in meeting the credit requirements of the tenant farmers and in increasing their awareness of the profitable opportunities on crops other than cotton, in addition to the highly centralized bureaucratic structure of the SGB, make it ill-suited for properly meeting this rising demand for loanable funds. The funds of the shail merchants, on the other hand, are too low to meet this demand and their profits from their owned funds would certainly be reduced at the annual cost of lending of 50%. With these incapabilities of the dual credit market and the need for a proper credit delivery mechanism and assured market outlets, institutional change would be needed. The next chapter elaborates on the appropriate credit market structures and the necessary policy guidelines.

Chapter IX

Towards a Unified Rural Credit Market

9.1. Setting

The question of the most appropriate channel to provide the small farmers with the necessary credit for development and to assure repayment of institutional funds has preoccupied the Government of less Developing Countries (LDCs) and other international organisations since the early 1950s. In the Gezira Scheme, new institutional channels like the ABS and the Co-operative Societies, were tried and their procedures modified for nearly two decades. The performance of these institutions, as was mentioned earlier, is very disappointing. Among all these credit structures, only the SGB credit system proved successful, though it was often subject to political interference. However, the success it achieved was only made possible by the close integration of its credit activities with cotton production and marketing and by the fact that cotton always needs processing before sale. With its present credit policy adapted only to annual agricultural expenditure in cotton and wheat, the SGB neglected the tenants other credit requirements. This had led to the development of a private rural credit market dominated by the shail merchants. These, as was seen earlier, exploited the situation by charging exorbitant rates of interest.

With the considerable opportunities to increase farm income by the adoption of proven innovation, as our calculations showed, the need arises for developing institutional farms which encourage provision of capital in the way implied by these opportunities and satisfy the increased demand for capital and encourage capital movement at the right time and in the right quantities. In view

the shail merchants' locally monopolistic position which made it difficult to replace them by an organized agency and their obvious advantages over the more bureaucratic alternatives, it is seen desirable to make use of these marketeers and other locally based institution in any credit structure for the Gezira Scheme. This is also considered necessary in order to avoid creation of institutional forms alien to the Gezira farming community and avoid non-essential adjustments to the social system.

This chapter draws upon the experience of credit structure in the Gezira Scheme and other developing countries to arrive at some suggestions for alternative institutional farms in the Gezira which make use of the shail merchants and other locally based institution, like the village councils, created to help the SGB supervisory staff. The discussion in this chapter falls in three sections, starting with a comparative literature review of some LDC credit structures in order to learn from their experience. In the second section, our proposed credit and market structure will be described. This new structure will, however, have various implications for the re-organisation of the present institutions, for the links between the organized and informal sectors of the economy and for the development of local institutions. These implications will be the subject of our final section.

9.2. Credit Structures in the LDCs:

Agricultural credit is often considered the key element in the modernization of agriculture because it can remove the existing financial constraints which either prevent or retard the adoption of new technologies. The role of agricultural credit, particularly after the technological breakthrough in the agriculture of most of LDCs in the 1950s, has shifted the emphasis of most LDC Governments

from providing credit to replace the informal sources and hence rescue the poor farmers from their exploitation to provision of credit to increase farm output. Accordingly these Governments exhibited general concern about increasing and improving their institutional agricultural credit. This resulted in the development of different credit channels like Specialised Agricultural and Development Banks, Special Crop and Project Authorities (SCPA) like the SGB in Sudan, Centre National de Promotion des Enterprises Cooperatives (CENAPEC) in the Ivory Coast, the Tea Development Authority in Kenya (KTDA), the Casamance Project in Senegal, the Tea Projects in Malawi and Mauritius and the Tobacco Companies in Urguay(i), the encouragement of the Commercial Banks whether private or nationalized, to finance agriculture and the establishment of Farm Groupings and Cooperative Societies.

Although the available evidence suggests that institutional credit is growing rapidly, the non-institutional credit sources still dominate the rural credit market in most of the LDCs. In 1973, for example, the outstanding institutional loans to agriculture in these countries were estimated by the World Bank to be about $15 billions. The total outstanding agricultural credit in these countries is not known, but it is believed that the bulk of it originates in the informal sector and may be not less than five times the estimated outstanding institutional credit. In Sudan, the total number of farmers obtaining credit from institutional sources is about one per cent only. The coverage of institutional credit in Latin America and Asia is about 15% while in China (Taiwan) nearly all farmers have access to institutional credit.

(i) See the World Bank Report (1974)

In spite of these renewed attempts by the Governments of the LDCs to expand institutional agricultural credit, the performance of most of the institutional credit structures entrusted with the task, is poor. Excluding co-operative societies for the time being, the failure of most of the other institutional structures was attributed to their highly centralised bureaucratic structure which make them ill-suited for lending to large numbers of highly dispersed small farmers. Their top heavy headquarter operation is also often combined with a field staff thinly spread over wide areas and unable to provide adequate local supervision. These institutions also lost out in not knowing their clientele, and being unable to evaluate the viability of investment possibilities. They were unable to supervise loans that had been disbursed or to enforce repayment except through the cumbersome machinery of legal sanctions. Experience with the Agricultural Bank of Sudan (ABS) and the National Agricultural Credit Corporation (NACC) in Kenya(i) has shown that farmers receiving loans are, in most cases, not visited at all unless when repayment is badly in arrears.

Excessive centralization has often resulted in an inability to adjust programmes to local conditions, in political interference, and in an increase in the cost of administration. With these drawbacks, most of the institutional credit sources tended to favour the most wealthy farmers, although their original purpose was often directed more towards the small farmers. According to the world Bank, the small 60% of farmers in Pakistan got only 3% of the institutional credit in 1973. In

(i) See Hoyer (1973)

Bangladesh, few farmers have more than three acres and yet these capture more than 80% of the loans from the Agricultural Bank and Cooperative Banking system. In the Phillipines, 27% of the large farmers handle 61% of the land and capture 98% of the institutional credit. According to Ling (1976), "Adams (1971) reported that in Latin America government credit programme tended to serve the elites. In Batswana (Garrison 1967) those farmers with most assets received most credit. In Kenya (Von Fischke, 1973) most of the credit went to large farmers while in Malawi (Alexander and Scott, 1974) the beneficiaries of the group credit programme were older and wealthier farmers." The experience of other developing countries like Thailand, Tunisia, Bolivia, Colombia, and others reveals that the main beneficiaries of the Institutional credit are the large farmers. This bias towards the large farmers has often necessitated a change or enforcement of certain criteria in the distribution of loans to the small farmers. To qualify for a loan from the ABS in the Mechanised Crop Production Schemes of the Sudan, the farmer must be cultivating not less than one thousand feddans. In Kenya, as stated by Heyer (1973), the NACC criteria for rationing credit suggest that loans are more likely to be given to people with regular off-farm incomes ie. those who only farm part-time, have adequate resources and with established reputation as good farmers and men of integrity.

Even with their bias to the large farmers, these institutional credit sources suffered severely from a high rate of default arising from unwillingness to repay. Some of the Government credit agencies in Brazil have, however, succeeded in achieving repayment records of more than 90%. But this was mainly due to

the heavily subsidised farm credit at a time when inflation ran at about 100 percent per annum. To reduce their administrative costs these institutions tend to lend only to the small groups of big farmers. In 1969, according to the World Bank (1974), while about 78% and 89% of the total credit requirements of the medium (31-200 hectars) and the large farmers (Over 201 hectars) respectively was obtained from institutional sources, the small farmers with less than 30 hectars received only 38% of their total credit requirements in this way. Adams (1974) reported that, in 1973, three percent of the farmers obtained more than one third of the total institutional credit.

To overcome the problem of excessive centralization and to promote the integration of the dual credit markets in the agricultural sector, many of the LDCs have looked to the establishment of co-operative societies. Conceptually, co-operatives for final credit delivery represent a form of organization which embodies decentralization of control and decision making and incorporates local knowledge and responsibilities. Group responsibility for repayment reduces default while such a grouping raises the size of loans and thus reduces administrative cost. Unfortunately, this idealistic picture of co-operative societies proved to be unworkable in most of the LDCs.

According to the World Bank (1974), the co-operative societies in Egypt, Korea, Vietnam and Israel often cited in the literature as cases of success, differ in essential respects from the real co-operative principles. While those in Israel are characterised by their heavy dependence on external funds, those in Korea and Vietnam were successful because they are centrally planned. The lower degree of success in Egypt was achieved when

the tendency of the Government in the 1960s was to follow a central planning approach. This greater degree of centralization has however, made these co-operative societies suffer from the same problems which the specialised banks encountered and thus defeats their own objectives. Another example of co-operative societies, the performance of which is considered satisfactory by the World Bank and the F.A.O., include the co-operative societies in India. However, the annual audit classification, as Subratka (1972) reported, revealed the very slow progress these co-operative societies achieved and showed that for 12 years, 1956/57 - 1967/68, the number of co-operative societies in each group remained, more or less, the same over this period.

The experience of most of the LDCs with co-operative societies has been discouraging in terms of high administration costs, default, inadequate and untimely services and high centralization. Besides the administrative and institutional problems, the difficulties of sustaining co-operative societies in the Gezira scheme stems basically from the strength of the private sector. The agricultural credit and groundnut marketing co-operative societies in the Gezira were captured by the well-to-do. The wealthy farmers who are often the local leaders have discouraged the growth of these co-operative societies to preserve their own vested interests. In Northern Nigeria as noted by King (1970), "The Co-operatives represented the wealthy groups in village society but not to a uniform extent. In traditional villages, co-operatives were centred around traditional leaders where these were strong. In more urbanised and commercialised settlements, traders led the co-operatives and the co-operative personality reflected the personality of the leaders who initiated

the group."

The main successful institutional credit structures in the LDCs, particularly in Africa and some parts of Latin America are the SCPAs. These authorities were set up to develop production of specific cash crops and have generally established units to look after agricultural credit. They have achieved close integration of credit operations with production and marketing and ensured satisfactory repayment performance. Another reason for the success of these authorities is the combination in one agency of credit, mostly given in kind rather than cash, and the marketing of the produce. This became possible, as stated earlier, because of the nature of the crops they handle in that they always require processing before sale. The SGB credit system for cotton and wheat proved to be successful, with the Board providing credit and controlling the disposal of the cotton crop and marketing part of the wheat crop. It was also successful in securing repayment by deducting its loans from the final value of sales. The KTDA in one year, 1968/69, as stated by Heyer (1973), covered 51% of the total acreage with loans in kind and succeeded in collecting all its debts through 20% deductions on net payments from the green leaves. Farmer's average income rose to about one thousand East African Shillings, which was over the postulated target income. With the CENAPEC, credit for cocoa is only granted when a group of about ten farmers present a contract for selling their crop to an 'expert house' which is often entrusted with deducting the principal and interest from the net value of the borrower's crop.

The above examples show that the SCPAs are either government departments, public boards or statutory corporations with funds

set by special acts or companies under special legislation and this often made them liable to political interference. Also these authorities are only concerned with cash crops and in none of the examples cited, were the farmers' other credit requirements satisfied.

9.3. Proposed Agricultural Credit Structure for the Gezira Scheme

9.3.1. Introduction:

It appears from the foregoing discussion that, despite a number of attempts made by the Governments of LDCs to provide an institutional basis for credit, almost nowhere was an appropriate credit structure developed. Again, in their trials with different structures, these governments deliberately neglected the locally based institutions, though indirectly acknowledging their quite extensive activities in channelling funds from those who do have them to those who need them. In Northern Nigeria where co-operative societies were established, King (1976) reported that, "All new behaviour (implied in co-operative societies) which was not absolutely essential for satisfying the effective desires was not adopted. Instead old behavioural norms are adapted to the new functions. Timing of loans and size of loans came to reflect the nature of loans provided by existing village institutions - an attempt to give loans in instalments was fiercely resisted. Repayment made use of the status and role personified in the village leaders and ignored the procedures contained in the regulations." King (1976) concluded that "it would have been better if the institutional policy had suggested this simplified form at the outset. Government resources would have been saved and government and farmers would have had a greater unity of interest." The co-operative societies in the Gezira Scheme had

passed through the same experience and in less than ten years, all failed due to favouritism, corruption and perversion by the wealthy groups and poor repayment record. The operations of the two credit sources available were seen to have retarded agricultural development, the SGB by confining its activities to certain crops and by depressing the tenant's price for his cotton, and informal credit sources by exploiting the tenant farmer and absorbing the remainder of his marketable surplus through the charge of exorbitant rates of interest. However, in spite of the SGB and shail merchants' defects, it would, nevertheless, be unwise to disperse with their particular strengths and deny ourselves their obvious advantages. The SGB, the most well established institution, also has the advantage of being accepted by the tenants as an authority to be obeyed and as an institution through which the Government can intervene to alter economic opportunities through extension policies, price and infra-structural policies, land and water policies and guard of rotations. The shail merchants, on the other hand, have substantial advantages which the institutional credit sources lack. These include (a) the easy access to information about the integrity of the borrower's circumstances and the potential repayment capacity of the investment (b) simplicity and flexibility which eases access to credit (c) repayment schedule compatible with crop harvest and hence cash flows (d) strong social sanctions, when borrowers are able but unwilling to repay. The sanctions go beyond those of a well-developed credit structure in which defaulters are excluded from further credit, thus assuring the continuity of the credit programme. In addition to strong sanctions, their credit activities are sufficiently

flexible in genuine repayment difficulties. Furthermore, the experience of both SGB and shail merchants demonstrates the great success to be achieved by integrating the credit and marketing activities of an organization.

In addition to providing a proper delivery mechanism, the institutionalisation of the shail merchants activities by developing linkages between them and the SGB is considered necessary to (a) avoid the creation of institutions alien to the farming community which would take a long time to adapt to local conditions and would take the farmers a long time to accept (b) avoid breaking down the present credit, marketing and social system with its numerous advantages (c) make use of the available manpower without requiring additional staff and equipment and (d) promote the commercialisation of agriculture.

Our discussion in this section elaborates on the possibilities of accommodating the shail merchants in the institutional agricultural credit hierarchy in the Gezira Scheme and unite the efforts of the locally based institutions with the Government Authority (ie. SGB) to improve the economic, social and cultural conditions of the Gezira communities and enable them to contribute fully to national progress.

9.3.2. Features of the Proposed Credit Structure:

The proposed credit structure, shown in Figure 9-1, rests on three pillars represented by the Sudan Government, the SGB and the shail merchants.The activities of these partners are summarized below:

9.3.2.1. Proposed Activities of the Sudan Government:

These include the basic strategic operations of mobilizing indigenous and foreign sources of finance and allocating

funds between the different regions and sectors of the economy. In the proposed Gezira Scheme, the Government would provide funds to enable the SCB to conduct its operations and supplement the shail merchants funds. Interest on such loans would be paid by the SCB as at the present time. In addition the Government would provide the necessary funds for education and extension, transport, warehouses and other infrastructures. These loans would be substantial in the initial stages, but their value would decline over time as the farmers' awareness of the promising innovations increased. The Government would also continue to provide land and water.

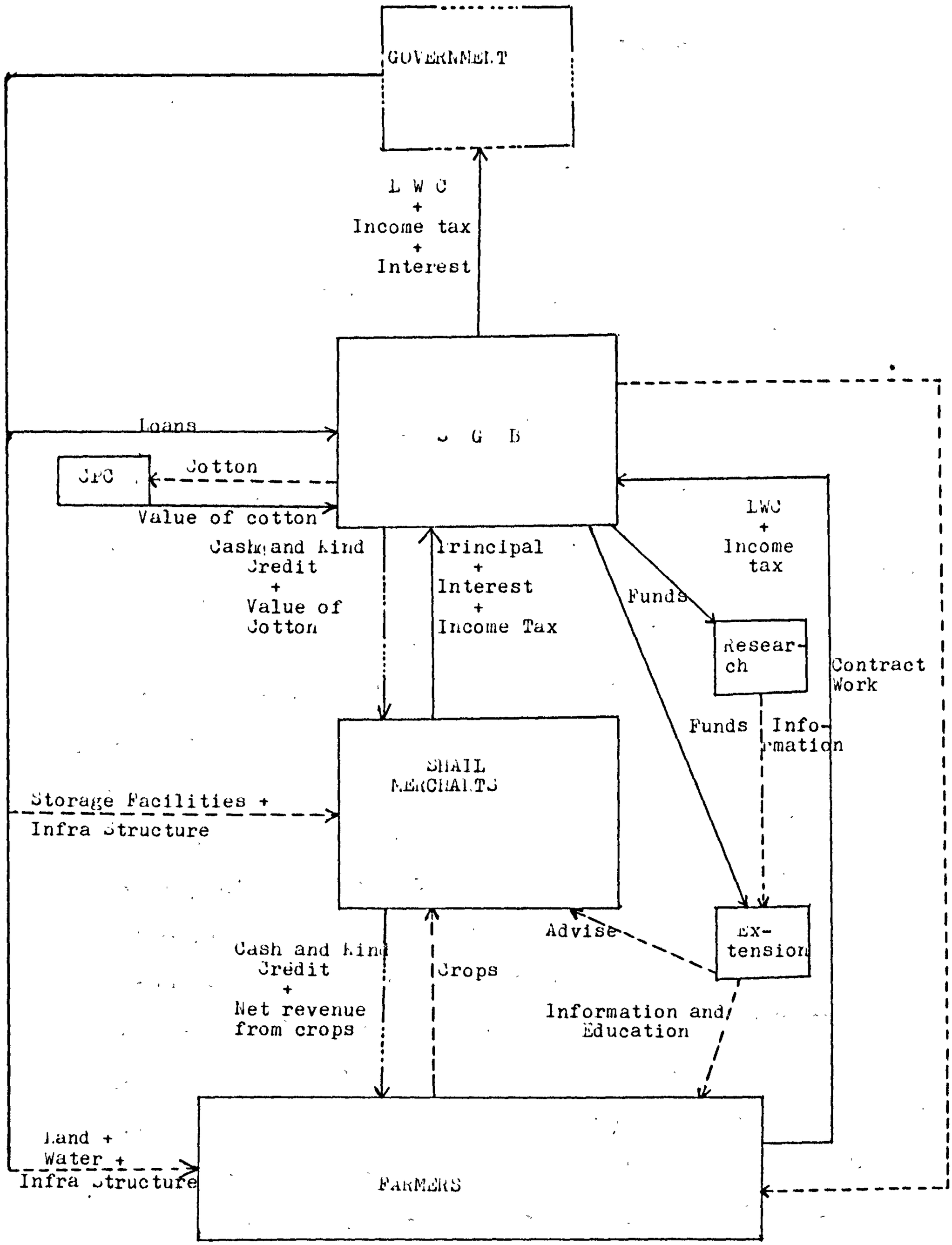
..?.?. Proposed Activities of the SCB:

The SCB would act both as a commercial enterprise and as a representative of the Government thus paving the way for Government intervention. Because of the irrigated nature of farming, the centralization for the responsibilities of general planning and supervision, cannot be dispensed with. On the other hand, decentralization for local implementation would be needed to promote the integration of the community with the central management.

At the level of the whole scheme, the SCB would provide the central management and retain all its current functions including the provision of the necessary inputs. It would maintain its contacts with the companies and agencies supplying such inputs as fertilizers, spraying, sacks, etc., contribute to research funds and continue with its seed farm for the propagation and multiplication of seeds, perform the contract work on all crops and collect, process and transport the cotton crop. The SCB would also organize and administer the extension service, finance

Figure 9-1

Proposed Credit Structure for the Gezira Scheme



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and organize pilot projects, develop new rotations in the different localities and organize the land and water policies to suit different rotations and economic opportunities. In addition to organizing the production programme, the SCB will also organise the credit programe.

At the locality level, the SCB would provide resident extension agents, manager, an accountant and clerk in each block and marketing officers at the present administrative group level.

Function of the Extension Agents:

Due to the large area and scattered villages within each block, extension agents could be appointed at the block level and follow 'group action' in education and dissemination of information. Besides these activities and maintaining the good relations with the farmers, extension agents should not be involved in credit issues apart from informal advise to shail merchants and block manager about the viability of the farmers' enterprise. The qualified field inspectors in the present structural organisation of the Gezira Scheme would form the nucleus of this extension service. For less qualified field inspectors, a programme had already started in the Department of Extra Mural Studies in the University of Khartoum, to train them in community development and social work. This plus their experience in farming would give them the necessary qualification to advise the tenant farmers and command their respect. This would provide an effective extension service without call on additional staff by re-orientating the activities of these inspectors from cotton supervision to extension. The re-orientation of this staff would, however, have no harmful effect on production because, as stated by Simpson (1970), supervision after half a century of cotton growing would not be

needed and the tenant farmers are quite capable of running their own affairs.

Functions of the Block Manager:

The SCB would also appoint a Block Manager and give him the responsibility for all decisions together with the village council. The job can be filled by the present Block Inspectors and the links between these inspectors and the present village councils (composed of the leaders of the villages) are already well established.

The manager's main task would be to provide the necessary liaison between the SCB and shail merchants, supervise and regulate the shail merchants' activities making use of the records maintained by the present clerical staff working under him and the present village councils and also making use of the extension agents in guarding the rotation.

The Block Manager and clerical staff would also be responsible for calculating and collecting the land and water charge and income tax from the tenant farmers and shail merchants and hand them to the Government through the SCB. These two measures forming the Government revenue from the Gezira Scheme will further be discussed in Section 9.4.1.2.

All kind credit (excluding contract work) and extra funds would be provided by the SCB and handled to the farmers through the shail merchants. The shail merchants would obtain the SCB credit from the Block Manager who would also have full authority to issue cash loans to the shail merchants in order to avoid damaging delay. Credit from SCB to shail merchants would be provided at an annual cost of 20% per annum to cover opportunity cost and the SCB cost of administrating the credit programme.

The shail merchants should be allowed to develop their own procedures for re-distribution and collection of loans because it is for their obvious advantages in this area that the need arose for accommodating them in the SCB credit system.

The relationship between the office staff and the shail merchants depends upon mutual trust. The shail merchant should be required to maintain records about the loans extended to farmers and crops received from farmers and should also be required to present these records to the office staff at any time when required for checking and auditing. In spite of anager's checking, the shail merchants might refuse credit to certain farmers and might exaggerate their requirement for cash from the Block Office to finance the farmers, since the Manager cannot know when the merchant's funds fall short of demand. Also the shail merchants might stand to lose in the case of deliberate default, however, there are means within the present organization of the Gezira Scheme to guard against these excesses. The village councils, formed of the leaders of each village, already help the Block Inspectors in the appointment of Sub-inspectors (Sumads) and help the Department of Social Development in social welfare and development of services like clinics, schools and provision of water for domestic use. They also look after the village garden for fruit production for local use and offer the inspectors invaluable help in administration. Being members of the village, the members of the village council naturally know more about the merchants than the SCB and can exert strong pressure on shail merchants if they refused to grant a loan. Also being the leaders of the village, they can exert undue pressure on the farmer if he was unwilling to repay. If this pressure were not

sufficient, the manager would have authority to delete the merchant from the credit agent's lists and thus deprive him of the credit and other services provided by the SCB. The Manager would also have authority to terminate farm tenancies in the case of deliberate default. The checking by the office staff of the shail merchants record would also prevent the shail merchants from charging too high a rate of interest. Another advantage to be gained from the village council would be in the distribution of cash loans. Full use, as stated earlier, would be made of the shail merchants' knowledge and talent in the advance of cash loans and the manager would provide the necessary reserves as soon as the shail merchants' funds ran short. Part of these cash loans would be used for production but a good proportion would be used for consumption, social and welfare activities to improve human resources and increase productive capacity in the long run. Since the members of the village council are already entrusted with social and welfare activities, their participation in the credit programme would help the shail merchants in assessing farmers' needs in the unlikely case of the shail merchants failing to appreciate them.

Functions of the Marketing Officer:

The shail merchants, as noted earlier, are primarily marketing agents with their credit activities disguised in and firmly linked to their marketing activities. In their capacity as traders, the shail merchants may fix prices for the farmer's produce far below the market price or may act (due to their implicit collusion) in a way that will prevent information about the market price from reaching the farmers. Since the tenant farmers, as stated earlier, respond favourably to price stimuli,

such malpractices of the snail merchants in the marketing front, might impede the farmers response in adopting the new innovations and thus hamper economic growth. To guard against these malpractices, a marketing officer would be appointed in each group to provide the necessary check on prices and report to the Block Managers. The Marketing Officer would also help the snail merchants with market intelligence, advise them and help them in negotiating contracts with the export agencies and other big buyers and make arrangements for the snail merchants to use the SGB light railway line in transport of crops and the warehouses for storage.

As regards the cotton crop, the SGB would assume its current responsibilities of collecting, processing and transporting the crop to Port Sudan and the marketing of this crop would continue to be the responsibility of the Cotton Public Corporation (CPC). This would deduct its fees and those of the exporting companies and hand over the balance to the SGB which would distribute it to the different blocks depending on the yield and grade of cotton obtained by the farmers in each block. Thereafter it would be the responsibility of the Block Manager and his clerks to calculate the loan and interest for the SGB, the interest for the snail merchants and the tenants' share. These payments should be made immediately after ginning and classification of the cotton crop using Government funds and based on an estimated price provided by the CPC. After deducting the interest on these loans obtained from the Government, the balance should be paid as soon as final sale prices are known.

9.3.2.2. Proposed Activities of Shail Merchants:

The shail merchants would be entrusted with the day-to-day issues relating to the distribution of kind credit in the form of seeds, fertilizers and bags to be obtained from the block store and the distribution of cash loans using their own funds and supplemented by cash from the SCB. The shail merchants would also be responsible for the collection and marketing of crops other than cotton and guidance in marketing must be provided by the Government when needed. By their new role of the distribution of inputs, the shail merchants would replace the Samads and economise on the present staff. The Samads who are already tenant farmers would be absorbed quickly in full-timing and since the income to be earned from farming would increase with the adoption of innovations, their need to supplement it from the SCB would diminish.

9.4. Implications of the Proposed Credit Structure:

9.4.1. Rewards to Shail Merchants, SCB and Sudan Government:

The success of the credit programme depends upon the borrowing groups having profitable opportunities to invest, prices giving adequate farm incentives and the credit programme well designed and administered. Our calculations in the previous chapter showed the considerable unforeseen economic opportunities the tenants have to increase their farm income and that with the adoption of innovations, the demand for working capital would increase. The integration of the shail merchants in the SCB hierarchy and the involvement of the village councils in the production and credit programmes of the SCB is seen essential to improve economic and cultural conditions of the Gezira farming community and promote the commercialization of agriculture without

antagonizing the present social system and beliefs. However, it is difficult to see how the essential changes in the present structural organization of the SGB (the Government Authority) taking place and the links between the shail merchants and the organized credit market growing without increasing the rewards to the SGB, shail merchants and the Sudan Government from their activities in the Gezira Scheme. These sub-sections discuss the rewards to these partners.

9.4.1.1. Shail Merchants Profits:

Loans from shail merchants at the present time are, in most cases, extended in cash and the shail merchants charge an average rate of interest of 700% per annum. Their present profits from total loans of Ls.49.15 extended to an average poor tenant farmer are Ls.14.75. Since the shail merchants funds are too low to meet the rising demand for loanable funds with the adoption of innovations, their profits at the low rate of interest of 50% per annum would certainly be reduced. Their integration in the SGB credit system would, however, increase the scale of their activities and increase their profits.

All credit, as was stated earlier, would be provided at an annual cost of 50% to enable farmers to attain the postulated target income. Credit would be provided in kind whenever possible since it may be difficult for farmers who are not used to buying inputs to automatically adjust to making the necessary transactions. This will indirectly assure the best use of credit. The kind credit - excluding contract work - would be provided by the SGB to shail merchants for re-distribution to the farmers and the SGB undertakes to provide cash in the case of the shail merchants funds running short. These measures would increase the volume of

the shail merchants' activities, assure the availability of inputs and increase the farmers' awareness of the profitable opportunities.

Since most of the credit is controlled by the SGB, it would need about 20% on funds it advances for on-lending to farmers leaving the shail merchants three fifths of the interest charge. With interest charges of about Ls.60 at 50% per annum (after allowing for interest on contract charges) following adoption of innovations, the shail merchant's income from lending to an average tenant farmer will be Ls.80 x 3/5 = Ls.48. Thus with the high demand for credit following the adoption of innovations and allowance made for the shail merchants to channel the SGB loanable funds, their profits as sole credit agents would more than double.

It is necessary for the SGB to charge about 20% per annum, which is higher than the 12% charged by commercial banks, in order to cover its costs arising from financing the shail merchants, controlling and regularizing their activities. The interest rate to be charged by an efficient rural institutional source was estimated by the World Bank (1974) to be between 24% and 26% per annum. However, with the day-to-day issues of loan distribution and collection performed by the shail merchants, the 20% charge per annum by the SGB is thought reasonable in the short run. In the long run, competition from commercial banks would lower the unit cost of lending.

9.4.1.2. Government Revenue:

Government Revenue from the Gezira Scheme has been questioned in the last few years as a result of the decline in cotton yields and quality and the tenants reduced interest in cultivating cotton due to their dissatisfaction with the present

cotton sharing system and the heavy direct and indirect levies on the cotton crop. The SGB administrators are also aware of the decline in cotton yields and quality and the available promising technological possibilities. However, their reluctance to change is due to two reasons, firstly, the pressure these technological possibilities will bring about on the present structural organization of the Gezira Scheme which Thornton (1972) described as being inappropriate in many respects, and secondly, the necessity to adopt new measures in order to assure the SGB and the Government of returns at least equal to their present reward from the cotton crop sharing system. With the technological breakthrough, there is ample justification for regional differentiation in cropping patterns according to opportunities. On the other hand, different systems were proposed in order to enable the Government to maintain its present revenue and advance the tenant's status as a farmer. Notable among these proposals is a land-water charge (LWC) scheme proposed initially by a Working Party (1960), the World Bank Mission and the Rahad and Rosseries Consultants(i). These proposals basically include (a) charging the tenants the cost of the collective services rendered then by the Government and the management; the value of all the schemes output over and above those costs solely accruing to the tenants and (b) an initial LWC assessment based on the present Government revenue under the existing sharing system. The World Bank Mission estimated that at an average cotton yield of 3.554 kantars per feddan (K.p.f.), its proposal of LWC of Ls.2.50 per irrigated feddan would leave the Government with the same revenue as under

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(i) See El Hassan, A.M. (1972) Cotton and the Sudan Economy. Ph.D. Thesis. Page 30-34.

the present sharing system. However, El Hassan (1972) argued that the introduction of a rental charge in Sudan's irrigated agriculture is almost certain to depress the Government relative income from the cotton crop and that, since the average cotton yield is already above the 3.554 K.p.f. incorporated in these proposals and would rise further in the future, the proposed system would mean that the Government share from cotton would fall progressively below that afforded by the present sharing system. The proposals also call for the Government to provide financial assistance in low income years to compensate the tenant farmer for any shortfall below the receipts obtainable from a minimal crop of 3 K.p.f. This emergency help from the Government would take the form of cash subsidies at a level to be determined by individual needs. El Hassan (1972) emphasised the point that since the tenant would be assured of Government relief in the event of low yields, this defeats the basic argument behind the LWC of increasing incentives to the tenant farmers and might tempt some of the tenants to sell some of their cotton crop to the neighbouring 'rich' farmers in order to qualify themselves for Government assistance.Also, since the Government relief will have to be provided from the LWC proceeds, this will reduce the Government revenue below that implied by the LWC and its 3.554 K.p.f. Further reduction would arise from the likely rise in the cost of services provided by the Government in the future and also the difficulty of assessing relief determined on such vague terms as 'individual needs'. Another criticism against the LWC is that it will leave the scheme's management without any income of their own and once again calls upon the Government to finance the cost of management.

These proposals concentrate on the static situation and are designed to give the Government a revenue from cotton. They also speak of the Gezira as a cotton producing scheme though most authorities argue that the Gezira should be thought of as an agricultural scheme with a production pattern designed to give the greatest social benefit. It is apparent that the Gezira Scheme has reached the limits of its horizontal expansion, that only vertical growth can be achieved stemming from the adoption of proven innovations and that with these opportunities for intensification, a change in the structure of the Gezira Scheme becomes necessary. With the importance of cotton reduced as shown by our calculations, the IMF proposal seems logical but it should be based on the actual cost of the services provided by the Government rather than on an average cotton yield. With the change in the structure of the Scheme, the SGB revenue would come from the services it provides for the farmers directly on a contract basis and through interest and the SGB would operate as a commercial enterprise. It is anticipated that the SGB share from lending alone (after paying 7% to the Government) would bring the SGB Ls.3 million or 80% of its present share in cotton proceeds.

On the other hand, with the adoption of innovations, farmers' incomes would rise and taxable surpluses would be generated despite the cynics. At the present time, direct tax is levied almost exclusively on the organized sector with the agriculturalists exempt. This policy ignores the disparities in income within the agricultural sector and directly benefits the wealthy who shelter behind the alleged poverty in agriculture. To be equitable and explicit, a progressive tax on incomes in excess of the postulated target income is considered necessary so that the wealthier rural

groups may contribute to government revenue according to their incomes. This income tax would be imposed on all sources of income, whether agricultural and non-agricultural. While this would have the advantage of taxing the shail merchants heavily, it would also form the basis of a tax policy for the whole country. With these two measures, the LWC and a progressive income tax, the share of the Government would be regulated and the great disparities in income would be reduced to a great extent.

The administration and collection costs on the agricultural and non-agricultural income, in the Gezira Scheme would be relatively easy because all records on farmers' income would be kept by the shail merchants and all records about the shail merchants activities would be checked by the SGB staff. This would make it easier to calculate both the amount of tax and the LWC at the block level.

9.4.2. Appropriate Forms of Village Saving Institutions

Credit and savings are inseparable programmes. Since savings facilitate capital accumulation, they directly compliment the credit policy in its attempt of promoting agricultural investment by increasing the financial supply to the farmers.

The present village savings arrangements are short term arrangements for accumulating funds for ceremonial occasions and other unexpected needs. The participants in the 'Sanding' (revolving credit) deposit their shares at certain specified times and the whole sum deposited jointly to one randomly selected participant every time. In case of urgent need, they normally agree to give the turn to the participant in desperate need and pass those entitled for the turn as determined by the

random selection. However due to the low level of surplus funds at the present time, the number of these savings institutions are very low but the system is widely accepted by the tenants. In view of the produce and money surpluses that would arise from the adoption of innovations and the relaxation of credit and other institutional constraints and also in view of the relatively high rate of interest compared to the commercial bank rates, savings would increase and the development of appropriate savings institutions would be needed.

The role of the banker as also noticed by King (1976) in Northern Nigeria, is the one which need to be introduced since all the tenants make expenditures at the beginning of the agricultural year. The banker would be a member of the revolving credit (Sandong) scheme and held responsible for collecting savings and depositing them within an institutional source. The SGB forms the ideal institute for the mobilization of these saved funds because it can maintain the records and adjust the deposit rate in an easy, quick, efficient and publicly accountable way. The case is further strengthened by the success achieved by the postal savings schemes in many LDCs and the SGB already performs some postal services in the village. This would also enable the Block Manager to finance the Shail Merchants without resorting to the headquarters.

To encourage savings, high deposit rates would be offered which were identical to the rate of interest the SGB charge on loans to the Shail Merchants on any administrative costs incurred by the SGB in looking after the

CHAPTER X

SUMMARY & CONCLUSIONS

Institutions like the Sudan Gezira Board must evolve over time in their organisation, and, in the light of experience with their old procedures, introduce appropriate forms which respond to new economic opportunities in order to raise the social benefit. This thesis looks critically at the credit situation in the Gezira and outlines certain reforms which would improve performance at the present time.

The Gezira was resettled in 1925 after the introduction of a major irrigation scheme. A highly centralised management was imposed by the Government to facilitate the effective operations of the irrigation system and aid the farmers to create economically viable holdings after transforming their way of living from nomadism to irrigated cotton production. Farm practice has developed in response to these government directives on permissible crop rotations, and the major decisions on crops, varieties, level of fertilizers, sprays, watering, etc., are all made centrally with little room for the tenants to manoeuvre.

The cropping pattern has changed over time as a result of advancement in agronomic research and the need to put more of the fallow land under cultivation as one response to economic pressures. At the present time two rotations are followed; an eight course rotation of Cotton - Wheat - Fallow - Cotton - Phillipesara/Fallow - Dura - Groundnuts/Lubia - Fallow in the Gezira Main and a six-course rotation of Cotton - Fallow - Cotton - Lubia/Groundnuts - Dura - Fallow in the Managil Extension. Recently, in the early 1970's, wheat was also

introduced in parts of the Managil Extension.

The credit policy of the management of the Gezira Scheme has always revolved around the production and marketing of the export cotton crop and the typically poor and illiterate tenants were left unaided to manage other crops and finance other needs. As a result, a private rural credit market has developed to cope with the lack of resources and the poverty which was not covered by the institutional sources. Recent Governmental attempts to increase tenants' participation in the SGB programmes by the establishment of cooperative societies failed mainly because the well-to-do profited from the existing situation and the poor tenants maintained their allegiance to local lenders and traders.

Two credit-cum-marketing systems have evolved, with the dual sources of credit paralleled by two commodity markets so that the linkages provide security for repayment. The institutional credit sources, the SGB and the ABS, concentrate on the production and marketing of cotton and wheat. The other credit requirements of the tenants are met by the private traders who dominated the disposal of the marketable surplus of crops other than cotton. In 1973/74, the institutional credit sources provided 73% of the total credit and, of the remaining 27% provided by the private sector, 5% was provided on 'shail' basis, 7% free of interest and 15% as delayed repayments. As a result of these credit and related arrangements, the SGB and the Sudan Government took nearly three quarters of the cotton value added, and the 'shail' merchants with their much smaller contribution, absorbed 27% of the value added generated by

other crops, or nearly one third of the marketable surplus through charging exorbitant rates of interest.

Data and Techniques.

For the agricultural credit in the Gezira Scheme to be studied in depth, adequate factual information is needed on the tenants' seasonal credit requirements, working operations of the traditional credit sources, the linkages between credit and marketing and the significance of assets and indebtedness for the distribution of value-added. To obtain such information, surveys were carried out at the farm level. These surveys were designed to obtain data in a way that would enable statistically valid generalization and aggregation for the whole Gezira. Though the emphasis was placed on representativeness, recording accuracy was insured by the use of frequent visit surveys for data collection. Frequent visits were also needed to provide the data basis for short period analysis within the year using cash flow technique of data analysis and, the requirement of normative techniques for accurate data. The multiple cropping, seasonability of farming operations, and diversity and complexity of Financial transactions, also required high recording frequency for their resolution.

The respondents were selected by a multi-stage disproportionate stratified random sample based on cotton feddanage. To get the same level of accuracy, higher sampling fractions were required in the Gezira Main than in the more homogeneous Managil Extension. Stratification was based on Cotton Feddanage

in the absence of prior data on the more relevant working capital and credit requirements. 96 tenant farmers were selected which gave a standard deviation of 0.1 of the mean cotton feddanage (is coefficient of variation of 10%) and thus, by proxy, of the maximum working capital and credit requirements. This number was just manageable under a system of fortnightly visits with the resources available.

To further increase the quality and uniformity of the analysis on apriori grounds, the data collected from the 96 tenants in the ramdom sample were used to subdivide farms into seven groups based upon variation in type of crops cultivated (vegetable or non-vegetable growers), size of assets (small medium or large) and source of income (farm and small business or farm and big business). This ex post stratification for analytical use does not add to the representativeness of the initial sample. They would provide the ex ante basis for further changes in sampling fractions, using three criteria (instead of cotton feddanage) in any further work.

Using data for the completed survey, an analysis of variance showed that the variation between the seven farm groups in their maximum working capital and credit requirements was statistically significant at 0.1% level. Further analysis for the whole sample, gave a coefficient of variation of 40% for these two attributes which is considered satisfactory given the fact that the sample has to be drawn up in the basis of cotton feddanage alone.

Level of resource use :

1. Land use

Land use in 1973/74 was determined largely by the limited volume of irrigable water available, rotational constraints to maintain soil fertility, lack of liquidity and crop requirements for labour. Land amounting to 31% of the cultivable area was left fallow because of the undersized irrigation canals, which permit only half the cultivable area to be watered at any one time, and the need to maintain soil fertility and the health of cotton plant which occupied 43% of the cultivated land - wheat, groundnuts and vegetables occupied 19%, 14% and 3% of the cultivated area respectively. Risk aversion partly accounted for 21% of the cultivated land being grown with dura to provide the local people with a local staple food grain. Liquidity, the central issue of this thesis, led to the tenants' diversion of that whole phase of the rotation left for animal fodder to the production of arable crops like wheat, groundnuts and vegetables which give quick cash returns.

Along with high seasonal labour requirements and the consequent need to attract cotton picking labour, shortage of cash played some part in the development of share cropping and subletting (dogondi).

More than half the groundnuts and vegetable land were cultivated on either a share basis or dogondi. The agent (wakiel) system in the case of cotton was practiced by many tenants but 93% of the dura and 99% of wheat were cultivated by the tenants themselves.

2. Labour use.

Paradoxically, in view of the liquidity problems, the tenant and his family provide less than 20% of the total labour used on farm work. The Farm family's contribution is not uniform, however varying directly with tenants' assets. Among the rich tenant farmers, the tenant and his family contributed 5% of the total labour used and in the case of the poor tenant farmers this rose to 22%. The low family participation in the case of the rich was due to their highly profitable off-farm activities which accounted for 86% of their total income. For the poor tenants, in addition to leisure preference and dependence on easy income from donations and remittances, lack of liquidity plays an important role in the low family participation and compels some of them to work for hire to satisfy urgent needs for cash. Nearly 8% of the poor tenants' income came from work for hire, 22% from handicrafts and 13% from social transfers. However, these explanations of the low level of family participation in farm work are not completely satisfactory and further research work in this area is recommended.

The Gezira objective of a tenancy cultivated by the tenant and his family has certainly not been achieved since expenses on hired labour constituted nearly half the total production expenditure. Cotton alone requires about 58% of the total labour used. Wheat, in addition to the high guaranteed price and SGB credit, is more popular among the tenants due to its low labour requirements, 4% of the total labour used. Of the total labour used, 20%, 12% and 6% was employed in dura, groundnuts and vegetables respectively.

3. Capital Use:

i. Results of the field survey indicate wide disparities in assets ownership. This variation is the main reason underlying the great disparities in income with the rich tenants investing in trade and lending and the poor tenants being dependent almost exclusively on crop cultivation.

ii. The familiar scale economics expressed in terms of higher marginal and physical product as size increases, could only be found in the case of wheat. In this, greater wheat acreage were found on the farms of rich tenants who could afford more of the non-traditional inputs required to raise yields. The Board discriminates against the poor by refusing them permission to cultivate more wheat because of their lack of liquidity and this further [illegible] the present disparities in income. Similarly, among other crops, marginal and physical products are more related to cash availability than size of holding.

iii. Cropping incentives indicate a clear divergence of private and social interests. For the tenants, wheat is the most profitable crop with average net returns ranging between Ls.20 and Ls.32 per feddan. Cotton can only be compared to the least profitable dura with both giving similar and lowest marginal productivity to labour and working capital.

The tenants' net returns from cotton average Ls.14 per feddan but only about Ls.5 after allowance for items debited to the tenants' individual account. For the Sudanese economy, cotton yields by far the greatest social margin per feddan. At world prices, the returns from cotton in 1973/74 were Ls.34 per feddan while returns from wheat were only Ls.5 per feddan.

iv. In addition to its high labour requirements, cotton was the dominant crop in its working capital requirements. Working expenses of Ls.41 per feddan were needed by cotton followed by wheat at Ls.15, vegetables Ls.14, dura Ls.9 and groundnuts Ls.5. Regarding total farm expenses, cotton production expenditure constituted 73% of the total, followed by wheat 11%, dura 7%, other farm activities (including livestock) 6%, groundnuts 3% and vegetables 1%.

Seasonal working capital and credit requirements.

1. Results of our cash flow analysis indicated the generally high correlation between resource productivity and initial liquid assets. Because vegetables provide incomes over long periods, the vegetable growers joined the rich non-vegetable growers in having the highest marginal productivity to labour and working capital. Due to their lack of liquidity, the poor non-vegetable growers (53% of the total population) have had the lowest marginal productivity to these resources. Most sold

part of their subsistence crop to obtain ready cash and had insufficient quantities of dura left to satisfy them for the whole year.

ii. Maximum working capital requirements ranged between Ls.477 for the poor tenants to Ls.854 for the rich tenants with a weighted average of Ls.532. In aggregate, working capital reached its maximum need of Ls.42 million at the end of the year in the second half of March. The amount and time period for which these Ls.42 million were needed varied with the different rotational constraint on cropping and the production cycles of the crops grown on individual farms. Heavy working capital requirements coincided with planting and cultivation of groundnuts, dura and cotton in July-August, dura harvesting and wheat planting in November and groundnut harvesting and cotton picking in January-March inclusive. With year round family consumption, none of the tenant farmers, apart from the rich vegetable growers, have had surplus cash from farming by the end of the year. Most tenants, therefore, had to supplement their farm income by off-farm earnings, gifts and remittances or bor owing. One third of the maximum Farm/Family working capita. quirement was financed by owned liquid assets, off-farm earnings, and returns from crops other than cotton and wheat harvested at the end of March, leaving credit requirements Ls.28 millions for the poor tenants and the less affluent ones alone, since the rich tenants always had surplus funds. Ls.9.913 millions of the maximum credit requirements (i.e. 34%) was needed in July-August, 24% (i.e. Ls.6.956 millions) in November, 11% (i.e. Ls 3.293 millions).

in the second half of February and first half of March and the rest i.e. 31% was needed at other times before the end of March.

With these peak periods at which credit was needed by the poor and cash surpluses in the hands of the rich throughout the year, internal financing within the Gezira Scheme becomes a tenants possibility and could satisfy about 21% of the credit requirement (i.e. Ls 6 millions). The encouragement and organisation of internal financing points to the need for locally based organizations and their integration into a larger savings and credit organization. This would facilitate capital transactions and capital movement at the right time and in the quantity needed.

Supply of Credit.

The institutional sources which provide 73% of the total credit requirement have failed to provide credit at the exact time of need. This encouraged misuse of credit and emphasised the need to use the locally based institutions' knowledge about the viability of investment opportunities and the precise pattern of credit needs and repayment schedules. One of the essential features of a successful credit programme revealed by the experience of both formal and informal credit sources in the Gezira is the necessity of linking credit and marketing in the same organization in order to reduce default and ensure the continuity of the credit programme.

ii. The practice of institutional credit sources, like the SGB, of restricting credit to annual expenditure of certain crops encourages the development of private rural credit market which provided 27% of total credit needed in 1973/74. 55% of

the informal credit arose from delaying payments to hired labour, canteen owners and private contractors. For these services, hidden charges were commonly levied with or without the borrowers' knowledge. Whether these levies (shop prices, wages and service charges) were excessively high so as to more than cover the delays in payments, cannot easily be assessed because lenders, naturally, are unwilling to give such information and the borrowers are either unaware of these charges or do not take them into account at the time of making the final arrangements.

Out of the remaining 45% of the credit provided by informal sources, three-fifths were extended free of direct interest by friends, relatives and neighbours and by traders to assure themselves of a continuous supply of the crops in which they trade, particularly groundnuts. Shail merchants who provided the remaining two-fifths of the informal credit (only 5% of total credit) acted as lenders of last resort.

iii. The present cotton sharing system reduces the tenant income from cotton to nearly 20% of the F.O.B. price. This low producer's price was due to the charge of the SGB service to other crops against cotton. Whether this price is fair can only be known by assessing the exact cost of services provided by the SGB to other crops and charged to cotton. In any case, the low price has discouraged cotton production and assured the shail merchants that the rewards the poor tenant can obtain from cotton are in no way sufficient to keep him living without their credit. For their very low contribution to total credit requirement, the shail merchants absorb approximately 19% of the

marketable surplus of wheat or nearly half the marketable surplus of the poor tenants after repaying the SGB.
In the case of dura, all the marketable surplus of the poor was absorbed by shail and nearly one-third of the groundnuts was repaid to these merchants. These quantities were excessive compared to the actual amount borrowed due to the high interest rates charged. As a result the poor tenants' cash surplus was reduced to no better position than when they started the year. Due to these high charges, the poor tenants' default to other informal credit sources is unavoidable to keep some cash in their hands to meet the unexpected incidence of disease and other needs as they arise.

iv. The shail merchants are clearly exploiting their monopoly position as lenders of last resort. Their average charge, for short term loans, when compounded to an annual rate, was 726 per cent per annum. Clearly charges would have to be high as a result of bad debts, uncertainties and high administration cost but, when all appropriate allowances have been made, their profits are at least twice those "normally" expected.

Economic Rationale of the Tenants and Shail Merchants.

i. According to PF analysis, maximum efficiency, at the present level of technology and resources, could be achieved by using more labour and working capital, particularly the latter.

ii. Current farming practice appeared to be reasonably consistent with profit maximising behaviour except for the low family labour input. Farm income would be considerably increased if the family put in more effort because of smaller

loans to finance hired labour and lower interest charges. However, due to their lack of liquidity and the harsh terms on which shail credit can be obtained, the poor tenants must turn to non-farm activities to earn ready cash. Partial confirmation of this reaction to cash shortage came from normative LP analysis conducted at different levels of owned funds. At low levels of initial cash in hand, the poor should cultivate more of the less profitable crops, like dura, for immediate sale after harvest to maximise their income rather than borrow at the prevailing high shail interest rate.

iii. High returns to further intensification even at the present level of resource endowment and rotational constraint could be achieved but require greater incentive and more working capital. This points to the need for more lending at substantially lower rates of interest than the current shail charges implicit in forward buying arrangements.

iv. Shail merchants exploit their monopoly advantage to the full when setting interest rates. They maximise returns on the funds available to them by absorbing the poor tenants' surplus and leaving them with just enough cash to maintain their families at subsistence level and to follow the SGZ rotation.

Farm Modernization.

i. Current farm profits and practice lags considerably behind the potential made available by proven innovations. Ample opportunities exist for increasing the tenants' farm incomes and raising the farming efficiency in the Gezira Scheme by the adoption of proven innovations like HYVs, increased

fertilizer application, mechanization at present financial market rates and improved crop protection measures. If alternative cropping patterns were adopted which would stem from the adoption of these innovations and from credit at an annual cost of 50% which adequately cover all costs of lending, tenants incomes would more th.n double.

ii. To raise the farming efficiency of the Gezira Scheme, economists have long ago showed the need for the Sudan to modify the Gezira system and to diversify production. The empirical evidence documented in chapter 8, clearly indicates the urgent need to allow cropping patterns to vary between localities to achieve greater benefit from the Gezira Scheme and improve the productivity of resource use, particularly capital and water.

To adopt the above innovations and increase mechanization, nearly twice the present number of tractors and combine harvesters would be needed. Further agronomic research and diversification of cropping patterns would increase the efficiency of machines' use, reduce the burden on foreign currency by reducing their number and reduce cost to tenants by allowing their operation nearer to capacity.

Increased mechanizatic following the adoption of these innovations, would not displace labour when the total labour requirement is considered. But since labour is time specific increased machine use would replace some labour at the cultivation time in July-August. This would result in some seasonal reduction in employment, which might have a social cost to the community although on a very minor scale. On the other hand, the demand for labour would increase at the

time of crop harvesting due to increased yields. The results obtained from the W/N V.F.E. also confirm this finding.

Shortage of irrigation water in October-November, also points to the need for diversifying cropping patterns within the Gezira Scheme. Further investigation of irrigation methods, including ridge and furrow systems, and continued agronomic research are also needed to avoid competition at this critical period.

A further analysis of a social cost-benefit type is needed to explore the wider implications for the economy as a whole of the proposed modifications to the cropping pattern and greater mechanization.

iii. Given the Sudan's scarce capital resources, credit should be provided on terms that reflect true opportunity costs. The high tenants' income after adoption of innovations, in relation to their current income, and the availability of credit at an annual cost of 50% indicate that grants and highly subsidised loans are not needed. Again with an estimated increase in demand for credit from Ls.28 millions to about Ls.70 millions, credit sh uld be provided at real cost to encourage private savings, opening the possibilities for using more funds from the commercial sector ' reducing the burden on funds of the public sector.

Credit Structure.

The operation of the two credit sources available have retarded agricultural development, the SGB by confining its activities to certain crops and by depressing the tenant price for cotton and the informal sources by exploiting the tenant farmer and absorbing the majority of his remaining marketable

surplus through charging exorbitant rates of interest. In addition to the rigid structure of the SGB, the operations of both credit sources have reduced the tenant interest in farming and deprived him of the incentive to adopt proven innovations.

With the attractive opportunities available, Government policy should be directed towards establishing institutional terms which would encourage the provision of capital required for the adoption of these opportunities. It should satisfy the effective demand for credit by facilitating capital transactions and encouraging capital movement.

It is however apparent that with technological change, a modification in the structure of the Gezira Scheme and its adaptation to local production needs is urgently needed. With these changes, the time is opportune to embody in them a credit structure that makes use of the numerous advantages of the SGB in the provision of capital and inputs. At the same time the locally based organizations should be institutionalized under a loose form of management from the headquarters to assure efficient distribution and collection of loans. The shail merchants' skill and experience would be invaluable in channelling all credit obtained from SGB, apart from contract work, but at the lower rate of interest of 50% per annum. The use of shail merchants would also avoid the creation of institutional forms alien to the farming community, which would take a long time to implement and would take the farmers a long time to accept. It would avoid breaking down the present marketing and social system with its numerous advantages, make use of the available

manpower without requiring additional staff and equipment, and promote the commercialization of agriculture. Also the compulsory investment of the shail merchants' profits in trading and agricultural machinery is recommended to assure that the profits they would obtain by being agents to the SGB would be used in the national interest.

To encourage local participation, the Government policy should be directed towards the encouragement of community development. The SGB would be responsible for planning and management and a combination of the Block managers, extension workers, members of village councils and shail merchants responsible for implementation, with loose headquarters control to help them identify unrealised economic opportunities in each locality. While this approach would enhance the tenant status as a farmer, it would also increase his incentive and income. Furthermore it would increase the social benefit to be derived from the Gezira Scheme. The imposition of a land-water-charge and a progressive income tax would raise Government revenues and secure a more equitable distribution of income.

The time is thus ripe for modifying the structure and practice of the Gezira Scheme in the light of national needs and proven innovations and cha[illegible] in credit institutions and proced[illegible]s are just part of a major overhaul which is required.

Selected Bibliography.

PAGE

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ORIGINAL

Abdalla, A.A.
and Simpson M.C. (1965) 'The Production and Marketing of vegetables in Khartoum Province'. Research Bulletin, Faculty of Agriculture, University of Khartoum No. 1 (1965).

Abdel Rahim, A.W.(1968) 'An Economic History of the Gezira Scheme'. Unpublished Ph.D. Thesis Manchester University (1968).

Abbott, J.C. (1974) 'Credit Institutions and Their Importance on Agricultural Development in Africa' Monthly Bulletin of Agric. Econ. and Statistics, volume 23 (10/11) pp 7 - 15 F.A.O., Rome, Italy.

Adam, F.H. (1971) 'Economic Appraisal of Agrarian Reform in the Private Cotton Estates, Sudan.' Dept. of Rural Economy, Faculty of Agriculture, University of Khartoum, Research Bulletin No.20 Sept. 1971.

Adams, D.W. (1972) 'Is inexpensive credit a bargain for small farmers: The recent Brazilian experience'. International Economic Affairs Volume 26 (1) pp.47-58.

Agency for International Development (1973) 'Spring Review of small farmers credit' A.I.D. Washington, D.C. (1973).

Agrawal, B.L. (1963) 'Risk and uncertainty in Agriculture: Implications for Agricultural Credit.' Ind. J. Agric. Econ. Vol 19(1) pp 132-143.

Agricultural Research Corporation (1967) 'Standard practices in the Gezira Research Farm'. Tech. Bulletin No. (1) (new series) Gezira Research Station (1967).

Alhadeff, D.A. (1954) 'Monopoly and Competition in Banking'. Berkeley and Los Angeles University of California (1954).

Amerasingh, N.S.M.A. (1974). 'A study of Economic Resource Use and Production possibilities in Settlement Schemes in S M Lanka - with Special reference to the Minipé Cottonization Scheme'. Unpublished Ph.D. Thesis, Wye College, London University (1954).

Atkinson, J. (1971) 'A Handbook for Interviewers' London 1971.

Bank of Sudan — 'Annual Reports'.

Barnard, C.S. (1963) — 'Farm Models, Management Objectives and the Branded Planning Environment.

Barnard, C.S. and Nix J.S. (1973) — 'Farm Planning and Control' Cambridge University Press 1973.

Barnett, T. (1975) — 'The Gezira Scheme, Production of Cotton and reproduction of under-development' IN Beyond The Sociology of Development. Roulledge and Kegan Paull, London 1975.

Baum, E.L., Deissein, G and Heady, E.O. (1961). — 'Capital and credit need in a changing Agriculture'. Ames, Iowa State University Press 1961.

Bottomley, A. (1965) — 'Reply'. Quarterly Journal of Economics Vol. 79 pp 325-327.

" " (1966) — 'A Monetary strategy for Underdeveloped Rural Areas'. J.A.E. Vol. A(2) pp 139-150.

" " (1971) — 'Factor Pricing and Economic Growth in Underdeveloped Rural Areas'. Crosby Lockwood and Son, London 1971.

Campbell, C and Change, S.A. (1962) 'Keyes and Mujins - Financial Intermediaries in South Korea' Econ. Develop. and Cutt. Charge Vol 11 (1) pp 55 - 68.

Carruthers, I.D. and Donaldson, G.F. (1971). Effective risk reduction through irrigation. J.A E. 1971

Chandler, L. (1969) 'The Economics of Money and Banking.' 2nd edition. New York, Harper and Raw 1969.

Charles, G. (1958) 'Poverty and Socio economic Aspects of Hoarding, savings and Borrowing in Malaya'. Malayan Econ. Review. Vol.3 (2) 1958.

Chandavarker, A.G.(1965) 'The Premium for risk as a determinant of interest rate in underdeveloped rural areas, Comment'. Qrtly. J. Econ. Vol. 49 pp 322-325.

" (1971) 'Some Aspects of interest rate policies in less developed economies - The experience of Asian countries'. International Monetary Fund Staff Papers Vol. 18 (1) March 1971.

Chennareddy, W. (1967) 'Production efficiency in South Indian Agriculture. J.Farm. Econ. Vol.49 (4) 1967.

Clarke, C and Hoswel, M.R. (1965) 'The economics of Subsistence Agriculture' London, 1965.

Clayton, E.S. (1964) 'Agricultural Development in peasant economies'. Pergamon Press, New York (1964).

Collinson, M.P. (1972) 'Farm Management in Peasant Agriculture' Praeger, New York, 1972.

Culwick, G.M. (1951) 'Diet in the Gezira Irrigated Area' Sudan Govt. Printing Press 1951.

Das Gupta, S. (1970) 'Agriculture; Producer's Rationality and Technical Change'. Indian Publishing House 1970.

Dell'Amore (1975) 'Agricultural Credit for Development' World Conference on credit for Farmers in Developing Countries. Milan, Cassa di Resparmiodell Provincie, Lombarde 1975.

De Wilde, J.C. Agricultural Development in Tropical Africa. 2 volumes.

EL Hadari, A.R. (1971) 'Occupational Immobility of Tenants on the Gezira Scheme, Sudan.' East Afric. J. of Rur. Develop. Vol.4(2) 1971 pp 67-76.

EL Hadari, A.R. and Adam, F.H. (1972) 'Some Socio economic aspects of Gezira Tenants'. Research Bulletin No. 6. Dept. of Rur. Econ., Faculty of Agriculture, University of Khartoum.

EL Hassan, A.M. (1972) 'Cotton and the Sudan Economy' Unpublished Ph.D. Thesis University of Reading (1972).

EL Khatim, S.I. (1966) 'Casual labour and its economic implication for agricultural production in the Gezira. Unpublished M.Sc. Thesis. University of Khartoum (1966).

Emery, F.E. (1969) ed. 'System Thinking'. Penguin 1969.

Farrington, J. (1976) 'A note of planned versus actual farmer performance under uncertainties in Underdeveloped Agriculture.' J.A.E. vol 27(2) pp 257-259.

Firth, R. (1964) 'Essays on Social organization and va ues'. University of London, The Alhlove Press, London 1964.

Firth, R. and Yamey, B.S. (1964) 'Capital, savings and credit in peasant societies'. London: George Allen & Unwin (1964).

F.A.O. (1953) 'Credit and Marketing in economically underdeveloped countries'. Development paper no. 34. F.A.O., Rome, Italy (1953).

F.A.O. (1964) 'New Approach to Agricultural Credit'. F.A.O. Rome, Italy (1964).

F.A.O. (1965) 'Agricultural Credit through cooperatives and other Institutions'. F.A.O., Rome, Italy (1965).

F.A.O. (1965) 'Cooperative thrift, credit and marketing in economically under-developed countries'. Agricultural Development paper No.34. F.A.O., Rome, Italy (1965).

F.A.O. (1966) 'The Indicative World Plan for Agricultural Development 1965-85 ' 2 volumes. F.A.O., Rome, Italy (1966).

F.A.O. (1966) 'New Approach to Agricultural Credit, Supervised credit combined with cooperatives and agricultural extension'. Agricultural Development Paper No. 77. F.A.O. Rome, Italy, (1966).

F.A.O. (1975) 'International Agricultural Adjustment - Case study of Sudan'. F.A.O., Rome, Italy (1975).

Gaitskell, A. (1959) 'Gezira, story of development in the Sudan'. London 1959.

Garner, J. (1975) 'Cotton: ow Khartoum missed the boat'. London. African development. Vol. 9 Part I.

Gittinger, J.P. (1972). 'Economic Analysis of Agricultural Projects'. IBRD and John Hopkinson, 1972.

Goode and Hoote (1952) 'Methods in Social Research'. McGraw-Hill Book Company, 1952.

Griliches (1957) 'Specification bias in estimation of production Function'. J. Farm Econ. Vol 39 (1957) pp 8-20.

Gunnar Myrdal (1968) 'Asian Drama'. Vol.III Pantheon, New York 1968.

Gorst Sheila (1962) 'Cooperative Credit for producers and consumers'. Oxford 1962.

Harrison, A. (1956) 'The Capital Profile as an Aid in Decision making in Farm Management'. J.A.E. vol. 12(1) pp 64-72.

Heyer (1973) 'Small holding Credit in Kenya'.

Heady, E.O. (1952) 'Use and estimation if input-output relationship or productivity coefficients. J. Farm. Econ. Vol. 34 pp 775-786.

" " (1952) 'Economics of Agricultural Production and resource use'. New York, Prentice Hall 1952.

" " (1954) 'Farm Management Economics' N.Y. Prentice Hall 1954.

" " (1956) 'Production functions from a random sample of arms'. J. Farm. Econ. Vol. 27 pp 989-1004.

" " (1969) Agricultural Policy under Economic Development'. Ames, Iowa State University Press 1969.

Heady, E.O. and Candler, W. (1960) Linear Programming Methods. Ames, Iowa State University Press 1960.

Heady, E.O. and Dillon, J.L. (1961) Agricultural Production Function. Ames, Iowa State University Press 1961.

Hunt, K (1969) 'Agricultural Statistics in Developing Countries'. Institute of Agrarian Affairs. Oxford 1967.

Hunter, G. (1969) 'Modernizing Peasant Society'. OUP 969.

Idris, B. (1971) 'Small Farm Credit and Development in East Kordofan - Sudan'. University of Reading (1971).

International Labour Offices, U.N. 'Growth, employment and equity: A Comprehensive Strategy for the Sudan.' Report of the ILO/UNDP Employment Mission 1975, United Nations Inter-agency team. Geneva, Switzerland 1976.

Johl, S.S. (1973) 'Agricultural Taxation in A developing Economy - A case study of India'. Occasional Paper No. 39. Ohio State University.

Johnston, J. (1962) 'Econometric Methods'. New York : McGraw Hill Company (1962.)

Khahil (1968) 'The Sudan Gezira Scheme - Some Institutional and administrative Aspects'. J.F. Admin. Overseas (1968).

Khalil, A.S. (1965) 'A Comparative Study of India, Pakistan & Ceylon'. Unpublished M.SC Thesis, Hull University 1965

Khider, M. and Simpson M.C. (1968) 'Cooperatives and Agricultural Development in Sudan'. J. Modern Agri. Stud. Vol 6 (4) pp 509-518.

King, R. (1976) 'Farmers Cooperatives in Northern Nigeria: A case study used to illustrate the relationship between economic Development and Institutional Change'. Dept. of Agric. Econ., University of Reading 1976.

Langham, M.P. (1968) 'A dynamic linear programming model for Development Planning'. IN Economic Development in Tropical Africa. McPherson (ed.) 1968.

Lele, Uma. J. (1971) Food Grain and Marketing in India. Cornell University Press (1971).

Lele, Uma J. (1972) 'Role of Credit and Marketing in Agricultural Development'. Paper delivered to the International Economic Association Conference on Agriculture in the Development of Low Income Countries. Bad Godenburg 1972.

Leser, C.E.V. (1974) 'Econmetric Techniques and Practices'. 2nd Edition. Griffin, London (1964).

Lewis, W.A. (1959) 'The Theory of Economic Growth'. Unwin University Press, London 1959.

Lipton, M. (1968) 'Theory of Optimising Peasant'. J. Develop. St. Vol. 4(3) 1968.

" " (1974) 'Village Study Programme'. IDS Discussion Paper. Institute of Development Studies, Sussex University (1974).

Lipton, M. and Moore M. (1972). 'The Methodology of Village Studies in less developed countries'. IDS Discussion Paper No. 4. Institute of Development Studies, Sussex (1972).

Little, I.M.D. and Mivvlees, J.A. (1974) 'Project Appraisal and Planning for developing countries'. Heineman Educational Books, London 1974.

Long, M.F. (1968) 'Why Peasant Farmers Borrow'. J.A.E. Vol.50(4) pp 991-1008.

Mahdi, S.M.A. (1971) 'A guide to Land settlement and Registration'. Khartoum University Press 1971.

Marget, S. (1969) 'Methods of Social Research'. Pergamon Press, London, 1969.

Marks, M ( ) 'The Measurement of Agriculture's Seasonal Credit requirements.'

McInerney, J.P. (1967) 'Maximum Programming - An Application to Farm Planning under uncertainty'. J.A.E. Vol 18, pp 279-290.

" " " (1969) 'Linear Programming and Game Theory Models - Some Extension'. J.A.E. Vol.20 (2).

Medani, A.I. (1972) 'The supply response to price of African Farmers at various stages of development'. Oxford Agrarian Study. Vol 1 (1) 1157-66

Meir, G.M. and Baldwin, R.E. (1957) 'Economic Development'. New York, John Witney & Son. 1957.

Mellor, J.W. (1966) 'The Economics of Agricultural Development.' Ithaca, New York: Cornell University Press, 1966.

Merrett, A.J. and Sykes, S.A. (1963) 'The Finance and Analysis of Capital Projects'. Longmans, London, 1963.

Moser, C.A. and Kalton, G. (1971) 'Survey methods in Social Investigation'. 2nd edition. Heineman, London. 1971.

Mosher, A.T. (1966) 'Getting Agriculture Moving'. Praegar Publishing Ltd., New York 1966.

Muller, A.G. (1966) 'Flow of Funds Analysis in Farm Financial Management'. J. Farm. Econ. Vol. 48, 1, 1, pp 661-667.

Mundlack (1963) 'Specification of estimation of Agricultural Production Functions'. J. Farm. Econ. Vol. 25.

Myint, H. (1971) 'Economic Theory and The Underdeveloped Countries'. Oxford University Press, 1971.

Narain, R.D. (1955) 'Methods of Collecting Current Agricultural Statistics'. Economic Division, F.A.O., Rome, Italy (1955).

Nelson, A.G. and Murray, W.G. (1973) 'Agricultural Finance'. 2nd edition. Iowa State University Press 1973.

Nisbet, C.T. Interest Rates and Imperfect Competition in the Informal Credit Market of Rural Chile.

Narske, R. (1962) 'Problems of Capital Finance in Underdeveloped Countries'. Oxford, Bladwell 1962.

Penny, D.H. (1968) 'Farm Credit Policy in the early stages of Agricultural Development'. Aust. J.A.E. Vol.12(1) 1968.

Philosophical Society of the Sudan (1961) Ninth Annual Conference in Surveying for development in Sudan. Khartoum 1961.

Plaxico, J.S. (1955) 'Problems of Factor - Product Aggregation'. J. Farm. Econ. Vol. 37 pp 664-675.

Quoraishy, B.D. (1964) 'The role of credit in Development of Agriculture, with special reference to Pakistan'. Unpublished M. Phil Thesis. Trinity College, Dublin 1964.

Rao, U.K.R.V. (1952) 'Investment, Income and the Multiplier in an underdeveloped economy'. Ind. Econ. Rev. Vol.1 (1) pp 59-61.

Schatz, S.P. (1965) 'The Capital Shortage Illusion - Government lending in Nigeria'. Oxford. Econ. Papers. Vol. 17(2).

Simpson, I.G. (1968) The Developing Balance between manpower and Machinery, Land and Water in the Sudan'. Tropical Agriculture, London. Vol.45 (2) pp 79-89.

" " " (1970) 'New Approaches to Irrigated Farming in the Sudan: Organization and Management'. Land Economics Vol.46,1970 pp.287-296.

Singh, U.S. (1969) 'A normative Analysis of the Impact of Capital Availability on Farm Income and demand for short-term credit on farms in Delhi'. Ind. J. Agric. Econ. Vol. 26 (4) pp 524-532.

Sinha, R.P. (1974) Chinese Agriculture: Past Performance and future outlook'. J.A.E. Vol. 25(1) pp 27-52.

Sharwa, J.S. and Prasad, B. (1969) 'An Assessment of Production Credit Need in Developing Agriculture'. Indian J.A.E. Vol. 26(4) pp 503-511.

Shaw, D.J. (1964) 'Labour Problems in the Gezira Scheme'. Dept. of Rural Economy, University of Khartoum (1964).

" " " (1964) 'The Managil - South West extension - An extension to the Gezira Scheme'. Faculty of Econ. and Social Studies, University of Khartoum.

Shultz, T. (1964) 'Transforming Traditional Agriculture'. New Haven, Yale University Press 1964.

Sorensen, D. Rosk, N. and Walker, F. (1971) 'Capital Productivity in specialised swine farms in Southern Brazil'. Report No. ESM-459. Ohio State University (1971).

Subrata, G. (1972)	'Rural Credit Markets in India'. Unpublished Ph.D. Thesis L.S.E. (1972).
Sudan, Department of Statistics.	'The Household Budget Survey in the Gezira, Mangil Area'. Khartoum, Sept. 1965.
Sudan "	Foreign Trade Statistics, Khartoum, Sudan.
"	Ten Year Plan of Economic and Social Development 1961/62 - 1970/71. Ministry of Finance and Economics, Khartoum.
"	Five year plan for economic and social Development 1970/71 - 1974/75. Ministry of Planning, Khartoum.
Sudan - Ministry of Planning.	'Economic Survey'. Feb. 1971.
" " "	'Economic Survey' 1972.
Sudan - Ministry of Finance .	Economics. Sudan Cotton Review, Kartoum.
SGB -	Annual Agricultural Reports, Khartoum, Sudan.
"	Annual Financial Reports, Khartoum, Sudan.
"	Dept. of Cooperation, Manad, Annual Report(1972/7).

Sudan - Sudan Cooperative Ordinance and Rates 1948.

Sullivan, A.A. (1965) 'Stabilization Policy for Cotton in the Sudan'.
IN Africa Primary Products and International Trade.
Edinburgh University Press. pp 159-180.

Taha, T.E.J. (1975) 'The Development of the Managil - South Western Extension to the Gezira Scheme, Sudan'.
Land Reform, Land Settlement and Cooperation 1975(1) pp 25-37.

Tayfour, S.A. (1968) 'The economics of cotton in the Sudan, with special reference to the Sudan Gezira Scheme'.
Unpublished Ph.D. Thesis, Glasgow University (1968).

The All India Rural Survey' - Report of the Commission of Directors' Bombay, Reserve Bank of India (1954).

Thornton, D.S. (1963) 'The Organization of Production in the Irrigated Areas of the Sudan.'
J.A.E. Vol.19,2. pp.286-295.

" " " (1965) 'Reform in the Structural Organization of Sudanese Agriculture'.
Khartoum: Dept. of Rur. Econ.
Faculty of Agriculture, University of Khartoum.

Thornton, D.S. (1966) 'Contrasting policies in Irrigation Development, Sudan and India'. Development Studies, No. 1. Dept. of Agric. Econ. University of Reading.

" " (1972) 'Agricultural Development in the Sudan Gezira Scheme'. Tropical Agriculture, Trinidad. Vol. 49(2) pp 105-114.

Thornton, P.S. and Wynne, R.F. (1965) 'An economic assessment of Khartoum and Girba Project' Khartoum: Dept. of Rural Economy, Faculty of Agriculture, University of Khartoum.

Tothill, J.D. (1948) 'Agriculture in the Sudan'. Oxford University Press (1948).

Tuck, R. (1956) 'A reconsideration of the Theory of Agricultural Credit'. J.A.E. vol.1(2) pp 20-40.

Tun Wai, U. (1957) 'Interest rates outside the organised money markets of underdeveloped countries'. Staff Paper of the International Monetary Fund Vol.6. 1957.

Tyler, G.J. (1960) 'An Application of Linear Programming' J.A.E. vol. 13(4) pp 473-486.

Tyler, G.J. (1966) 'Analysis of the Solution Tableau of a Standard LP Problem'. J.A.E. Vol 17(2) pp 159-70.

Upton, M. (1973) 'Farm Management in Africa'. London, Oxford University Press 1973.

" " (1976) 'Agricultural Production Economics and Resource use'. Oxford University Press 1976.

Van Piske (1973) 'Farm Credit in Kenya - The poor Farmers Paradox'. Institute of Development Studies, University of Nairobi (1973).

Vasthoff (1968) 'Farm Credit and Development'. Munich, Welfirum - Verlag 1968.

Verhaegen, G. (1967) 'The Incentive Factor in Peasant Agriculture'. Unpublished M.Sc Thesis L.S.E. 1967.

Viggiani, D. (1956) 'The Rate of Farm Credit in Development Programmes'. Ind. JA.E. vol. 2(2) pp 86-7.

Webster, J.P.G.W.(1972) 'Effect of Short-term Cash Shortage on choice of small holding Farming System'. East Afric. Agric. and Far. J. Vol. 37(4) 1972.

Wharton C.R. (1962) 'Marketing, Merchandizing and Moneylenders: A note on Middle men Monoposony in Malaya'. Malayan Econ. Rev. Vol. 7 (2) pp 34-5

Wharton, C.R.(1970) ed 'Subsistence Agriculture and Economic Development'. Aldine Publishing Company, Chicago (1970).

World Bank (1974) 'Agricultural Credit'. World Bank Paper - Rural Development Series. April 1974.

Wynne, R.F. (1965) 'A Note on Costing Water Supply for Irrigation'. Sudan Agric. J. Vol 1 (1) page 37-46.

Wynne, R.F. (1968) A case for Increased Tenant Autonomy in the Gezira (Sudan) Sudan J.A. Vol 4 pp 18-31.

" " " (1971) 'Prospects for the Further Development of the Water Resources of the Nile Ba in'. African J. of Rur. Develop. Vol.4. pp.37-66.

Yang, H.P. (1955) 'Fact finding with Rural People: A guide to effective social surveys'. Agricultural Development Paper No.52. F.A.O., Rome, Italy (1955).

Yang, W.Y. (1965) 'Farm Management Investigation'. (revised edition). Agricultural Development Paper No. 80. F.A.O. Rome, Italy (1965).

.tes, F. (1960) 'Sampling Methods for Censuses and Surveys'. 3rd Edition 1960.

A P P E N D I C E S

Appendix A (1)

Farm Level Survey

A. General Attributes

A.1 Name of tenant_____

Name of village_____

Name of Block_____

1. Marital Status_____

2. Sex_____

3. Age_____

4. Education_____

A.2 Household structure and composition

No.	Name	Relation-ship	Age	Marital Status	Level of education	Occupation	Payments Cash Kind

B. Allocation of labour and expenses

B.1 Allocation of family labour

B.1-1 Farm work

Crop_____ Variety_____ Area_____

Period From To	Operation	Materials and Implements	Hours of work Men	Women	Children	Total in man-hour equivalents

B.1.2. Allocation of Family Labour for non-farming committments and work in non-farming time.

Period From To	Name	Type of Work	Place of work	Hours worked Men	Women	Children	Earnings Cash	Kind	Trial No.2 Hours worked

B.2. Allocation of hired labour and expenses

Crop . . . . . Variety . . . . . Area . . . . . .

Period From to	Operation	Implement	Working Force MEN Hrs.	MEN wage per unit Ls	MEN Amount Cash Ls	MEN Amount paid Kind Ls	WOMEN Hrs.	WOMEN wage per unit Ls	WOMEN Amount Cash Ls	WOMEN Amount paid Kind Ls	CHILDREN Hrs.	CHILDREN wage per unit Ls	CHILDREN Amount Cash Ls	CHILDREN Amount paid Kind Ls

Total Number of hours worked	Total Payments made LS Cash	Total Payments made LS Kind	Arrears Ls.

B.3 Allocation of Group Labour and Expenses

Crop . . . . . Variety . . . . . Area . . . . . .

Period From to	Operation	Implements Used	Hours worked by Men	Women	Children	Total No. of hours worked	Expenses Cash	Kind-	

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es
able crops expenses
... Variety ..... Area .....

Source	Quantity	Price Ls.	Value Ls.	Amount Paid Ls.		Date of Payment	Arrears
				Cash	Kind		

C.1.2. Livestock expenses (including poultry)

Period From to	Type of Livestock	No.	Feed: Nature of feed	Feed: Source of feed: Farm: Quantity	Farm: Value Ls.	Purchased: Quantity	Purchased: Value Ls.	Purchased: Source	VET Expenses Ls	Rearing Expenses Ls.	Taxes Ls.	Other Expenses Ls.	Payments made: Cash Ls	Payments made: Kind Ls	Date of Payment	Arrears Ls

C.2 Family Expenses

Period From to	Item of Expenditure	Source	Quantity	Price Ls	Value Ls	Payments Cash Ls	Payments Kind Ls	Total amount paid Ls	Arrears Ls

Items of expenditure include; food, clothing, shoes, purchase of domestic utensils and equipment, other goods, transport, services, gifts, other consumption expenditure.

D. Returns from farming.

D.1. Farm crops

D.1.1. Output

Period From to	Crop	Variety	Area Cultivated (feddans)	Quantity Produced	Quantity in store	Total

D.1.2. Crop Use

Period From to	Sales Quantity	Sales Value Ls.	Paid to labour Quantity	Paid to labour Value Ls	Family use Quantity	Family use Value Ls	Farm Use Seeds Quantity	Farm Use Seeds Value Ls	Farm Use Feed Quantity	Farm Use Feed Value Ls	Total Quantity	Total Value Ls	Stored Quantity	Stored Value Ls	Total Value Ls

D.1.3. Crop Sales

Crop . . . . . Variety . . . . . Area . . . . . .

Period from to	Quantity sold	Price Ls	Value Ls	Time of sale	Type of Buyer	Place of Buyer	Amount received Ls Cash	Kind	Arrears Ls.	

D.1.4. Crops by-products.

Crop . . . . . By-product . . . . . .

Period From	to	Sales Quantity	Price Ls.	Value Ls.	Amount Received	Type of Buyer	Farm Use Quantity	Value Ls.	Family Use Quantity	Value Ls.	Stores Quantity	Value Ls.	Total Value Ls.

D.2 Livestock

D.2.1. Structure

Period From To	Type of livestock	Owned No.	Owned Value Ls.	Purchased No.	Purchased Value Ls.	Births No.	Gifts No.	Gifts Value Ls.	Sold No.	Sold Value Ls.	Slaughter No.	Death No.	Stock

D.2.2. Livestock products

Period From	To	Type of Livestock	Milk						Manure			
			Family		Sold		Processed		Farm Use		Sold	
			Quantity	Value Ls.	Quantity	Value Ls.	Quantity	Value Ls.	Quantity	Value Ls.	Quantity	Value Ls.

Eggs				Total Value
Family		Sold		
Quantity	Value Ls.	Quantity	Value Ls.	

E. Assets and Liabilities

E.1 - Position

Date . . . . . .

ITEMS	Quantity or Number	Age and Condition	Production Life	Value Ls.
Current assets:				
1. Cash in hand				
2. Other savings deposits				
3. Value of goods in shops				
4. Shares in co-operative societies				
5. Value of crops and crops products in store				
6. Value of supplies of feeds and fertilizers in store.				
7. Accounts receivable from sale of cotton				
Others . .				
Intermediate and Fixed assets:				
1. Livestock and poultry				
2. Machines and transport facilities				
3. Implements, simple tools and vehicles for personal use				
4, Perennial gardens				
5. Other investment				
6. Furniture				
7. Buildings and dwellings				
8. Land				
Liabilities:				
1. Debts in SEB				
2. Debts to Shail merchants				
3. Debts to others				
4. Debts in long term loans				

E.2 Assets - Sales and Purchases

Type of Asset	Purchases			Sales			Hire Cost
	No.	Value Ls.	Amount Paid Ls.	No.	Value Ls.	Amount Paid Ls.	

F. Other Income

Period From To	Income from activities outside the farm (Ls.)	Remittances Ls.	Gifts Ls.	Others Ls.	Others Ls.	Total Ls.

G. Credit Operations

G.1 Borrowing

Period From To	Credit Agency	Place for Work	Occupation (if private)	Relationship (if private)	Amount Borrowed Rs. Cash	Amount Borrowed Rs. Kind	Date of Borrowing	Use to which Borrowed Funds were put	Security Offered	When to Repay	How to Repay Cash	How to Repay Kind	Interest Rate to be charged

G.2 Advances

Period From	To	Agency giving Advances	Initial Debt to this Agency	Amount of Advances Ls. Cash	Kind	Date	Purpose of the advance

G.3 Repayment Record

Period From To	Amount Repaid Ls.	Mode of Repayment Cash Kind	Date of Repay	Source from which repaid money was raised	To whom repaid	Place of his work	Occupation (if private)	Relationship (if private)	Out-standing debt Ts.	When to Repay	How Cash	Kind	Interest Rate

G.4 Shail Transaction

Period From To	Transaction (Crop)	Quantity shailed	Price Ls.	Type of Buyer	Relationship if any	Nature of payment and amount received Ls. Cash	Kind

G.5 Lending:

Period From To	Occupation of Borrower	Place of work	Relationship if any	Amount lent Ls. Cash	Kind	Date of lending	Purpose for which loans were made	Sources from which you raised funds	Interest rate or terms of lending

G.6 Recovery:

Period From To	Occupation of borrower	Place of Work	Relationship	Amount received Ls. Cash	Kind	When	Outstanding Debt	When tc be repaid	Form you like it to be repaid in Cash	Kind - (specifying)

H. Savings

Period From	Period To	Form of Savings	Amount Saved Ls.	Where	Purpose for which it will be used

I. Ruling prices

Date	Crop	Unit	Shail Price Ls.	Village Price Ls.	Price in nearest town Ls.

J. Attitude towards the various credit sources Date .....

Statement	Yes	No
Do you lend money?		
If yes, state the form you like it to be repaid in.		
Why?		
Do you borrow from Shail Merchants?		
If yes, is it because:		
1. He lives in the village		
2. He is your relative		
If yes, what is the relationship		
3. He has authority in the village		
If yes, what type of authority?		
4. He satisfies your needs at any time		
5. He transports your farm produce		
6. He markets your crops		
7. He does not insist on collateral security		
8. You can repay at your ease		
9. He takes no action against you if you default. If no, what type of action he normally takes.		
10. Do you expect him to write off the debt		
11. Is it because you do not know any other source of credit.		
If no, is it because:		
1. You do not know how to obtain credit from this source		
2. Of routine involved in withdrawals		
3. The source is far from the village		
If yes, what is the distance?		
4. The source insists on collateral security		
5. The source charges high interest rate		
If yes, what interest rate does it charge?		
Are you a member of a co-operative society?		
If yes, name and type of society		
If no, would you like to be a member of a co-operative society?		
If yes, what type of co-operative society?		
If a member, or likes to be a member, is it because the co-operative society		
1. Gives credit		
2. Satisfies all your credit needs		
3. Transports your crops		
4. Markets your crops		
5. Gives advice in production		
6. Does not insist on repayment		
7. You can escape repayment		
8. Do you like to escape repaying		
If not a member but likes to be a member state why you can not join.		

	Yes	No
If not a member and does not like to be a member, is it because:		
1. The co-operative does not repay in time		
2. It does not obtain good prices for your produce		
3. The leaders of the co-operative are corrupted		
4. You can not market your crop through the co-operative		
If yes, why		
5. Other reasons		

BLANK IN ORIGINAL

C. Credit Operations

C.1 Borrowing and Repayment

Date . . . . . .

Initial Borrowing Ls.	Credit Agency	Occupation (if private)	Relationship (if private)	Amount Borrowed Ls. Cash	Amount Borrowed Ls. Kind	Date	Security Offered	Interest Rate	Amount repaid Ls. Cash	Amount repaid Ls. Kind	Outstanding Debt Ls.

C.2 Lending and Recovery

Date . . . . . .

Initial Lending Ls.	Name of Borrower	Occupation	Relationship	Amount lent Ls. Cash	Amount lent Ls. Kind	Date	Security Accepted	Interest Rate	Amount received Ls. Cash	Amount received Ls. Kind	Date	Out-standing debt Ls.

D. Marketing Activities

D.1 Sales

Date . . . . . .

Name of Buyer	Place	Occupation	Crop	Quantity Sold	Price Ls.	Value Ls.	Amount Received Ls.	Arrears Ls.	Debt of Buyer Ls.	Amount in Store

D.2 Purchases

Date . . . . . .

Name of Tenant (Seller)	Crop	Quantity Bought	Price Ls.	Value Ls.	Date	Amount Paid Ls. Cash	Amount Paid Ls. Kind	Residue	Debt of Seller Ls.

E. Attitudes towards Lending and Marketing of Agricultural Products Date .....

	Yes	No
I. Do you own all the money and assets you have If NO, then; 1. What proportion do you own 2. To whom does the rest belong --- 3. What relation do you have with these people --- 4. Have you any other source of income? If YES, then; Source — Annual Amount 1. ---------- ---------- 2. ---------- ---------- 3. ---------- ----------		
II. Do you buy any crop or crop by-product from the tenant? If YES, then; 1. What crops do you buy 2. Do you pay all value at or after harvest? If NO, then; Do you pay all before harvest? If YES, when If NO, what proportion to value do you pay --- --- 3. How do you determine the price every time you buy?		
II. If you buy do you sell the crops you buy away from the village? If YES, then; 1. Place of destination 2. To whom do you sell it 3. Do you usually sell it to this buyer? If YES; a. Do you agree beforehand on selling him a certain quantity of crop? b. What is the price at that time c. Does the buyer pay some money in advance? i. If Yes, what proportion to total ii. Other reasons for selling to this buyer --- ---		
IV. Do you lend money to tenants? If Yes, is it because: 1. They usually repay 2. You could compel them to sell some of their produce to you in this way 3. Of social obligations 4. There are no other opportunities for investment. If No, what are these opportunities and the expected returns from them --- ---		

	Yes	No
V. Do you like lending money?		
If No, is it because;		
1. You have slender reserves		
2. Of high default		
3. Of risk involved		
4. Other reasons		

Appendix 2A-3

Survey of Tenant Members of the Agricultural Marketing and Credit Cooperative Societies in the Gezira Scheme

A. General:

Name : .....

Age : .....

Sex : .....

Level of Education: .....

Membership : .....

Date of Registration: .....

Shares: No. ..... Amount: .....

Members only.....member of B. of Directors .....

B- Reasons for Joining the Coop.:.....

Goal	Opinion			To what extent you feel that these goals have been met		
	Yes	No	DN	to a great extent	to some extent	to a little or no extent
1. Economic Goals:						
a. To transport my produce	1	2	3	A	B	C
b. To market my crops	1	2	3	A	B	C
c. To obtain services:	1	2	3	A	B	C
i. Gives advice in production	1	2	3	A	B	C
ii. Gives credit in kind	1	2	3	A	B	C
iii. Gives credit in cash	1	2	3	A	B	C.
iv. Don't insist on repaying	1	2	3	A	B	C
v. I can escape repaying	1	2	3	A	B	C

Goal	Opinion			To what extent you feel that these goals have been met		
	Yes	No	DN	to a great extent	to some extent	to a little or no extent
2. Moral Goals:						
a. Spread message of cooperation						
b. Raise socio-economic level of tenants						
c. Village progress						
3. Other Reasons						
a.						
b.						

C- Belief Variables

C-1 Members belief in Cooperation and Cooperatives

Statement	Opinion
1. The members of our Cooperative society like to cooperate and help each other	A 1 2 3 4 5 D
2. Cooperatives provide opportunities for earning higher farm incomes	A 1 2 3 4 5 D
3. Our cooperative society enabled us to replace the middlemen and improved our bargaining position as farmers	A 1 2 3 4 5 D
4. Our cooperative provided us with a useful channel for propagating ideas for the improvement of our methods of cultivation and marketing	A 1 2 3 4 5 D
5. Cooperatives serve as a useful means of extending credit to tenants	A 1 2 3 4 5 D
6. Mutual assistance	A 1 2 3 4 5 D
7. Cooperatives reduce the harm effects of shail	A 1 2 3 4 5 D

C.11- Members belief in Individualism

Statement	Opinion
1. I wish I have not joined this cooperative	A 1 2 3 4 5 D
2. If I were given the chance to leave this scheme; I would have left without hesitation	A 1 2 3 4 5 D
3. The members of our cooperative are selfish	A 1 2 3 4 5 D
4. The members are always in disagreement with each other	A 1 2 3 4 5 D
5. The members are always jealous of each other	A 1 2 3 4 5 D
6. Members do not handle their produce to cooperative	A 1 2 3 4 5 D
7. Members do not repay	A 1 2 3 4 5 D
8. Cooperative do not advance credit nor repay profits in time	A 1 2 3 4 5 D

D- Opinion and attitudes towards the Cooperative

Attitudinal Statements	Opinion
1. Joining a Cooperative helps to increase income (ready cash)	A 1 2 3 4 5 D
2. Joining a Cooperative restricts dealing with shail operators	A 1 2 3 4 5 D
3. Joining a Cooperative helps to reduce indebtedness	A 1 2 3 4 5 D
4. Joining a Cooperative allows me to get better prices for my produce (Coop. price market price)	A 1 2 3 4 5 D
5. Joining a Cooperative helps to increase my production by providing me with services that I won't be able to obtain otherwise	A 1 2 3 4 5 D
6. Joining a Cooperative reduces marketing costs	A 1 2 3 4 5 D
7. Our cooperative would be more beneficial if were a multi-purpose rather than a single-purpose society	A 1 2 3 4 5 D

Attitudinal Statements	Opinion
8. The Agricultural Bank is indifferent to the needs and viewpoints of our cooperative	A 1 2 3 4 5 D
9. Lack of education and inadequacy of training hampered progress of our cooperative	A 1 2 3 4 5 D
10. There is no official sponsorship	A 1 2 3 4 5 D
11. The Cooperative is indebted	Yes No

If Yes, to whom.....

.....

Why do you think .....

.....

E- Satisfaction Factor

How efficient:	Very efficient	Some what efficient	Little or inefficient
1. The cooperative in marketing your products	1	2	3
2. The cooperative administration	1	2	3
3. The Board of Directors	1	2	3
4. The Officers	1	2	3
5. How satisfied with the cooperative in general	Very well	Only satisfied	little or not satisfied at all

I. Reasons for inefficient marketing: Yes No

1. Giving crops to middlemen on credit
2. Crops sold in absence of official in charge
3. Favouritism in crop sales of some members
4. Inefficient control on sale of agricultural products

	Yes	No
II. Justification for inefficient administration:		
1. Inefficient emphasis on grading of crops		
2. Disorganisation		
3. Bad control over matters		
4. Cooperative regulations not inforced ...		
5. No distribution of profits		
6. Inefficiency in calling for general meetings in time		
III. Dissatisfaction with the cooperative as a whole:		
1. Certain people use cooperative for their own interests and private benefits		
2. Thievery in cooperative		
3. Is favouritism practiced with cooperative?		
4. Lack of services provided by cooperative to members		
5. Family prejuidice		
6. Cooperative property of one family and its relatives		
7. Many members joined to serve political interests of a few people		
8. Members are dishonest and inefficient		
9. Cooperative do not pay in time		

Where money went?.....

.....

which crops are marketed through cooperative

.....

Are you able to market some of these crops outside the Cooperative? Yes No

If yes, state where and to whom .....

.....

Average cotton yield (in Kantar) in the Gezira and Manugil Extension by Block (1961/62-1970/71)

1. The Gezira Main

Group and Blocks	1st season of cropping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
South												
Hag Abdalla	1927/28	7.35	5.45	1.90	4.64	3.65	3.62	4.36	6.39	6.26	5.39	4.91
Fahal	29/30	7.11	4.64	1.68	3.53	3.78	3.69	3.56	5.65	5.90	4.46	4.43
Ghubshan	25/26	7.72	5.58	1.94	4.48	3.66	4.14	4.58	7.18	7.27	6.55	5.32
Wad Naaman	25/26	7.16	3.80	1.64	4.39	2.79	3.27	3.54	6.43	5.78	4.50	4.33
El Hosh	21/22	7.28	4.35	1.92	4.60	2.37	2.47	3.87	6.31	6.18	5.75	4.59
El Remietab	24/25	6.75	4.58	1.89	4.39	2.73	3.02	4.00	5.73	5.13	5.37	4.36
W/El Attaya	25/26	6.69	4.11	1.83	4.21	3.75	3.92	4.14	6.07	5.33	5.52	4.56
H/El Nil	23/24	7.34	5.51	2.29	5.26	4.68	4.76	5.04	5.94	5.74	5.90	5.29
Seed Farm	25/26	8.68	5.80	2.11	5.62	4.27	5.57	5.20	7.69	7.97	6.46	5.95
Tounsa	61/62	6.38	4.91	1.74	4.23	2.27	3.25	2.74	4.90	4.91	2.99	3.84
W/El Hadad	66/67	-	-	-	-	-	4.90	4.62	6.42	6.02	5.05	+5.45
El Kavatieb	66/67	-	-	-	-	-	3.08	3.01	5.94	4.68	4.12	+4.26
Group Average		7.12	4.82	1.87	4.43	3.37	3.75	4.02	6.10	5.77	5.04	
Centre												
Barakat	1914/15	7.07	5.75	1.93	5.53	3.26	4.45	4.96	6.71	5.58	6.36	5.16
Darwish	23/24	7/68	6.18	2.43	6.35	3.62	5.23	4.29	7.25	5.71	7.81	5.65
Kumor	25/26	6.03	3.98	1.86	4.20	2.84	4.28	3.93	6.08	5.83	5.81	4.49
Radma	26/27	5.41	3.37	1.90	4.08	2.72	3.82	3.69	5.21	5.65	4.75	4.06
A/El Hakam	25/26	5.51	4.32	2.17	4.01	2.62	3.48	3.79	5.65	5.89	5.75	4.32
Medina	25/26	6.10	3.70	2.22	3.98	3.06	3.67	4.69	5.65	6.19	5.33	4.46
Tayiba	11/12	7.32	5.40	2.40	5.12	3.27	4.61	4.48	5.47	5.72	5.83	4.96
Selemi	25/26	5.74	3.94	2.30	4.33	2.35	3.86	3.29	4.71	4.66	5.15	4.03
El Tebub	26/27	6.72	3.48	2.42	4.42	2.87	4.38	4.73	4.78	5.90	5.83	4.55
W/El Bur	29/30	7.49	4.42	2.47	4.36	3.28	6.01	5.01	5.71	5.95	5.80	5.04
Group Average		6.47	4.36	2.22	4.58	2.99	4.31	4.28	5.63	5.74	5.74	4.63

+ Average for 5 years

Group and Blocks	1st season of cropping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
Messelamia												
A/Galil	1925/26	7.15	3.95	0.69	4.47	3.67	5.60	5.42	4.90	5.62	5.34	4.68
W/Saadalla	25/26	7.36	4.04	0.59	3.48	3.47	5.40	4.63	4.65	6.43	5.87	4.59
A/Rahman	26/27	7.26	3.44	0.66	3.40	4.00	5.28	4.10	5.05	6.07	4.54	4.38
W/Hussein	29/30	7.50	3.62	0.93	3.36	3.33	5.51	3.58	5.20	5.93	4.59	4.35
Nidiana	25/26	7.69	3.87	0.75	3.93	3.57	4.49	4.13	5.73	6.22	6.50	4.69
W/Sulfah	25/26	7.89	3.40	0.60	2.95	4.18	6.13	4.67	5.72	6.14	5.21	4.81
Dolga	28/29	6.81	3.47	0.98	2.36	3.65	5.01	4.94	5.66	5.08	4.89	4.25
Istnhua	28/29	6.50	3.51	0.96	2.95	3.99	5.43	3.85	5.67	4.13	4.80	4.18
Rukun	29/30	7.63	4.18	0.89	3.69	3.61	5.73	4.31	5.86	5.09	4.79	4.58
Group Average		7.31	3.72	0.81	3.34	3.72	5.39	4.35	5.60	5.52	5.15	4.49
WADI SHAIR												
Nueila	1935/36	6.24	1.92	0.46	3.13	2.84	4.81	3.65	4.89	4.77	4.68	3.76
Feteis	29/30	7.21	3.00	1.00	4.00	4.59	5.99	4.55	5.75	5.73	6.25	4.84
Amera Kasir	29/30	6.50	2.81	0.86	3.51	3.91	6.28	4.44	5.57	6.55	7.99	4.84
Keteir	29/30	6.57	4.07	0.90	3.23	3.61	5.10	4.36	5.32	5.92	6.94	4.60
Touris	37/38	5.67	3.48	0.85	2.81	2.80	4.32	3.90	4.50	4.64	5.03	3.83
Fawar	36/37	5.22	2.52	0.64	2.84	4.52	5.74	4.69	5.02	6.10	5.65	4.28
Surhan	63/64	-	-	2.68	4.00	4.24	5.54	4.92	4.56	5.72	5.85	4.82
Group Average		6.31	2.99	1.05	3.40	3.71	5.33	4.36	5.05	5.55	5.95	4.40

son ping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
	6.29	4.70	2.14	1.82	2.90	4.32	4.42	4.30	4.37	4.88	4.11
	7.40	6.01	2.12	2.98	4.13	5.62	5.31	5.42	4.90	6.10	5.00
	5.74	4.74	2.91	3.53	2.79	4.12	4.82	4.62	4.11	4.93	4.25
	7.63	6.25	3.70	3.82	4.06	4.33	5.52	6.79	5.38	5.74	5.33
	6.35	6.41	3.32	3.81	3.30	4.29	4.48	5.85	4.95	5.29	4.81
	-	-	5.53	4.15	5.33	6.80	6.53	6.30	5.95	6.32	+5.87
	4.94	3.32	1.85	2.66	1.99	3.46	3.13	2.60	3.32	3.73	+3.11
	6.65	5.64	3.01	3.45	3.54	4.42	4.62	4.90	4.51	5.09	4.58
	7.27	5.48	2.55	3.42	4.23	3.30	5.57	6.95	5.82	6.04	5.06
	6.41	5.96	2.36	3.68	3.50	3.52	4.35	5.15	4.50	5.13	4.46
	5.37	4.39	1.97	2.94	1.90	3.13	3.00	3.83	3.82	4.41	3.50
	4.85	3.50	1.80	3.13	2.37	2.61	2.26	1.85	2.93	3.35	2.89
	-	-	-	-	-	3.56	3.80	5.00	4.80	5.06	=4.41
	-	-	-	-	-	-	3.57	4.24	4.44	4.33	x4.14
	-	-	-	-	-	3.12	3.50	2.83	3.77	4.02	=3.46
	-	-	-	-	-	5.44	6.11	6.45	6.89	6.63	=6.36
	-	-	-	-	-	-	-	-	-	5.45	Ø5.45
	5.82	4.51	2.12	3.14	2.84	3.32	3.95	4.50	4.49	4.79	4.02
	-	-	-	-	-	-	4.27	5.19	3.96	4.90	4.85
	-	-	-	-	-	-	3.39	4.90	3.57	5.44	4.39
							3.85	5.01	3.77	5.68	4.62

easons Ø average for 1 season
easons = average for 5 seasons

II Maragil Extension

Group and Blocks	1st season of cropping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
HUDA												
Hamadualla	1958/59	6.18	3.09	2.01	3.33	3.61	5.16	3.94	5.47	5.79	5.49	4.40
Abu Digin	58/59	6.16	2.98	1.81	2.90	3.98	4.34	3.70	4.06	4.70	4.46	3.91
Murad	58/59	5.57	3.68	2.30	2.36	3.82	4.84	3.95	4.39	5.21	5.93	4.22
W/El Zein	58/59	6.61	5.05	3.85	3.05	4.63	6.85	4.98	5.96	6.96	7.25	5.52
Malan	58/59	5.07	3.25	2.36	3.10	3.02	4.45	3.27	3.96	4.53	4.41	3.74
S Lendi	58/59	5.46	3.45	3.29	3.19	3.36	4.13	3.57	4.37	4.70	5.24	4.08
Wad Abid	61/62	5.47	3.77	1.65	3.30	3.08	4.07	2.05	4.29	4.01	3.91	3.57
Freigab	63/64	-	-	1.26	4.02	4.57	6.31	4.86	5.37	5.22	5.70	4.77
Goz elRinied	63/64	-	-	2.33	3.15	3.10	5.71	3.72	4.56	4.41	5.68	4.12
El Naseih	67/68	-	-	-	-	-	-	2.01	4.98	4.67	4.14	+3.97
Group average		5.76	3.64	2.39	3.09	3.66	5.02	3.62	4.70	5.01	5.26	4.23
WADEL MANSI												
Gelei	1958/59	6.93	4.45	3.85	3.97	3.99	4.41	3.80	5.20	5.75	5.47	4.78
Rasel Fil	58/59	6.37	4.18	3.02	3.16	4.14	5.36	3.78	5.13	5.11	6.29	4.65
El Neima	58/59	6.23	4.96	4.52	4.83	3.72	4.54	3.50	5.05	5.35	5.38	4.81
Mabrouk	58/59	6.51	4.48	4.49	3.57	4.45	4.94	3.84	5.00	5.57	5.57	4.85
Shakir	58/59	4.56	3.91	3.69	3.82	4.39	4.19	3.87	4.43	4.36	4.72	4.19
El Gadid	59/60	6.35	3.85	2.87	1.67	4.49	4.91	4.73	5.54	5.37	5.86	4.57
El Tayif	59/60	6.58	3.93	3.06	2.85	4.19	4.02	4.19	4.68	4.66	5.19	4.34
Keremit	61/62	5.62	3.95	2.56	2.05	3.27	4.13	4.79	4.54	4.95	5.76	4.16
Group average		6.07	4.23	3.49	3.23	4.09	4.56	4.06	4.94	5.14	5.54	4.55

Group and Blocks	1st season of cropping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
MAATUG												
Maturab	1959/60	5.83	2.81	2.04	3.04	4.55	4.78	4.69	5.37	4.45	4.99	4.26
El Neur	59/60	5.18	1.81	2.56	3.01	3.26	3.90	3.87	3.62	3.43	4.55	3.54
Abu Hawa	59/60	3.95	1.70	2.21	2.17	2.87	3.37	3.09	3.91	3.17	4.26	3.08
Hashaba	59/60	5.17	3.03	2.51	2.07	3.35	4.78	4.56	5.06	4.50	4.72	3.98
Um Higleiga	59/60	5.47	2.42	2.63	2.35	3.66	4.87	4.37	5.27	4.04	5.62	4.08
Afan	60/61	4.98	2.79	2.74	1.90	3.33	5.43	3.62	6.99	4.10	5.69	4.06
Higeirat	60.61	4.58	2.07	1.99	2.78	2.75	4.23	3.79	4.86	3.17	4.04	3.42
Group average		5.18	2.42	2.41	2.44	3.38	4.53	4.00	4.91	3.86	4.88	3.83
MATURI												
Kartaub	1959/60	4.97	7.95	2.80	3.31	4.43	4.41	4.77	5.11	4.54	5.39	4.37
Agouba	59/60	4.14	2.06	2.67	2.75	3.68	4.01	3.90	4.55	3.01	5.00	3.65
El Tamad	59/60	4.81	2.41	2.48	2.64	3.58	4.09	3.91	4.74	3.20	4.86	3.69
El Zafir	59/60	4.45	1.82	1.98	2.66	3.20	3.66	3.92	4.64	3.31	5.36	3.52
El Nayir	60/61	4.59	1.40	2.18	2.97	4.27	4.75	4.88	5.50	4.21	5.58	4.04
El Jebel	60/61	4.21	1.95	2.21	3.56	3.67	4.11	4.14	4.87	4.07	5.30	3.83
Um Seneita	60/61	3.60	1.99	1.88	3.74	3.03	3.57	3.73	4.21	3.16	4.88	3.39
Group average		4.33	2.10	2.26	3.11	3.62	4.04	4.13	4.78	3.67	5.18	3.72

Group and Blocks	1st season of cropping	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	Average for 10 years
Samousi												
Rahama	1960/61	4.19	2.06	2.20	4.17	3.81	4.89	4.67	5.55	3.98	5.42	4.07
Dishienat	60/61	5.56	2.87	2.62	3.62	3.99	4.84	4.62	5.47	4.00	5.45	4.30
El Keheid	61/62	5.35	3.12	3.22	4.51	3.49	6.11	4.95	5.87	4.52	5.46	4.65
Gabouga	61/62	6.26	4.79	3.47	5.62	4.73	5.93	5.73	6.36	6.56	6.53	5.59
Abulikalik	61/62	5.35	2.73	2.96	4.25	3.09	5.31	4.61	5.21	4.45	5.41	4.34
Kaujouk	61/62	5.59	4.25	3.21	5.61	5.54	6.59	5.20	7.07	6.77	7.00	5.68
Tuweimat	61/62	6.01	4.13	3.27	5.16	3.75	4.58	4.54	6.51	5.50	6.68	5.11
Kuwait	68/69	-	-	-	-	-	-	-	6.55	7.33	7.78	7.23
Wagialla	68/69	-	-	-	-	-	-	-	6.83	7.56	7.92	7.48
Sagadi	68/69	-	-	-	-	-	-	-	7.97	8.60	10.71	9.05
El Waha	69/70	-	-	-	-	-	-	-	-	9.01	9.78	9.54
Group average		5.46	3.37	2.97	4.65	9.00	5.45	4.91	6.28	5.98	6.86	5.14
Tahameed												
Beida	1960/61	5.66	3.02	3.12	2.98	3.89	3.97	3.08	4.33	3.72	4.57	3.84
El Tar	59/60	5.53	3.22	2.48	2.86	3.24	3.45	2.83	3.53	2.48	4.25	3.40
Shiweirif	62/63	-	4.30	2.73	3.59	4.82	5.05	3.65	4.27	4.04	5.02	4.16
Um Shadida	62/63	-	5.42	2.88	4.04	6.53	6.22	4.84	5.23	5.45	5.58	5.13
Meheila	62/63	-	5.41	3.43	4.38	6.17	6.40	4.96	5.72	5.87	6.01	5.37
El Nala	62/63	-	6.46	3.20	4.77	6.00	7.27	5.26	5.29	5.91	5.49	5.52
Group average			4.61	2.97	3.74	5.03	5.33	4.05	4.72	4.51	5.12	4.45
Average for the Gezira and Managil Extension		6.02	3.85	2.30	3.55	3.67	4.60	4.18	5.21	5.04	5.41	4.41

Average value of assets owned by type and by individual tenant farmers (in Ls.)

Code No.	Current Assets							
	Cash in hand	Other Savings	Value of goods in shops	Shares in Co-op Societies	Value of crops and crops products in store	Value of feeds and fertilizers in store	Accounts Receivable from sale of cotton	Total Current Assets
1	16.76						28.37	45.13
5							12.10	12.10
6							40.95	40.95
9		1.00					5.65	15.65
10	16.00				12.00		30.35	48.35
12	10.00						11.10	21.10
17	7.00						31.74	38.74
25				-	-	-	25.05	25.04
26	4.00			-	-	-	9.73	13.73
27				-	4.00	-	25.12	29.12
28				2.00	-	-	9.26	11.26
29	1.00						24.24	25.24
31	2.00			2.00			31.34	35.34
32							30.15	30.15
33							83.80	83.80
37	5.00			1.00			51.20	57.20
39	3.30						9.27	12.57
40							74.30	74.30
41				2.00			39.41	41.41
43	40.00	70.00	80.00	5.00			67.18	262.18
49							15.64	15.64
53	90.00						37.38	127.38
55							178.59	178.59
57	1.50				4.00		187.36	192.86
59							73.96	73.96
61	1.20						8.50	10.70
62	0.60						32.00	32.60
63							27.45	27.45
65	2.00						19.20	21.20

Code No.	Cash in hand	Other Savings	Value of Goods in shops	Shares in Co-op Societies	Value of crops and crops products in store	Value of feeds and fertilizers in store	Accounts receivable from sale of cotton	Total Current Assets
66	20.00				5.00		40.70	420.70
67	1.00						7.30	8.80
69							22.00	22.00
70	1.00				3.00		11.00	115.00
78	20.00		50.00	3.00			41.50	114.50
79	3.50						159.20	162.70
80	15.00				10.00		133.30	163.30
81							108.10	108.10
83	4.00						91.60	95.60
84	4.00						57.00	61.00
85							12.89	12.89
87	13.00						60.86	73.86
88	6.00						23.11	29.11
89	2.00				12.00		50.55	64.55
91	15.00				10.00		79.55	104.55
92	22.00						12.27	34.27
93	10.00				12.00		62.52	84.52
94	1.00				14.00		65.37	80.37
95							30.95	30.95
2	14.00				24.75		66.55	105.30
7	130.00				53.70		41.80	455.50
8	250.00						9.35	259.35
30	10.00			35.00	40.00		26.02	111.02
44	5.00			2.00			137.86	144.86
46	5.00			2.00			115.46	122.46
48	3.00			4.00	19.00		151.67	177.67
68	15.00				12.00		49.60	76.60
72	20.00	20.00					134.08	174.08
90	105.00				8.00		74.85	187.85

Code No.	Current Assets								
	Cash in hand	Other Savings	Value of Goods in Shops	Shares in Co-op Societies	Value of crops and crops products in store	Value of feeds and fertilizers in store	Accounts Receivable from sale of cotton	Total Current Assets
4	12.00				6.00		13.45	31.45
35	3.00			2.00	48.00		54.59	107.59
36	50.00	25.00	100.00		27.00		34.44	236.44
75	10.00			3.00			134.50	147.50
86	50.00		114.00				104.72	284.92
3	75.00		500.00		200.00		15.10	790.10
34	200.00				45.00		71.06	466.60
54	50.00		440.00				33.83	523.83
58	31.50		325.00				85.24	841.74
3				3.00			81.17	84.17
14	5.00	5.00		6.00			83.28	109.28
15							4.38	4.38
18	5.00			2.00			11.58	18.58
21	15.00				12.00		87.37	114.37
22				1.00	9.00		50.93	60.93
38				1.00			14.29	15.29
42	2.00			2.00			14.79	18.79
45	10.00			2.00			34.70	46.70
51	1.75					7.50	167.95	177.20
52	2.50						15.61	18.11
56	10.00						142.58	152.58
11	11.21						122.50	133.71
64	6.00				6.00		163.39	175.39
71	2.00						71.29	73.29
73	7.00			3.00			77.90	87.90
77	15.00		60.00	3.00			77.65	155.65
15	25.00				12.00		17.39	54.89
20	30.00				34.75		101.39	166.14
76				8.00	8.00		137.00	153.00

Code No.	Current Assets: Cash in hand	Other Savings	Value of goods in shops	Shares in Co-Op Societies	Value of crops and crops products in store	Value of feeds and fertilizers in store	Accounts Receivable from sale of cotton	Total Current Assets
*19	400.00		550.00		60.00		321.48	1331.48
23	63.00				8.00		36.64	104.64
47			50.00	1.00			51.00	102.01
24	140.00				47.00		307.76	
50	2.00						113.44	
60	17.00				25.00		276.61	
74	40.00				20.00		42.40	
82					5.60		304.40	

*The value of an asset item represents the average of the opening and closing valuation.

Average value of assets owned by type and by individual tenant farmers (in Ls.)
Intermediate and Fixed Assets:

Code No.	Livestock and Poultry	Machines and transport facilities	Simple Implements and Tools	Permanent Gardens	Other Investment	Furniture	Buildings	Land	Total Intermediate and Fixed Assets	Total Assets
1	96.00		4.20			12.00	40.00		152.00	197.33
5	267.50		1.40		1.50	31.00	70.00		371.40	383.50
6	83.60		3.60			35.40	60.00		182.00	222.95
9	29.70		16.80			35.00	38.70		118.80	134.45
10	148.40		4.80			79.00	123.10		355.50	403.65
12	300.00		4.00			43.50	220.00		585.50	601.60
17	74.80		2.75			40.00	90.00	11.20	218.75	257.49
25	45.00		1.90			25.60	24.00		77.70	102.74
26	57.20		1.45			16.00	15.80		93.45	107.18
27	53.00		2.50			22.00	150.00		227.50	256.62
28	-		1.20			8.75	7.00		16.95	28.21
29	6.25		1.65			43.00	100.00		150.90	176.14
31	25.00		2.50			59.00	100.00		186.50	221.84
32	10.50		3.20			53.00	150.00		216.70	246.85
33	69.50		2.80			14.00	30.00		116.30	200.10
37	9.00		2.50			30.00	150.00		191.50	248.70
39	11.00		1.30			10.00	30.00		52.30	64.87
40	83.00		1.05			27.00	110.00		221.05	295.35
41	13.50		2.65			120.00	300.00		436.15	477.56
43	-		1.10			78.00	70.00		149.10	411.28
49	-		1.25			19.00	25.00		45.25	60.89
53	113.00		2.30			43.00	75.00		233.30	360.68
55	70.00		1.70			32.00	90.00		193.70	372.29
57	45.50		3.01			32.00	100.00		180.51	373.37
59	20.90		2.50			31.00	41.00		95.40	169.36
61	57.74		2.06			25.00	22.00		106.80	117.50
62	30.15		4.05			20.70	30.00		84.90	117.50
63	29.00		4.00			19.50	30.00		82.50	109.95
65	182.10	115.00	3.50			35.00	109.00		444.60	465.80
66	62.00		2.30			48.00	77.00		189.30	610.00

Code No.	Intermediate and Fixed Assets: Livestock and Poultry	Machines and transport facilities	Simple Implements and tools	Permanent Gardens	Other Investment	Furniture	Buildings	Land	Total Intermediate and Fixed Assets	Total Assets
67	13.00		1.35			15.90	45.00		72.25	184.05
69	75.00		3.60			18.50	35.00		133.10	155.10
70	34.50		2.20			15.40	60.00		112.10	227.10
78	293.00		4.85			80.00	85.00		462.85	577.35
79	284.50		3.50			33.50	86.00		407.50	570.20
80	317.00		4.10			41.50	68.00		430.60	593.90
81	191.00		4.25			39.40	71.00		305.65	413.75
83	93.00		2.80			35.00	115.00		245.80	341.40
84	151.00		4.25			38.40	84.00		277.65	338.65
85	2.50		1.42			7.35	15.00		26.27	39.16
87	24.70		1.50			14.00	30.00		70.20	144.06
88	65.00		1.00			20.00	50.00		136.00	165.11
89	217.00		3.50			45.00	120.00		385.50	450.05
91	154.00		2.15			8.60	33.60		198.35	302.90
92	9.00		2.25			30.00	50.00		91.25	125.52
93	170.00		1.87			17.50	85.00		274.35	358.89
94	185.00		4.35			50.00	35.00		274.35	354.72
95	6.00		0.80			11.00	15.00		32.80	63.75
	298.75		2.50			41.50	460.00		825.25	930.55
	501.40		15.00			50.00	330.00		896.40	1351.90
	524.00		5.50			50.00	700.00	400.	1179.50	1438.85
	168.20		4,60			114.00	660.00		946.80	1057.82
	8.00		2.50			101.00	500.00		611.50	756.36
46	210.00		2.60			87.60	508.00		808.20	930.66
48	10.00		20.00			230.00	810.00		1070.00	1247.67
68	342.00		1.00			38.00	300.00		681.00	757.60
72	439.80	110.00	2.75			43.50	270.00		866.05	1040.13
90	236.60		3.20			60.00	250.00		549.80	737.65

Code No.	Intermediate and Fixed Assets									Total Assets
	Livestock and Poultry	Machines and transport facilities	Simple Implements and tools	Permanent Gardens	Other Investment	Furniture	Buillings	Land	Total Inter-mediate and Fixed Assets	
4	390.00	400.00	3.00			55.00	600.00		1429.00	1460.45
35	259.00		2.50			52.75	561.00		657.25	764.84
36	82.50		2.55			58.50	190.00		329.05	565.49
75	227.50	105.00	1.65			57.50	136.00		577.15	764.65
86	162.50	120.00	4.20			27.40	139.00		440.60	725.52
3	430.00	4000.00	10.00			80.00	575.00		5095.00	5885.10
34	1140.50	6210.00	5.00		750.00	427.00	920.00		9452.00	9918.60
54	44.00		1.00			116.00	159.00		320.00	843.83
58	36.00		2.45			105.00	350.00		493.45	1335.19
13	70.00		2.35			61.00	250.00		383.35	467.52
14	158.00		3.95			75.70	184.00		421.65	530.93
16	7.50		1.89			40.00	295.00		344.39	348.77
18	149.50		1.50			50.00	170.00		341.00	389.58
21	27.00		2.25			121.75	204.00		355.00	469.37
22	113.00		2.05			21.00	70.00		206.05	266.98
38	18.00		4.50			85.00	30.00		407.50	422.79
42	20.50		3.80			25.00	100.00		149.30	168.09
45	43.00		5.35			84.00	100.00		232.39	279.05
51	35.20		5.20			23.00	50.00		113.40	290.60
52	61.00		4.50			38.00	60.00		163.50	181.61
56	44.00		5.25			40.25	50.00		139.50	292.08
11	71.50	207.59	6.90			130.51	200.00		616.50	750.21
64	14.60		3.35			34.00	63.00		114.95	290.34
71	7.00		1.20			29.20	160.00		197.40	170.69
73	345.00		3.20			61.25	88.00		497.45	585.35
77	650.00		2.80			30.50	72.00		170.30	325.95
15	19.00		7.00			100.00	800.00	320.00	1246.00	1300.89
20	32.00		3.00			158.00	300.00		493.00	659.14
76	313.00		4.00			87.00	229.00		633.40	786.40

Code No.	Livestock and Poultry	Machines and transport facilities	Simple Implements and Tools	Intermediate and Fixed Assets: Permanent Gardens	Other Investment	Furniture	Buildings	Land	Total Intermediate and Fixed Assets	Total Assets
*19	117.00	9000.00	7.50			850.00	1000.00		11012.00	13343.48
23	248.00	1000.00	3.00			51.00	200.00		1482.50	1587.14
47	252.00	100.00	2.00			138.00	360.00		*933.01	933.01
24	560.00	-	630.47	1500.00		220.00	950.00			
50	144.20	-	5.05			120.00	80.00			
60	374.00	-	4.50			240.00	790.00			
74	150.00	5250.00	2.70			131.00	167.00			
82	560.00	5750.00				410.00	707.00			

*The value of an asset item represents the average of the opening and closing valuation.

Appendix 3B

Relation between maximum credit requirement and value of assets, farm income, off-farm income, type of farming and area cultivated.

Equation No.	Dependent variable	Linear Equation-s Intercept K	Regression Coefficients B's	Multiple correlation coefficient K2
1	Y	36.55	- 0.055 x1 (-4.38)*	17
2	Y	37.48	- 1.03 x2 (-2.19)**	4
3	Y	37.44	- 2.19 x3 (-5.83)*	27
4	Y	30.70	+6.14 xy (1.16)*****	0.2
5	Y	10.66	+ 1.13 x5 (3.97)*	14
6	Y	4.79	- 0.038 x1 -0.043 x2-1.66x5 +6.61x4 +1.82x5 (-2.41)** (-1.03) (-3.37)* (1.78)**** (8.3)*	59
7	Y	35.92	-0.0407 -2.08x3 + 6.17x4 (-0.20) (-3.26)** (1.27)*****	27

Variables
Y = maximum credit requirement in Ls.
x1= value of assets in Ls.
x2= farm income in Ls.
x3= off-farm income in Ls.
x4= type of farming ie. vegetable and non-vegetable growers (during variable)
x5= area cultivated in fodders

Level of significance
* variable statistically significant at 0.1% level
** " " " 1% "
*** " " " 5% "
**** " " " 10% "
***** " " " 25% "

Variables with no subscript are not statistically significant

Figures in brackets denote the computed t-value.

Appendix 3-C

Labour availability and use by crop, by time period and by farm group

Group I - NV LAS FYT

Period (half Months)	Family labour used for the Production of: Cotton	Groundnuts	Dura	Wheat	Vegetables	Total family labour used	Hired labour used for the Production of: Cotton	Groundnuts	Dura	Wheat	Vegetables	Total Hired Labour used	Total labour used	Available Family Labour
						(In Man/hour equivalents)								
June														
1-15							3.75	2.31				6.06	6.06	226.80
16-30			3.02			3.02	2.62	12.47				15.09	18.11	226.80
July														
1-15		2.31	17.80			20.11	39.18	13.63	12.47			65.28	85.39	234.36
16-31	4.81	0.17	11.47			16.45	49.09	24.46	21.18			94.73	111.18	180.56
August														
1-15	63.59	3.45	17.84			84.88	155.89	13.95	46.62			216.46	301.34	180.56
16-31	32.18	0.27	14.92			47.37	85.44	6.00	6.59			98.03	145.40	180.56
September														
1-15	30.56	0.19	6.59			37.34	92.51	4.23				96.74	134.08	214.05
16-30	15.91	2.70	3.06			21.67	45.70	1.28				46.98	68.65	234.00
October														
1-15	26.81	1.93	3.20	0.71		32.65	92.79	2.66		0.55		96.00	128.65	180.56
16-31	14.92	0.61	1.49	2.83		19.85	23.34	0.28	6.63	1.85		32.11	51.96	180.56
November														
1-15	21.64	0.39	25.51	5.35		50.89	15.71	0.21	17.04	9.95		42.92	93.81	174.75
16-30	5.80	0.32	1.06	6.11		13.29	2.05		64.82	2.49		69.36	82.65	174.75
December														
1-15	10.40	4.10	6.41	9.39		30.30	1.20	5.16	11.75	3.23		21.39	51.69	180.56
16-31	5.59	2.15	1.38	5.40		14.52	4.95	3.79	.08	1.13		9.95	24.47	276.68
January														
1-15	35.15	4.90		5.07		45.12	92.80	13.56	1.20	1.93		109.55	154.67	240.25
16-31	26.17	0.17		2.62		28.96	197.48	15.41	.85	1.11		214.00	242.96	240.25
February														
1-15	55.38			2.88		58.26	179.94	2.10		1.43		183.47	241.73	224.75
16-28	38.97			1.34		40.31	231.01			1.05		232.07	272.38	224.75
March														
1-15	40.60			0.33		40.93	204.76			0.63		205.39	246.32	240.25
16-31	25.04					25.04	99.16			0.13		99.29	124.33	276.68

Period (half months)	Family Labour used for the Production of: (In Man/hour equivalents)					Total family labour used	Hired Labour used for the Production of: (In Man/hour equivalents)					Total Hired Labour used	Total Labour available	Family Labour used
	Cotton	Ground-nuts	Dura	Wheat	Vegetables		Cotton	Ground-nuts	Dura	Wheat	Vegetables			
April 1-15													226.80	
16-30													226.80	
May 1-15													234.36	
16-31	31.19					105.04						110.76	135.80 234.36	3.02
June 1-15													308.10	
16-30		2.20				54.07	12,60					14.92	51.47 308.10	
July 1-15													318.37	
16-31		9.19				124.57	154.71						260.23 276.03 258.23	
August 1-15		7.98				114.01	117.97					3.20	483.44 510.54 258.23	
16-31		7.76				26.47	22.05					1.49	251.95 302.51 258.23	
September 1-15		3.85				28.14	83.82					23.51	294.98 338.24 259.20	
16-30		2.42				21.31						1.06	127.74 162.19 324.00	
October 1-15		2.75				0.49	6.66					0.41	38.25 87.56 258.23	
16-31		0.39				0.43	32.78	6.39				1.38	43.28 56.53 258.23	
November 1-15							102.14	5.07					125.38 140.31 249.90	
16-30						0.22	80.80						100.73 140.79 249.90	
December 1-15						13.16	19.31						47.45 60.05 258.23	
16-31						30.68	4.90	12.31					73.85 93.14 390.60	
January 1-15						62.27		5.12					218.08 247.40 312.15	
16-31								5.12					376.35 393.39 312.15	

Period (half months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In man/hour equivalents)													
February														
1-15	5.31			4.36		9.67	485.69			7.43		493.12	502.79	292.02
16-28	29.26			0.26		29.52	433.30			4.56		437.86	467.38	292.02
March														
1-15	12.04					12.04	369.22					369.22	381.26	312.15
16-31	17.70			3.55		17.70	257.95			0.94		257.95	275.65	390.60
April				7.01						0.94				
1-15														308.10
16-30				0.39										308.10
May														
1-15	17.46					17.46	182.20					182.20	199.66	318.37
16-31							227.50					227.50	227.50	318.37
Group III - NV MAS FYT														
June														
1-15														306.00
16-30									2.00			2.00	2.00	306.00
July														
1-15			7.75			7.75			4.50	13.35		20.85	28.60	268.77
16-31			18.00			18.00	67.13		60.05	67.25		194.43	212.43	268.77
August														
1-15	8.43		6.85			15.28	177.97		2.50	71.20		25.67	266.95	268.77
16-31	13.43		17.95			31.38	133.57			14.95		148.52	178.90	268.77
September														
1-15	32.93		1.50			34.43	141.80			10.55		152.35	186.78	306.00
16-30	3.72		2.20			5.92	45.28					45.28	51.20	267.75
October														
1-15	39.98		2.85	2.33		42.83	81.93					81.93	124.76	268.77
16-31	11.47			7.16		19.03	45.86				2.78	48.64	67.67	288.77
November														
1-15	24.70			6.23		30.93	14.40		154.00	5.02		173.42	204.35	260.10
16-30	4.12			10.80		14.92	12.74		56.65	25.54		94.93	109.85	260.10

Period (half Months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Hired Labour Used	Total Labour Used	Available Family Labour Period (half Months)
	(In Man/hour Equivalents):						(In Man/hour Equivalents):							
December														
1-15	8.53			2.70		11.23	5.19		40.05	22.00	26.36	93.36	104.83	308.30
16-31	1.18			3.23		4.41	276.64		77.75		3.26	357.65	362.06	322.79
January														
1-15	12.54			1.39		13.93	95.36		31.70		17.44	144.50	158.43	322.79
16-31	8.04			1.84		9.88	607.79		12.95		3.41	624.15	634.03	322.79
February														
1-15	6.76			0.94		7.70	370.64		5.00		3.56	379.20	386.90	301.96
16-28	5.78			0.94		6.72	122.40				7.01	129.41	136.13	301.96
March														
1-15	19.80					19.80	386.90				0.38	387.28	407.08	322.79
16-31	1.08					1.08	200.60					200.60	201.68	322.79
April														
1-15														298.35
16-30														298.35
May														
1-15	6.27						154.84					154.84	154.84	322.79
16-31	6.27						204.82					204.82	204.82	322.79
June														
1-15														270.00
16-30														270.00
July														
1-15														279.00
16-31			5.03			5.03	31.65		1.56	72.35		105.56	110.59	227.85
August														
1-15	0.75		0.63			3.04	128.70		16.75	35.40		180.85	183.89	227.85
16-31	3.38		3.00			7.22	103.65		1.57	12.84		118.06	125.28	227.85
September														
1-15	1.88		1.88			4.79	65.40		7.72	1.43		74.55	79.34	229.50
16-30	5.63		3.00			11.13	55.80					55.80	66.93	279.00

Period (half months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In Man/hour Equivalents)													
October														
1-15	84.95	38.66	3.13		32.15	85.14.17	73.27	86.55.31				78.58	92.75	227.85
16-31	2.10	0.84	12.00			14.94	57.90				5.47	63.37	78.31	227.85
November														
1-15	77	15.00	0.76			15.00	127.38	3.97			6.52	37.87	52.87	220.50
16-30	5.48	0.84		2.10		8.42	3.37				12.86	16.23	24.65	220.50
December														
1-15	99	8.85	1.08	18.90		28.59	1.13	10.63			2.63	14.91	43.50	279.00
16-31	5.10			4.73		9.83	0.75	74.94			2.05	77.74	87.57	276.60
January														
1-15	75	78	1.18	5.60	0.18	11.38	52	38.28			3.85	42.65	54.03	276.60
16-31				2.84		2.84	14.78	8.34			1.1		24.31	27.15
February														
1-15	80	48	4.24	4.11		9.59	234.90	13.75				240.58	250.17	258.75
16-28	6.00			2.63		8.63	212.78				2.05	214.83	223.46	258.75
March														
1-15	00	5.10		2.19		7.29	312.90					312.90	320.19	276.60
16-31	1.95					1.95	431.70					431.70	433.65	336.35
April														
1-15	83													279.00
16-30														279.00
May														
1-15	26													279.00
16-31							166.35					166.35	166.35	279.00
							117.83					117.83	117.83	279.00

Period (half months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In Man/hour Equivalents)													
Group V - VG LASSFY														
June														
1-15								2.68				2.68	2.68	275:10
16-30			2.28					1.85	32.13			33.98	36.84	275:10
July														
1-15		0.50	5.70		0.06	6.26	7.51	4.49	67.82			10.31	90.13	96.39	284:27
16-31			10.92					5.46	30.03			0.76	63.03	94.77	226:30
August										2.10				
1-15		21.69	18.49		3.35	43.53	186.13	4.18	56.57			21.47	268.35	311.88	226:30
16-31			12.02					1.20	18.86	1.90		21.00	107.19	148.99	226:30
September										4.75				
1-15		25.59	5.51		4.94	36.04	109.08		11.47			5.47	126.02	162.06	157.25
16-30			3.31					1.10	0.18	0.97		1.18	27.95	51.07	282:75
October										2.64				
1-15	12.47	0.58	2.32	2.92	11.29	29.58	61.88	1.36	12.42			3.53	79.19	108.77	226:30
16-31			0.29					0.47	165.31	1.30		4.24	190.80	211.88	226:30
November										2.63				
1-15	6.73	0.29	4.67	6.70	11.76	30.15	21.62	0.64	79.33			14.06	115.65	145.80	219.00
16-30				10.92	4.35	20.09		17.28	60.18	2.43		6.50	90.17	110.26	219:00
December														
1-15	3.19	4.07		11.81	8.41	27.48	8.22	35.75	34.59	44.04		7.65	130.25	157.73	265.83
16-31	23.74			7.55	3.18	34.47	11.98	4.65	47.93	2.64		1.53	68.73	103.20	335:58
January														
1-15	17.79			6.05	21.88	45.72	47.14	13.94	2.24	3.16		3.06	69.54	115.26	262.26
16-31				4.95	1.00	22.79		3.84	0.85	0.53			195.25	218.04	262:26
February														
1-15	13.96			3.73	3.76	21.45	251.91			1.30			253.21	274.66	245.34
16-28	11.98			1.30	2.47	15.75	189.04			0.04			189.08	204.83	245.34
March														
1-15	10.49			0.45	0.59	11.53	300.45			0.36			300.82	312.35	262.26
16-31	2.55				5.53	8.08	161.32					20.00	181.32	189.40	335.58

Period (half months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vege-tables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vege-tables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In Man/hour Equivalents)													
April														
1-15					3.59	3.59					23.92	26.52	30.11	275.10
16-30														275.10
May														
1-15	8.51					8.51	130.84					130.84	139.35	284.27
16-31	14.32					14.32	122.69					122.69	137.01	284.27
Group VI - VG MAS FY														
June														
1-15					0.33	0.33							0.33	216.80
16-30					1.33	1.33			6.66	21.00		27.66	28.99	216.80
July														
1-15			10.00		1.33	13.33			11.95	22.50		50.67	85.12	98.45	183.13
16-31					1.33	1.33	55.99			75.95		33.33	165.27	166.60	183.13
August														
1-15			24.50		1.33	25.83	299.19			133.15		26.67	459.01	484.84	183.13
16-31	15.18				1.33	16.51	158.63			38.60			197.23	213.74	183.13
September														
1-15	1.55		17.50		2.67	21.72	226.57			20.85		20.00	267.42	289.14	267.00
16-30	5.51		3.50		4.00	13.01	27.85			0.15			28.00	(41.01)	200.33
October														
1-15	20.89		2.00		5.67	28.56	71.27			91.30	3.20	12.67	178.44	207.00	183.13
16-31	5.71				1.33	7.04	2.90					6.67	9.57	(16.61)	183.13
November														
1-15	30.56				10.00	40.56	43.42				3.20	18.33	64.95	105.51	176.80
16-30	31.04				5.33	36.37	3.48		2.21	131.70	18.40	28.00	183.79	220.16	176.80
December														
1-15	3.58				9.20	3.33	16.11		0.77	43.50	13.35	20.00	10.67	88.29	104.40	243.04
16-31	1.55				11.40	1.33	14.28		5.41	22.48			4.00	31.89	46.17	223.20
January																
1-15	3.58				6.80		10.38	175.61		9.18		5.80	27.67	218.26	228.64	223.20
16-31	2.80				4.20	0.67	7.37	368.82				6.20	10.00	385.00	392.39	223.20

Period (half months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vegetables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In Mar/hour Equivalents)													
February														
1-15	2.80			4.80	3.67	11.27	449.27				2.80	452.07	463.34	222.33
16-28	1.26			3.20		4.46	264.47				11.33	275.80	280.26	222.33
March														
1-15	1.55					1.55	233.43		3.59	3.59	4.00	237.43	238.98	223.20
16-31	1.26					1.26	52.02					50.76	51.82	223.20
April														
1-15	1.55					1.55	130.84		8.51				1.55	216.80
16-30							122.69		14.32					216.80
May														
1-15							135.25					135.25	135.25	224.08
16-31							250.16					250.16	250.16	224.08
Group VII														
June														
1-15							15.93		1.33	1.33	10.00	15.93	15.93	312.00
16-30							23.97		1.33			23.97	23.97	312.00
July														
1-15							27:80		9:45	19:35	3:00	59.60	59.60	322.40
16-31							42:80		159:81	56:20	1.33	270.14	270:14	254.20
August														
1-15							245:70		25:44	216:50	12:00	499.64	499:64	254.20
16-31	(1:70)					1.70	193:90		22:26	5:20	10:00	231.26	232:96	254.20
September														
1-15	(13:30)					13.30	141:30		28:56	25:80	1.67	168.77	182:07	258.00
16-30	(1:30)					1.30	61:80		7.04	7:80	4.00	73.60	74:90	324.00
October														
1-15	(10:00)					10.00	44:10		40:56	4:95	3.67	52.70	62:70	254.20
16-31	(2:70)					2:70	13:30		36:37		3.67	25.06	27:76	254.20
November														
1-15							28:20		16.11	3.33	1.83	39.65	42:74	246.00
16-30				1.82			16:30		14.28	355.80	31.67	408.25	412:77	246.00

Period (half-months)	Family Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vege-tables	Total Family Labour Used	Hired Labour used for the production of: Cotton	Ground-nuts	Dura	Wheat	Vege-tables	Total Hired Labour Used	Total Labour Used	Available Family Labour
	(In Man/hour Equivalents)													
December														
1-15	2.70			0.92		3.62	13.50				32.17	30.00	75.67	79.29	254.20
16-31	2.30			0.92		3.22	3.30		18.39		4.71	22.33	48.76	51.98	448.41
January															
1-15	2.30			7.12		9.42	85.60		63.84		10.89	1.33	164.66	174.08	339.92
16-31	26.70			16.55		43.25	346.30		19.05		14.11	1.33	380.79	424.04	339.92
February															
1-15	29.00					29.00	496.10				17.13	1.33	514.58	543.58	317.99
16-28	26.70					26.70	317.80				6.63		324.43	351.13	317.99
March															
1-15	29.00					29.00	495.20				6.63		501.30	530.83	339.92
16-31	26.70					26.70	421.10				3.41		424.51	451.21	448.41
April															
1-15															312.00
16-30															312.00
May															
1-15							123.90						123.90	123.90	322.40
16-30							169.60						169.60	169.90	322.40

Number and value of livestock owned by each sampled tenant farmer

Farm Group No.	Code No.-of tenant	Cattle	Goats	Sheep	Poultry	Donkeys	Horses	Value of Livestock Ls.	Total value of assets Ls.
	1	4	4					96.00	197.33
	5	3	13				-	267.50	383.50
	6	4	-				-	83.60	222.95
	9	-	3	1	-	3	-	29.70	134.45
	10	4	8	-		2.5	-	148.40	403.65
	12	6.5	2			1.5	-	300.00	601.60
	17	2.5	-	-		1	-	74.80	257.49
	25		4			1	-	45.00	102.74
	26	2.5	2	-	-	-	-	57.20	107.18
	27	1	5	-	-	-	-	53.00	256.62
	28	-	-	-	-	-	-	-	28.21
	29	-	2	-	-	-	-	5.25	179.14
	31	-	4.5	-	-	1	-	25.00	221.84
	32	-	3	-	-	-	-	10.50	246.85
	33	3.5	1	-		1	-	39.50	200.10
	37	-	-	-	-	1.5	-	9.00	248.70
	39	-	1	-	-	1	-	11.00	64.87
	40	2.5	2	-	-	1.5	-	83.00	292.35
	41	-	3	-	-	-	-	13.50	477.56
	43	-	-	-	-	-	-	-	411.28
	49	-	-	-	-	-	-	-	60.89
	53	4	2	-	-	1	-	113.00	360.68
	55	2.5	-	-	-	1	-	70.00	372.29
	57	-	9	-	-	1	-	45.50	373.37
	59	-	4	-	-	-	-	20.90	169.36
	61	2.5	3	-	10	2	-	57.74	117.50
	62	-	6	2.5	6	-	-	30.15	117.50
	63	-	5.5	-	-	-	-	29.00	109.95
	65	6	5	-	2	2	1	182.10	465.80
	66	1.5	9	-	-	1	-	62.00	610.00
	67	-	1	1	-	-	-	13.00	84.65

Farm Group No.	Code No. of tenant	Cattle	Goats	Sheep	Poultry	Donkeys	Horses	Value of Livestock Ls.	Total value of assets Ls.
I-NVESTMENT FY (Contd.)	69	3.5	2	-	-	-	-	76.00	155.10
	70	-	4	-	-	-	-	340.50	227.10
	78	10.5	7	-	-	-	-	293.00	577.35
	79	5	13.5	7	8	-	-	284.50	570.20
	80	9	-	9	-	-	-	317.00	593.90
	81	5	3.5	13	-	-	-	191.00	413.75
	83	3.5	-	-	15	-	-	93.00	341.40
	84	5	5	-	-	-	-	151.00	338.65
	85	-	-	-	-	-	-	22.50	39.16
	87	-	5	-	-	5	-	24.70	144.06
	88	-	3.5	5	15	-	-	65.00	165.11
	89	4	16	12	-	-	-	217.00	450.05
	91	1	2	3	-	1.5	-	154.00	302.90
	92	-	2	-	20	-	-	9.00	125.52
	93	3	4	5	-	-	-	170.00	358.89
	94	3	4	8	-	1.5	-	183.00	354.89
	95	-	2	-	-	-	-	6.00	63.75
Total		102.5	163.5	96.5	-	33	-	45	-1	1150.54	13102.18
II-NVESTMENT FY	42	7	-	2	5	-	3.5	2.5	-	298.75	930.55
	57	2.5	15	41	4	3	-	10	-	501.40	1351.90
	68	-	-	6	-	-	-	-	-	24.00	1438.85
	70	5.5	6.5	-	10	6	-	1.5	-	168.20	1057.82
	74	-	-	-	-	-	-	1.5	2.5	8.00	756.36
	46	4.5	7	-	-	-	2	1	-	210.00	930.66
	48	-	-	-	-	-	-	1	-	10.00	1247.67
	68	10	-	10	-	-	-	5	-	342.00	757.60
	72	12	-	7.5	-	-	2	5	1	439.80	1040.13
	90	4	-	2	6	34	30.5	5	-	236.60	737.65
Total		45.5		46	62		14	20	1	2238.75	10249.19

Farm Group No.	Code No. of tenant	Cattle	Goats	Sheep	Poultry	Donkeys	Horses	Value of Livestock Ls.	Total value of assets Ls.
III- NV HAS FYT	4	5	10	18	8	2.5	-	390.00	1460.45
	35	1	3	-	-	1	-	59.00	764.84
	36	2	3.5	-	-	1	-	82.50	565.49
		-8.5	3.5	-	-	1	1.5	227.50	764.65
		-5	-	4	-	-	1-	62.5	(725.52)
Total		23.5	20	22	8	5.5	2	1121.50	4280.95
IV- NV HAS FYT		10	6	-	-		-	430.00	5885.10
		20	68	32.5	15	-	1-	1140.50	9918.60
		-1	3	-	-	-	1	44.00	843.83
		-	3	-	-	-	2-	36.00	1335.19
Total		31	80	32.5	15		-	1650.50	17982.72
V- VG LAS FY		-	1.5	7.5	-		-	70.00	467.52
		-4	11	-	20	-	-	158.00	530.93
		-	-	-	-		-	97.50	348.77
		-2.5	3	11.5	-		-	149.50	389.58
		-	8	-	-	-	-	27.00	469.37
	22	5	2	-		1	-	113.00	266.98
		1	4	-				18.00	422.79
	42	-	4	-	-	1	-	20.50	168.09
		-	2.5	2.5	-		-	43.00	279.05
		-	7	-	4			35.20	290.60
		-	4	-	-	-	-	61.00	181.61
		-	3.5	-	10	-		44.00	292.08
		-2.5	1.5	-	-	-	-	71.50	750.21
		-	-	2	-	-		14.60	290.34
		-	-	-	-	-	-	7.00	170.69
		-12	5	-	-			345.00	585.35
		1	3	-	-	-	-	65.00	325.95
Total		28	58	30.5	34			1250.34	6229.91

Farm Group No.	Code No. of Tenant	Cattle	Goats	Sheep	Poultry	Donkeys	Horses	Value of Livestock Rs.	Total value of assets Rs.
VI-VG HAS FY	15	2.5	-	2	-	-	-	19.00	1300.89
	20	-	5	-	-	1	-	32.00	659.14
	76	8.5	2.5	5	-	2	-	313.00	1786.40
Total		11	7.5	7	-	3	-	364.00	2746.43
VII-VG HAS FYT	19	3	4.5	-	-	1	-	117.00	1343.48
	23	5	5	-	2	1	-	248.00	1587.14
	47	4.5	5	-	-	1	1	252.00	933.01
Total		12.5	14.5	-	2	3	1	617.00	15863.63

Appendix 3-E

Working expenses and cash receipts by crops and by individual tenant farmers in Ls.

Code No.	Working Expenses						Total Working Expenses
	Cotton	Dura	Groundnuts	Wheat	Wheat Extra	Vegetables	Other Farm Activity	
1	196.81	19.38	11.40	27.83	11.97		7.10	274.49
5	166.53	20.09	10.00	28.59	12.63		37.54	275.38
6	341.98	25.71	25.50	66.76	13.20		17.80	766.32
9	239.53	16.06	10.20	35.99			3.00	304.78
10	374.07	46.26	22.50				8.40	451.23
12	182.32	19.15	30.65	59.98			7.51	299.61
17	385.57	52.93	12.55	81.67	25.14		4.05	561.94
25	165.11	9.28	20.55	34.83	25.75		2.45	257.97
26	153.69	13.13	12.05	33.88	21.37		13.20	247.32
27	187.49	29.98	6.00	36.40			5.20	258.07
28	112.82	7.83	11.35					132.00
29	207.08	21.02	6.90	58.81			2.10	295.91
31	307.00	28.29	15.65	62.83			1.20	442.67
32	373.15	18.79	63.50	71.01	36.81		2.25	562.81
33	340.12	31.24	16.00	62.76			3.00	453.12
37	234.24	32.10	24.50	33.79				324.63
39	236.16	30.25		33.99			0.17	300.57
40	455.31	37.52		64.48			4.97	562.28
41	265.86	36.50	8.50	34.59			2.80	348.25
43	307.51	21.50	21.10	64.18				414.29
49	185.89				36.06			221.95
53	225.31	26.50	10.70	26.65	20.48		7.80	317.44
55	489.45	55.43	16.90	72.75	34.78		2.80	669.31
57	531.74	41.07	7.25	78.10	15.27		10.75	684.18
59	257.14	6.47	17.90	44.72	24.38		4.26	354.87
61	210.93	12.73					4.80	228.46
62	179.61	13.83					2.25	195.69
63	250.79	10.11						260.90
65	366.44	34.94					158.05	559.43
66	219.74	16.63					6.85	243.22
67	180.81	3.43					44.30	228.54
69	352.96	4.43					7.35	364.74
70	213.68	20.68	40.75				3.60	278.71
78	245.74	84.58					98.30	428.62
79	395.30	67.55	23.00	58.69			30.30	574.84
80	519.82	45.55		61.74			82.60	709.71
81	352.53	42.90	18.10				19.65	433.18
83	289.26	43.75	16.30	32.92			30.06	412.34
84	183.55	49.50	11.70				18.26	260.01
85	111.20	15.87						127.07
87	177.70	6.97					3.00	187.67
88	321.20	8.34					9.60	339.14
89	318.78	13.84	8.80				18.70	360.12
91	287.25	22.14	4.00				10.00	314.39
92	388.75	9.91						398.66
93	166.88	18.17					14.34	199.36
94	214.51	21.47	4.50				15.40	255.88
95	195.86	6.72					0.60	203.18

Working Expenses and cash receipts by crops and by individual tenant farmers in Ls.

Code No.	Receipts - Actual Sale Cotton	Dura	Ground-nuts	Wheat	Wheat Extra	Vegetables	Other Farm Activities	Total value of sales
1	211.91	26.50	42.50	76.61	31.92			389.44
5	169.28	11.63	26.50	82.99	31.92			322.32
6	447.63	21.25	113.60	178.75	31.92			793.15
9	236.63	19.00	63.00	80.97		80.00		399.60
10	388.34	20.00	70.00			176.00	110.50	478.34
12	176.73		65.00	159.60		54.00	25.50	401.33
17	428.65	46.25	24.00	198.32	63.84	128.00	111.00	761.03
25	227.83		40.00	102.14	89.38			459.35
26	185.22	6.00	41.40	76.71	70.22	48.00	8.54	388.09
27	211.06	0.80	4.00	108.51			19.80	324.37
28	126.58	3.00	16.75			61.05	5.75	196.33
29	206.09	22.70	6.75	159.60				395.14
31	220.63	24.00	22.50	127.68		92.50	27.00	404.81
32	438.79	5.00	75.00	159.60	95.76	63.00	30.00	774.10
33	356.35		22.50	102.14				480.99
37	194.11	77.50	68.80	82.99				423.40
39	256.13	38.30	24.00	63.84		75.70		382.27
40	531.30	100.00	16.00	255.36		80.00	9.00	911.66
41	292.59	78.00	13.50	95.76				479.85
43	322.86	42.00	100.00	191.52				656.38
49	261.49	10.50	11.00	49.69				332.68
53	264.60	7.00	56.00	127.68	63.84			519.12
55	647.43	40.60	122.40	255.36	51.07			1116.86
57	587.07	42.00	36.00	248.67	127.68			1041.42
59	295.31	7.26	47.00	127.68	127.68			604.94
61	239.37	7.55						246.92
62	217.03	2.50	1.75					221.28
63	300.68		10.00					310.68
65	345.41							345.41
66	273.26	2.50	3.00					278.78
67	143.24	8.50						151.74
69	402.75		1.50					404.25
70	281.27		30.00					311.27
78	207.61	44.00	12.00					263.61
79	300.94	107.50	50.00	95.76				554.20
80	165.47	28.00		156.43				376.40
81	344.22	60.00	70.00					474.22
83	341.73	86.00	33.00	95.76				556.49
84	199.23	54.00	45.00					298.23
85	111.45	12.00	1.50					132.95
87	300.09	18.00	1.50					319.59
88	455.63	7.00						462.63
89	483.89							483.89
91	452.48	18.00	7.50					478.28
92	474.21	39.00						513.21
93	229.79	37.70						267.49
94	303.52	12.00	5.00					322.52
95	498.37	9.00	1.75					509.12

Working Expenses and cash receipts by crops and by individual tenant farmers in Rs.

Code No.	Receipts - Actual Sale						Total Value of Sales
	Cotton	Dura	Groundnuts	Wheat	Wheat Extra	Vegetables	Other Farm Activities	
2	434.05	8.00	78.40	253.36		5.55	779.36
7	726.56	27.50	200.00	150.90		11.53	1104.96
	289.30	93.00				35.00	417.30
30	406.92		80.00	197.90	95.76	26.00	806.58
44	697.77	110.50	176.00	434.12		70.00	1418.39
46	496.21	23.50	54.60	351.12		21.50	925.43
48	1027.74	111.00	128.00	510.72	127.68	46.25	1905.14
68	421.53			102.14			425.53
72	602.67		48.00	126.09		16.00	792.76
90	469.51	19.80		108.51			489.31
	281.70	5.75	61.05	223.44	31.92		603.86
35	249.05	4.00	43.90	191.52			488.47
36	458.32	27.00	92.50	222.82	63.84		864.48
75	804.16	90.00	63.00				957.16
	560.64	9.00	19.80			12.00	601.44
3	194.01		56.70	31.51			282.22
34	370.35		80.00	255.36	191.52	92.00	989.23
54	311.08		40.00	159.60	95.76		606.44
58	579.93		66.00	302.36			948.29
13	481.15	47.00		201.00	45.50	99.67	874.32
14	466.75	36.00	28.75	191.52	63.84	51.60	838.46
15	197.86	26.00		82.99		71.20	378.05
18	157.53	8.00		96.57		26.65	288.75
21	411.50	80.50	59.80	242.59	70.22	62.22	926.83
22	170.24	9.50	35.90	89.38	63.84	32.32	401.18
38	293.71	24.00	105.00	159.60		250.00	832.31
42	313.39	60.50	32.00	95.76	31.92	112.10	645.67
45	396.54	122.00		228.23		150.00	896.77
51	551.79	60.00	10.00	287.08	63.84	67.50	1040.21
52	246.78			223.44	76.61	264.01	810.84
56	486.10	15.00	110.85	256.98	82.99	112.25	1147.15
11	225.81	7.00	46.00	95.76		12.00	386.57
64	410.95	3.50		255.64		46.00	716.09
70	263.17	8.63				24.00	295.80
73	467.38	60.00				104.00	631.38
74	224.65	24.00		63.84		174.00	486.49
13	341.25	16.00	36.55	153.22		146.18	693.20
20	620.02	60.00	75.75	319.20	95.76	84.00	1254.73
76	533.93	60.00				88.00	681.93
19	1029.27		100.50	236.21	31.92	216.25	1614.15
23	238.20	27.00		95.76	51.07	22.10	434.13
47	649.96	35.00	83.00	223.44		140.00	1131.40

Code No.	Working Expenses							Total Working Expenses
	Cotton	Dura	Groundnuts	Wheat	Wheat Extra	Vegetables	Farm Activity	
2	425.11	35.86	25.15	94.35			13.40	593.87
7	642.74	47.51	62.55	59.26	10.75		145.75	968.56
8	287.89	26.58					3.60	318.07
30	435.23	19.70	40.01	63.50	35.61		10.30	604.35
44	649.24	63.10	56.40	109.61				878.35
46	518.61	66.85	19.50	114.45			52.90	772.31
48	1216.92	132.04	58.50	154.19	23.50		0.55	1585.70
68	406.35	41.06					17.00	464.41
72	412.84	41.91	19.20	33.78			54.15	561.88
90	333.80	25.14					8.90	367.84
4	334.60	36.46	18.45	53.77	13.14		38.00	488.42
35	285.40	25.99	23.60	66.29			4.55	405.83
36	413.01	35.89	29.00	79.67	32.41		12.85	602.83
75	638.73	68.00	20.50				81.00	808.23
86	433.61	16.94	8.50				19.85	478.90
3	202.89	36.29		26.80			15.00	280.98
34	322.13	32.14	58.05	70.78	48.22		304.00	835.22
54	274.30	24.90	8.20	52.48	22.05		4.31	386.24
58	518.95	59.63	12.00	109.83			3.29	703.70
13	409.13	61.31		72.63	33.95	31.50	2.80	611.32
14	410.71	32.76	18.35	114.77	54.40	19.40	21.80	672.19
16	197.87	18.92		35.80		13.25	0.20	266.04
18	172.71	26.87		32.49		18.60	10.40	261.07
21	391.97	39.51	20.00	84.65	31.72	14.50	15.40	582.35
22	163.09	17.50	16.25	41.59	28.68	4.75	16.15	288.01
38	260.08	25.85	14.90	32.79		72.50	2.50	398.62
42	268.68	24.55	9.40	36.21	14.17	40.80	2.55	396.36
45	443.98	46.10		58.93		46.00	3.45	598.46
51	514.76	54.05		86.50	22.77	34.00	5.00	717.08
52	231.31	18.74		51.06	30.10	44.22	11.32	386.75
56	467.02	43.97	10.00	68.77	36.85	14.20	3.85	640.81
11	200.85	28.43	27.50	34.29		2.00	5.68	298.75
64	322.88	29.82		68.06		37.00	0.90	458.66
71	180.46	19.48				25.00		224.94
73	392.95	46.30				27.00	62.05	528.30
77	207.76	41.05		33.52		16.70	17.00	316.03
15	336.04	61.71	18.78	72.42		43.05	2.40	534.40
20	467.35	40.21	18.90	76.20	26.09	14.05	5.25	648.05
76	488.46	40.76				2.50	75.80	607.52
19	828.30	68.43	56.50	118.76	7.30	21.90	6.97	1108.16
23	234.56	37.75		45.20	31.30	7.30	21.20	388.31
47	604.74	63.44	31.25	68.58		63.00	20.40	851.41

Appendix 3-F

Amount of funds borrowed by source of credit and by individual tenant farmers in Ls.

Code No.	SGB CREDIT			Shail Credit	CREDIT DUE TO DELAY IN PAYMENT								Total	Other traditional Credit	Total Credit
	Cotton	to Wheat and Dura	Others	Total	Cotton	Dura	Ground-nuts	Wheat	Vegetables	Wheat Extra	Other Farm Activities	Family Consumption			
1	186.88	26.68	13.96	227.52	37.25	14.65	7.50	3.50			2.95	39.54	105.39	7.70	340.6
5	178.19	26.92	15.21	220.32	30.65	13.58	7.00		2.20		5.75	8.94	68.12	46.00	334.4
6	389.85	53.84	27.93	471.62	60.45	19.35	5.00		3.50	8.25	1.55	38.10	136.20	40.75	648.5
9	219.76	25.67	15.72	261.15	34.25	6.10	1.00	1.50	3.50			11.45	57.80	4.00	322.9
10	392.58	53.84	32.43	478.85	53.10	32.95	22.80				1.00	46.20	156.05	19.30	654.2
12	187.71	50.91	15.51	254.13	21.00	36.00	10.00	3.50	3.00		1.00	53.50	128.00	17.50	399.6
17	395.62	70.00	28.25	493.87		6.40	11.28	4.25	8.00			0.50	30.43	35.50	559.8
25	186.03	44.71	15.21	245.95	53.40	21.75	4.00	10.00	1.35	4.00	1.25	27.74	123.49	55.50	424.9
26	185.00	42.83	13.96	241.79	49.40	11.30	3.50	5.00			6.20	27.20	103.10	21.00	365.8
27	138.93	31.53	13.96	184.42	33.40	12.93	4.79		0.90		2.25	41.55	96.32	44.50	325.2
28	132.79	0.58	22.09	155.46		13.68	7.25					11.88	32.81	8.75	197.0
29	255.11	60.55	25.72	341.38	49.00	35.10	9.00		1.88		1.60	22.92	119.50	11.50	472.3
31	323.47	59.29	40.08	422.84	48.00	40.38	12.00	6.00	1.10		0.70	32.41	140.59	30.40	593.8
32	407.19	82.67	27.93	517.79		60.95	6.50	54.00	1.23		0.40	12.27	135.35	55.80	708.9
33	384.91	60.55	25.20	470.66	23.30	45.13	10.50	9.40	1.35		1.60	17.40	108.28	46.00	624.9
37	179.56	31.21	13.96	224.73	86.70	25.30	8.00	7.00				36.05	163.05	53.00	440.7
39	220.77	30.72	13.96	265.45	65.50	26.60	12.00		2.70			29.11	135.91	44.45	445.8
40	465.92	62.69	27.93	556.54	134.50	45.50	13.50				1.20	36.94	231.64	41.00	829.1
41	248.72	30.87	13.96	293.55	85.50	22.00	11.00				0.80	20.38	139.68	92.00	525.2
43	356.40	61.42	18.37	436.19	1.00	9.50	12.50					26.50	49.50	40.70	526.3
49	221.26	36.82	13.97	272.05	39.50	40.71			1.50			15.50	97.21	22.00	391.2
53	229.99	31.83	13.96	275.78		23.08	8.00			13.50		7.50	52.08	54.00	381.8
55	540.45	87.53	27.93	655.91	69.40	36.00	15.00				2.00	65.77	188.17	44.15	988.2
57	503.79	85.02	27.92	616.73	55.00	52.60	20.00			1.50	6.00	27.25	158.35	46.65	821.7
59	256.72	53.95	13.96	324.63	63.00	20.00	1.25				1.40	45.85	131.50	34.50	490.6
61	204.86	0.43	15.21	220.50	2.00	27.60	2.80				0.50	19.77	54.67	27.00	302.1
62	197.38	0.43	13.96	211.77	17.00	40.95	5.75					50.39	114.09	30.30	356.1
63	272.96	0.86	18.32	292.14	4.00	33.20	1.50					16.05	54.75	6.00	352.8
65	359.95	0.43	30.43	390.81	2.00	18.75	14.00				0.80	31.32	82.87	7.50	481.1
66	232.21	0.43	15.21	247.85		24.00					3.30		27.30	6.50	281.6

Code No.	SGB CREDIT To: Cotton	Wheat and Dura	Others	Total	Shail Credit	CREDIT DUE TO DELAY IN PAYMENT to: Cotton	Dura	Ground-nuts	Wheat	Veget-ables	Wheat Extra	Other Farm Activities	Family Consumption	Total	Other traditional Credit	Total Credit
4	334.21	40.91	43.11	418.23		4.75	14.00					21.60	1.57	41.92	112.00	572.15
35	313.02	60.55	30.18	403.75		30.85	10.00	11.00				1.50	4.63	57.98	28.75	490.48
36	425.68	85.17	27.93	538.78		55.07	13.00	12.00					54.70	117.66	97.20	753.64
75	622.67	0.90	28.25	651.82		166.00	14.00	9.00				58.80	2.85	250.65		902.47
86	474.07	0.94	8.03	483.04		26.25	8.00					4.40	5.50	45.15	52.50	580.69
3	194.99	16.08	15.22	226.29		17.50	16.00					1.30		34.80		261.09
34	364.73	114.19	25.20	504.12			12.00	19.00				49.00		80.00		584.12
54	262.05	51.20	13.96	327.21			7.00					1.28		8.28	23.00	358.49
58	510.05	85.28	27.92	623.25			48.60	32.00						80.60	136.00	839.85
13	435.45	59.30	28.15	522.90	31.00	33.50	21.25		2.00			0.85	82.75	190.90	58.75	772.55
14	431.09	98.26	27.60	556.95	74.00	37.00	17.50	2.25	4.00			4.20	48.40	187.35	8.00	752.30
16	186.57	28.40	13.93	228.90	13.25	22.25	8.86		1.00				27.91	73.27	43.30	345.47
18	154.61	28.34	14.13	197.08	10.00	15.92	6.00		1.00			3.00	50.73	86.65	55.00	338.73
21	379.45	75.95	28.25	483.65	42.00	5.00	12.00	3.00	4.50			2.40	16.50	85.40	26.00	595.05
22	161.62	42.49	14.13	218.24	13.50	2.85	6.50	5.50	1.00			3.05	7.30	39.70	18.00	275.94
38	242.98	31.97	13.95	288.90	23.00	1.50	9.50					1.20	55.61	190.81	135.50	615.21
42	254.00	38.47	13.96	306.43	35.00	14.34	10.25	1.50				0.45	60.11	122.20	45.80	474.43
45	382.43	54.89	22.43	459.75	101.00	56.80	16.00					1.55	50.15	225.50	70.00	755.25
51	483.27	87.77	28.25	599.24	121.00	51.00	18.00		2.00			1.50	40.60	234.10	80.00	913.34
52	171.82	47.59	13.96	233.37	39.00		7.50						26.70	74.70	61.50	369.57
56	446.17	84.52	27.92	558.61	5.25	60.55	15.00					1.30	9.35	91.45	127.50	777.56
11	205.15	25.67	14.32	245.14	3.00	29.00	8.15		3.25			0.75	6.89	51.04	29.50	325.68
64	409.33	54.42	27.93	491.68		1.65	3.00		6.50			0.30	28.43	39.88	12.50	544.06
71	235.89	0.43	13.96	250.28	3.00	7.08	2.50						21.43	34.01	18.50	302.79
73	404.95	0.90	27.92	433.77	16.00	54.00	11.00							163.28	4.80	601.85
77	197.04	26.92	13.96	237.92		24.00	7.00					0.80		31.80	8.00	277.72
15	332.07	56.70	28.25	417.02	70.00	27.50	13.00	4.50				0.95		115.95	28.50	561.47
20	505.01	71.19	28.25	604.45	9.00	40.00	11.50	6.00					17.28	83.78	16.50	704.73
76	456.79	0.86	28.25	485.90		40.00	11.00					2.40	6.22	59.62	48.10	593.62

Code No.	SGB CREDIT To: Cotton	Wheat and Durra	Others	Total	Shall Credit	PAYMENT CREDIT DUE TO DELAY IN PAYMENT to: Cotton-Durra	Ground-nuts	Wheat	Vegetables	Wheat Extra	Other Farm Activities	Family Consumption	Total	Other traditional Credit	Total Credit
4	334.21	40.91	43.11	418.23		4.75	14.00				21.60	1.57	41.92	112.00	572.15
35	313.02	60.55	30.18	403.75		30.85	10.00	11.00			1.50	4.63	57.98	28.75	490.48
36	425.68	85.17	27.93	538.78		55.07	13.00	12.00		1.75		34.70	117.66	97.20	753.64
75	622.67	0.90	28.25	651.82		166.00	14.00	9.00			58.80	2.85	250.65		902.47
86	474.07	0.94	8.03	483.04		26.25	8.00				4.40	5.50	45.15	52.50	580.69
3	194.99	16.08	15.22	226.29		17.50	16.00				1.30		34.80		261.09
34	364.73	114.19	25.20	504.12			12.00	19.00			49.00		80.00		584.12
54	262.05	51.20	13.96	327.21			7.00				1.28		8.28	23.00	358.49
58	510.05	85.28	27.92	623.25		48.60	32.00						80.60	136.00	839.85
13	435.45	59.30	28.15	522.90	31.00	33.50	21.25		2.00		19.55	0.85	82.75	190.90	58.75	772.55
14	431.09	98.26	27.60	556.95	74.00	37.00	17.50	2.25	4.00		4.20	48.40	187.35	8.00	752.30
16	186.57	28.40	13.93	228.90	13.25	22.25	8.86		1.00			27.91	73.27	43.30	345.47
18	154.61	28.34	14.13	197.08	10.00	15.92	6.00		1.00		3.00	50.73	86.65	55.00	338.73
21	379.45	75.95	28.25	483.65	42.00	5.00	12.00	3.00	4.50		2.40	16.50	85.40	26.00	595.05
22	161.62	42.49	14.13	218.24	13.50	2.85	6.50	5.50	1.00		3.05	7.30	39.70	18.00	275.94
38	242.98	31.97	13.95	288.90	123.00	1.50	9.50				1.20	55.61	190.81	135.50	615.21
42	254.00	38.47	13.96	306.43	35.00	14.34	10.25	1.50		0.55	0.45	60.11	122.20	45.80	474.43
45	382.43	54.89	22.43	459.75	101.00	56.80	16.00				1.55	50.15	225.50	70.00	755.25
51	483.27	87.77	28.25	599.24	121.00	51.00	18.00		2.00		1.50	10.60	234.10	80.00	913.34
52	171.82	47.59	13.96	233.37	39.00		7.50					26.70	74.70	61.50	369.57
56	446.17	84.52	27.92	558.61	5.25	60.55	15.00				1.30	9.35	91.45	127.50	777.56
11	205.15	25.67	14.32	245.14	3.00	29.00	8.15		3.25		0.75	6.89	51.04	29.50	325.68
64	409.33	54.42	27.93	491.68		1.65	3.00		6.50		2.30	28.43	39.88	12.50	544.06
71	235.89	0.43	13.96	250.28	3.00	7.08	2.50				21.43	34.01	18.50		302.79
73	404.95	0.90	27.92	433.77	16.00	54.00	11.00				25.25	57.03	163.28	4.80	601.85
77	197.04	26.92	13.96	237.92		24.00	7.00				0.80		31.80	8.00	277.72
15	332.07	56.70	28.25	417.02	70.00	27.50	13.00	4.50	4.50		0.95		115.95	28.50	561.47
20	505.01	71.19	28.25	604.45	9.00	40.00	11.50	6.00				17.28	83.78	16.50	704.73
76	456.79	0.86	28.25	485.90		40.00	11.00				2.40	6.22	59.62	48.10	593.62

Code No.	SGB CREDIT To: Total Shail Credit	Cotton Dura and Durapeas	Ground-Wheat Vegetables	Wheat Other Extra	Other Farm Activities	Family Consumption	Total Other traditional Credit	Total Credit
14	803.89	100.85	42.38	947.12				
33	217.38	36.03	14.14	267.55				
17	533.70	10.81	13.18	557.69	186.50	44.60	15.00	18.75
						2.40	7.50	

INCOME FROM:

Code No.	Farming Activities	Farming Activities	Social Allied	Transfer payments	Other	Total	Total Credit
						23.33	
						56.94	
						276.35	164.00

Appendix 3-C

Cash Income by source and by tenant farmers (Rs)

Appendix 3-G

Cash Income by Source and by tenant farmers (in Ls.)

Code No.	Income from: Farming Activities	Allied Farming Activities	Social Transfer	Other business	Total
Group No. I- NV LAS FY					
1	114.95				114.95
5	46.94	12.00	11.67	9.00	79.57
6	26.83	2.35	3.00		32.18
9	94.82			158.10	252.92
10	27.11	108.20		50.50	185.81
12	101.72		110.00		211.72
17	199.09	3.95	24.00		227.04
25	201.38				201.38
26	140.77	12.00			152.77
27	66.30		90.00		156.30
28	14.33	23.70	10.00	59.30	103.96
29	99.23	18.12	49.50		166.85
31	-37.86		6.50		-31.36
32	211.29		234.00		445.29
33	27.87	14.30	75.91		118.08
37	98.77		3.75	154.00	256.52
39	81.70		14.60	0.50	96.80
40	349.38	23.30	4.00		376.68
41	130.60		42.00		172.60
43	242.09				242.09
49	110.73	31.50	17.00	7.20	166.43
53	201.68				201.68
55	447.55				447.55
57	357.24				357.24
59	250.07	22.20	36.00		308.27
61	18.46		60.40		78.86
62	25.59	56.25	1.25	63.00	146.09
63	49.78	24.75	90.00		164.53
65	-214.02		56.50	342.50	184.98
66	35.56		3.00	155.50	194.06
67	-76.80	58.50		206.00	187.70
69	39.51		0.85		40.36
70	32.56	11.20			43.76
78	-165.01			323.00	157.99
79	-20.64				-20.64
80	-333.31				-333.31
81	41.04			125.25	166.29
83	144.15			41.50	185.65
84	38.22		144.00		182.22
85	5.88	29.50			35.38
87	131.92	28.50			160.82
88	123.49	7.00			130.49
89	123.77		40.00		163.77
91	163.89	34.50		60.00	258.39
92	-114.55	47.95		20.75	-45.85
93	68.13	3.00			71.13
94	66.64	60.00			126.64
95	305.94	31.75			62.69

Code No.	Income from: Farming Activities	Allied Farming Activities	Social Transfer	Other Business	Total
Group No. II NV MAS FY					
2	185.49		54.00		239.41
7	136.40				136.40
8	99.23	6.00	44.70	103.75	253.68
30	202.23	120.00	55.00	24.00	401.23
44	540.01		700.00		1240.01
46	153.12	25.00	360.00		538.12
48	319.44		120.00		439.44
68	-38.88	55.20	5.00		21.32
72	230.88			192.50	423.38
90	121.47		43.25		164.72
Group No. III NV MAS FYT					
4	115.44			78.35	193.79
35	82.64		78.00	175.48	336.12
36	261.65		65.00	309.35	636.00
75	148.93		73.00	349.00	530.93
86	122.54			1027.98	1150.52
Group No. IV NV HAS FYT					
3	1.24			1687.00	1688.24
34	153.91			4095.00	4248.91
54	220.20			1977.00	2197.20
58	244.59		333.00	202.00	779.59
Group No. V VG LAS FY					
11	87.82			217.75	305.57
13	263.00				263.00
14	166.27			176.02	342.29
16	112.01		158.50		270.51
18	27.68	2.00		180.00	209.68
21	344.48		60.00		404.48
22	113.17		55.50		168.67
38	433.69		351.00		784.69
42	249.31				249.31
45	298.31				298.31
51	323.13		72.00		395.13
52	424.09				424.09
56	506.34				506.34
64	257.43	13.50			270.93
71	70.86	27.75			98.61
73	103.08	132.00			235.08
77	170.46				170.46
Group No. VI - VG MAS FY					
15	155.80		127.00		282.80
20	606.69		14.00		620.69
76	74.41		90.00		164.41

640

Code No.	Income from: Farming Activities	Allied Farming Activities	Social Transfer	Other Business	Total
Group No. VII- VG HAS FYT					
19	505.99			2121.20	2627.19
23	45.82			323.00	368.82
47	279.99			997.00	1276.99

Appendix 4A

Balance Sheets

Group (I):

Non-Vegetable Growers, Low Assets, Income from Farming Activities.

A) Opening Balance Sheet (1.6.73)

Assets:		Liabilities:	
Current Assets (1)	70.56	Current Liabilities (3)	28.39
Intermediate and Fixed Assets (2)	204.59	Long-term Liabilities (4)	0.0
		Net Worth (5)	246.76
Total Assets	275.15	Total Liabilities	275.15

B) Closing Balance Sheet (31.5.74)

Assets:		Liabilities:	
Current Assets	71.47	Current Liabilities	82.77
Intermediate and Fixed Assets	195.11	Long-term Liabilities	0.0
		Net Worth	183.81
Total Assets	266.58	Total Liabilities	266.58

(1) Current assets include such items as, cash in hand, other savings deposits, accounts receivable from sale of the cotton crop, shares in cooperative societies, value of goods in shops, value of crops and crop products in store and value of supplies of feeds and fertilizers in store.

(2) Intermediate and fixed assets include: livestock and poultry, transport facilities and vehicles for personal use, farm machinery, simple tools and implements, other investments such as flour mills, furniture, buildings and dwellings and land.

(3) Current liabilities over more categories of outstanding debts to SGB, shail merchant and relations and other sources of credit.

(4) Long-term liabilities include outstanding long-term loans.

(5) Net-worth measures the balance of assets and liabilities.

Appendix 4A(cont.)

Balance Sheets

Group (II):

Non-vegetable Growers, Medium Assets, Income from Farming Activities.

A) Opening Balance Sheet (1.6.73)

Assets:		Liabilities:	
Current Assets	177.13	Current Liabilities	31.57
Intermediate and Fixed Assets	822.82	Long-term Liabilities	0.0
		Net Worth	968.38
Total Assets	999.95	Total Liabilities	999.95

B) Closing Balance Sheet (31.5.74)

Assets:		Liabilities:	
Current Assets	221.39	Current Liabilities	68.16
Intermediate and Fixed Assets	817.51	Long-term Liabilities	0.0
		Net Worth	970.74
Total Assets	1038.90	Total Liabilities	1038.90

Appendix 4A (cont.)

Balance Sheets

Group (III):

Non-Vegetable Growers, Medium Assets, Income from Farming and Merchandise.

B) Opening Balance Sheet (1.6.73)

Assets:		Liabilities:	
Current Assets	169.58	Current Liabilities	11.93
Intermediate and Fixed Assets	686.61	Long-term Liabilities	0.0
		Net Worth	844.26
Total Assets	856.19	Total Liabilities	856.19

B) Closing Balance Sheet (31.5.74)

Assets:		Liabilities:	
Current Assets	613.14	Current Liabilities	28.96
Intermediate and Fixed Assets	592.41	Long-term Liabilities	0.0
		New Worth	1176.59
Total Assets	1205.55	Total Liabilities	1205.55

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Appendix 4A(cont.)

Balance Sheets

Group (V)

Vegetable Growers, Low Assets, Income from Farming Activities.

A) Opening Balance Sheet (1.6.73)

Assets:		Liabilities:	
Current Assets	81.56	Current Liabilities	16.29
Intermediate and Fixed Assets	250.73	Long-term Liabilities	0.0
		Net Worth	316.01
Total Assets	332.30	Total Liabilities	332.30

B) Closing Balance Sheet (31.5.74)

Assets:		Liabilities:	
Current Assets	109.99	Current Liabilities	65.58
Intermediate and Fixed Assets	226.33	Long-term Liabilities	0.0
		Net Worth	270.74
Total Assets	226.33	Total Liabilities	336.32

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Appendix 4A(cont.)

Balance Sheets

Group (VII)

Vegetable Growers, High Assets, Income from Farming and Merchandise

A) Opening Balance Sheet (1.6.73)

Assets:		Liabilities:	
Current Assets	846.04	Current Liabilities	7.15
Intermediate and Fixed Assets	4441.83	Long-term Liabilities	5280.73
		Net Worth	0.0
Total Assets	5287.88	Total Liabilities	5287.88

B) Closing Balance Sheet (31.5.74)

Assets:		Liabilities:	
Current Assets	1991.03	Current Liabilities	108.32
Intermediate and Fixed Assets	4338.78	Long-term Liabilities	~~6499.92~~
		Net Worth	6241.49
Total Assets	6249.81	Total Liabilities	6249.81

Appendix 4B

Profit and Loss and Trading Account and Family Consumption and Off-farm Income Ls.

Group (I)

Non-Vegetable Growers, Low Assets, Income from Farming Activities.

a) Trading Account:

1- Receipts			
Receipts from farming			
Sale of farm crops and li stock products		458.92	
Crops and products used by farm		12.01	
Crops and livestock products consumed by family		36.94	
Crops paid as wages in kind		3.14	
Crops paid as religious tax		2.09	
Gifts in kind	0.30		
Total receipts from farming		513.40	
Off-farm Income		73.61	
Total receipts			587.01
2- Expenses:			
Farm crops and livestock cash expenses	346.97		
Wages paid in kind	3.14		
Total farm operating expenses		350.11	
Household cash and kind expenses		210.09	
Interest expenses		24.90	
Total Expenses			585.10
Trading surplus			1.91

b) nventory changes

Inventory changes for crops and crop products	3.55	
Inventory changes in livestock	3.27	
Inventory changes in farm supplies	-9.05	
Inventory changes in other intermediate and fixed assets	-4.95	
Total Inventory Change		-7.18
Profit Loss		-5.77

Appendix 4B(cont.)

Profit and Loss and Trading Account
and Family Consumption and Off-farm Income

Group (II)

Non-vegetable Growers, Medium Assets, Income from Farming Activities

a) Trading Account:

1- Receipts			
Receipts from farming			
Sales of crops and livestock products	885.68		
Crops and crops products used by farm	27.30		
Crops and livestock products consumed by family	63.93		
Crops paid as wages in kind	12.56		
Crops paid as religious tax	3.59		
Gifts in kind	1.22		
Total receipts from farming		994.28	
Off-farm income		193.29	
Total Receipts			1187.53
2- Expenses			
Farm crops and livestock cash expenses	661.99		
Wages paid in kind	12.56		
Total farm operating expenses		674.55	
Household cash and kind expenses		442.51	
Interest expense		33.34	
Total Expenses			1150.40
Trading Surplus			37.13

b) Inventory Changes

Inventory changes in crops and crop products	19.89
Inventory changes in livestock	6.13
Inventory changes in farm supplies	-16.35
Inventory changes in other intermediate and fixed assets	-16.10
Total Inventory Changes	-6.43
Profit	32.20

Appendix 4B(cont.)

Profit and Loss and Trading Account and Family Consumption and Off-farm Income

Group (III)

Non-Vegetable Growers, Medium Assets, Income from Farming and Merchandise.

a) Trading Account

1- Receipts			
Receipts from farming			
Sales of crops and livestock products	714.73		
Crops and crops products used by farm	19.50		
Crops and livestock products consumed by family	67.74		
Crops paid as wages in kind	2.86		
Crops paid as religious tax	1.30		
Gifts in kind	6.21		
Total receipts from farming		812.33	
Off-farm income		434.06	
Total Receipts			1246.39
2- Expenses			
Farm crop and livestock cash expenses	543.92		
Wages paid in kind	2.86		
Total farm operating expenses		546.78	
Household cash and kind expenses		329.91	
Interest expenses		10.20	
Total Expenses		866.89	
Trading Surplus			379.50

b) Inventory Changes

Inventory changes in crops and crops products		0.70	
Inventory changes in livestock		19.42	
Inventory changes in farm supplies		-13.05	
Inventory changes in other intermediate and fixed assets		-29.88	
Total Inventory Changes			-22.81
Profit			356.69

Appendix 4B (cont.)

Profit and Loss and Trading Account and Family Consumption and Off-farm Income

Group (IV)

Non-Vegetable Growers, High Assets, and Income from Farming and Merchandise Activity

a) Trading Account

1- Receipts		
Receipts from farming		
Sale of Farm Crops and livestock products	869.85	
Crops and products used by farm	28.00	
Crops and livestock products consumed	82.71	
Crops paid as wages in kind	8.59	
Crops paid as religious tax	4.20	
Gifts in kind	0.00	
Total receipts from farming		993.25
Off-farm Income		2157.90
Total Receipts		3151.15
2- Expenses		
Farm crops cash expenses	534.68	
Wages paid in kind	8.58	
Total farm operating expenses		543.26
Household cash and kind expenses		445.53
Interest expenses		7.47
Total Expenses		996.26
Trading Surplus		2164.89

b) Inventory Changes

Inventory changes of crops and crops products	31.12
Inventory changes of livestock	13.88
Inventory changes of farm supplies	-41.64
Inventory changes of other intermediate and fixed assets	-14.03
Total Inventory Changes	-10.67
Profit	2154.22

Appendix 4B(cont.)

Profit and Loss and Trading Account and Family Consumption and Off-farm Income

Group V

Vegetable Growers, Low Assets, Income from Farming Activities.

a) Trading Account:

1- Receipts		
Receipts from farming		
Sales of crops and livestock products		699.98
Crops and crops products used by farm	16.32	
Crops and livestock products consumed by family	52.70	
Crops paid as wages in kind	7.25	
Crops paid as religious tax	1.17	
Gifts in kind	1.43	
Total receipts from farming		778.85
Off-farm income		87.07
Total Receipts		865.92
2- Expenses		
Farm crops and livestock cash expenese	460.42	
Wages paid in kind	7.25	
Total farm operating expenses		467.67
Household cash and kind expenses		306.23
Interest expenses		32.68
Total Expences		815.58
Trading Surplus		50.34

b) Inventory Changes

Inventory changes in crops and crops products	3.80
Inventory changes in livestock	1.53
Inventory changes in farm supplies	-6.41
Inventory changes in other intermediate and fixed assets	-14.44
Total Inventory Changes	15.52
Profit	34.82

Appendix 4B(cont.)

Profit and Loss and Trading Accoun
and Family Consumption and Off-farm Income

Group (VI)

Vegetable Growers, Medium Assets, Income from Farming Activities.

a) Trading Account

1- Receipts			
Receipts from farming			
Sales of crops and livestock products		876.05	
Crops and crops products used by farm		19.33	
Crops and livestock products consumed by family		59.77	
Crops paid as wages in kind		31.01	
Crops paid as religious tax	-		
Gifts in kind	0.33		
Total receipts from farming		986.49	
Off-farm income		77.00	
Total Receipts			1063.49
2- Expenses			
Farm crops and livestock cash expenses	598.44		
Wages paid in kind	31.01		
Total farm operating expenses		629.45	
Household cash and kind expenses		364.07	
Interest expenses		18.28	
Total Expenses		1011.80	
Trading Surplus			51.69

b) Inventory Changes

Inventory changes in crops and crops products	9.38	
Inventory changes in livestock	5.33	
Inventory changes in farm supplies	-12.33	
Inventory changes in other intermediate and fixed assets	-17.28	
Total Inventory Changes		-14.90
Profit		36.79

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Appendix 4-C
Actual area cultivated by each tenant farmer - in Feddans

Farm Group	Tenant Code	Area Cultivated	Farm Group	Tenant Code	Area Cultivated	Farm Group	Tenant Code	Area Cultivated
NV LAS FY	1	13.75	NV LAS FY	70	10	NV MAS FY	86	20
	5	12.50		78	10			
	6	26.25		79	25	NV HAS FYT	3	12.50
	9	12.50		80	20		34	32.50
	10	25		81	20		54	17.50
	12	15		83.	12.50		58	30
	17	24.50		84	9			
	25	15		85	12.50	VG LAS FY	11	12.50
	26	15		87	0		13	24.50
	27	12.50		88	15		14	25
	28	9		89	20		16	10.75
	29	23		91	17.50		18	10.25
	31	25		92	18		21	26
	32	27.50		93	8.75		22	13.75
	33	25		94	10		38	12.50
	37	11		95	10		42	14.25
	39	12.50					45	23.50
	40	25	NV MAS FY	2	27.50		51	27.50
	41	12.50		7	34.25		52.	17.50
	43	25		8	15		56	30
	49	13.50		30	27.50		64	22.50
	53	15.00		44	27.50		71	10
	55	27.50		46	27.50		73	19
	57	27.50		48	52 50		77	12
	59	14.50		68	20			
	61	10		72	22.50	VG MAS FY	15	24
	62	10		90	15		20	27
	63	11					76	17.50
	65	20	NV HAS FYT	4	26.25			
	66	10		35	24	VG HAS FYT	19	39.75
	67	10		36	27.50		23	13
	69	20		75	20		47	25

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Appendix 4-D.

Marginal Productivity of Land, Labour and Working Capital by Crop and by Farm Group.

in Ls.

A - Land	Marginal Productivity per feddar of				
Farm Group	Cotton	Wheat	Groundnuts	Dura	Vegetables
I - NV LAS FY	42.70	36.31	7.84	6.36	
II - NV HAS FY	44.54	47.88	14.40	9.66	
III - NV MAS FYT	45.25	38.30	6.77	8.88	
IV - NV HAS FYT	46.64	43.41	9.84	11.82	
V - NG LAS FY	47.91	38.94	21.04	12.90	37.60
VI - VG MAS FY	48.71	43.41	15.60	12.54	59.63
VII - VG HAS FYT	60.53	35.75	13.20	13.98	61.17
B - Labour	Marginal Productivity per mon-hour equivalent				
I - NV LAS FY	0.13	1.35	0.14	0.08	
II - NV MAS FY	0.14	1.96	0.15	0.07	
III - NV MAS FYT	0.13	1.08	0.14	0.09	
IV - NV HAS FYT	0.16	3.65	0.12	0.47	
V - VG LAS FY	0.17	1.41	0.2	0.07	0.41
VI - VG MAS FY	0.16	1.75	0.37	0.10	0.37
VII - VG HAS FYT	0.18	1.39	0.11	0.10	0.81
C - Working Capital.	Margir. roductivity per Ls.1 working capital				
I - NV LAS FY	1.10	2.84	2.04	0.90	
II - NV MAS FY	1.00	3.52	2.05	1.23	
III - NV MAS FYT	1.05	2.93	1.69	1.25	
IV - NV HAS FYT	1.09	3.61	1.88	2.03	
V - VG LAS FY	1.12	2.48	3.97	1.40	3.76
VI - VG MAS FY	1.10	2.98	2.89	1.32	5.01
VII - VG HAS FYT	1.09	2.16	1.35	1.24	3.48

Appendix 4E

Yield/feddan of cotton, wheat, dura and groundnuts by individual tenants

Farm Group	Code	Yield per feddar of: Cotton (Kantar)	Wheat (tonne)	Dura (Ardah)	Groundnuts (Kantar)
NV LAS FY	1	3.85	0.46	1.05	10
	5	3.24	0.52	1.31	5.2
	6	3.58	0.48	0.75	15
	9	4.95	0.59	1.20	14
	10	3.61	0.56	1.50	7
	12	3.45	0.5	0.6	20
	17	3.9	0.55	1.73	7.2
	25	2.56	0.60	0.15	7.2
	26	2.87	0.48	..6	8.8
	27	3.34	0.68	0.6	0.8
	28	1.44	-	-	3
	29	1.32	0.5	0.68	-
	31	1.48	0.4	0.3	3
	32	4.1	0.55	0.25	6.4
	33	2.8	0.32	0.52	3
	37	5.07	0.48	2.4	25
	39	5.45	0.4	1.2	-
	40	5.62	0.8	2.0	-
	41	6.41	0.6	4.4	-
	43	2.01	0.6	1.8	10
	49	4.20	0.28	-	-
	53	5.06	0.64	2.25	14.8
	55	6.82	0.55	3.20	15.3
	57	5.72	0.8	2.16	3.6
	59	6.16	0.75	0.7	20.5
	61	4.02	-	0.80	-
	62	3.06	-	1.08	-
	63	4.95	-	1	-
	65	2.46	-	1.60	-
	66	5.71	-	0.80	-
	67	2.44	-	0.80	-
	69	3.24	-	0.25	-
	70	6.49	-	1.49	8
NV LAS FY	78	3.4	-	3.8	-
	79	2.43	0.2	3.0	5
	80	4.21	0.5	2.0	-
	81	2.28	-	3.0	7
	83	7.14	0.6	4.4	6
	84	4.9	-	3.6	10
	85	1.63	-	1.20	-
	87	6.20	-	1.6	-
	88	3.86	-	1.20	-
	89	4.31		1.80	-
	91	3.75	-	2.0	3.5
	92	3.06	-	0.67	-
	93	4.07	-	2.2	..
	94	6.36	-	2.4	1.2
	95	4.6		1.3	
NV MAS FY	2	4.15	0.67	0.9	9.8
	7	3.46	0.70	1.28	22.2
	8	3.11	-	0.67	-
	30	3.44	0.05	0.45	9
	44	8.00	0.96	4.0	20
	46	4.89	0.67	2.0	10
	48	5.99	0.8	2.15	-
	68	4.33	-	1.4	-
	72	6.27	0.8	1.4	6
	90	4.49	-	1.9	-
NV MAS FYT	4	2.22	0.55	0.9	7.4
	35	2.09	0.5	0.8	4.6
	36	4.65	0.65	1.12	7
	75	9.64	-	3.6	7
	86	5.5	-	1.0	2.2

Farm Group	Code	Yield per fedd.an of: Cotton (Kantar)	Wheat (Tonne)	Dura (Ardab)	Groundnuts (Kantar)
NV HAS FYT	3	3.52	0.52	1.2	10.8
	34	2.68	0.74	0.9	8
	54	7.26	0.8	4	8
	58	5.5	0.65	1.80	6

Appendix 4-E

Farm Group	Code	Yield per feddan of Cotton (Kantar)	Wheat (tonne)	Dura (Ardab)	Groundnuts (Kantar)
VG LAS FY	11	4.17	0.60	1.95	-
	13	4.50	0.43	1.65	-
	14	4.36	0.60	1.90	5
	16	3.20	0.52	1.95	-
	18	2.57	0.60	1.50	-
	21	4.07	0.71	2.25	14
	22	2.90	0.53	1.50	18.7
	38	6.67	1.00	2.80	40
	42	7.36	0.50	4.00	14.5
	45	4.68	0.78	2.40	-
	51	5.72	0.55	2.60	-
	52	5.30	0.54	1.35	-
	56	5.50	0.66	2.10	13
	64	3.72	0.80	1.20	-
	71	5.47	-	1.40	-
	73	5.26	-	3.60	-
	77	4.85	0.40	2.40	-
VG MAS FY	15	2.72	0.48	1.87	-
	20	6.60	0.88	2.40	13
	76	5.42	-	2.00	-
VG HAS FYT	19	8 5	0.39	1.20	11
	23	4.48	0.62	3.00	-
	47	7.54	0.70	2.80	10.6

Appendix 6-A

Total production and quantitysold in advance of dura, wheat and groundnuts by tenant farmers.

Group	Code No.	Dura		Wheat		Groundnuts	
		Production (Ardabs)	Quantitysold through shail as % to total yield	Production (tonnes)	Quantity sold through shail as % to total yield	Production (Kantars)	Quantity sold through shail as % to total yield
I-NV LAS FY	1	2.625	79	1.80	15	25	60
-	5	3.275	-	1.30	28	13	115
-	6	3.75	7	3.3	39	75	33.3
-	9	3.00	-	1.475	2	35	71
-	10	7.5	-	2.80	53	35	85
-	12	1.5	-	2.5	24	50	-
-	17	8.65	-	4	10	18	-
-	25	0.375	100	3	40	15	67
-	26	4.0	-	2.30	52	22	36
-	27	1.50	-	1.7	-	20	150
-	29	3.4	30	2.5	48	-	-
-	31	1.5	67	2.0	55	15	33
-	33	2.6	-	1.6	25	45	80
-	37	6	77	1.2	92	31.25	91
-	39	3	133	1	130	-	-
-	40	10	120	4	57.5	-	-
-	41	11	72	1.5	100	-	-
-	49	-	-	0.70	185	-	-
-	55	16	-	4.8	-	76.5	100
-	57	10.80	-	6	18	18	-
-	59	1.76	171	4	32.50	41	24.4
-	61	2	25	-	-	-	-
-	62	2.70	158	-	-	-	-
-	63	2.5	40	-	-	-	-
-	65	8	5	-	-	-	-
-	67	2	100	-	-	-	-
-	69	1.25	267	-	-	-	-

Appendix 6-A (Continued)

Total production and quantity sold in advance of dura, wheat and groundnuts by tenant farmers.

Group	Code No.	Dura		Wheat		Groundnuts	
		Production (Ardabs)	Quantity sold through shail as % to total yield	Production (tonnes)	Quantity sold through shail as % to total yield	Production (Kantars)	Quantity sold through shail as % to total yield
I-NV LAS FY (contd.)	70	3.725	-	-	-	20	15
	78	9.50	32	-	-	-	-
	79	15	40	1.00	-	25	-
	83	10	9	1.5	-	15	-
	84	9	33.3	-	-	25	-
	85	3	66	-	-	-	-
	92	4.02	50	-	-	-	-
	95	3.25	40	-	-	-	-
	87	9.5	32	-	-	-	-
	28	-	-	-	-	7.50	-
	32	1.25	-	4	-	22	-
	43	9	-	3	-	25	-
	53	5.625	-	2.80	-	27	-
	66	2	-	-	-	-	-
	80	10	-	2.5	-	-	-
	81	15	-	-	-	35	-
	88	6	-	-	-	-	-
	89	9	-	-	-	-	-
	91	10	-	-	-	6.75	-
	93	7.99	-	-	-	-	-
	94	6	-	-	-	3	-
II- NV MAS-FY	44	20	- 4	7.25	29	70	100
	48	21.50	- 16	- 10	32	35	100
	2	4.9	- -	- 5.025	-	45	-
	7	3.2	- -	- 5.5	-	111	-
	8	3.35	- -	- -	-	-	-
	30	2.25	- -	- 5		45	-

Appendix 6-A (Contd.)

Total production and quantity sold in advance of dura, wheat and groundnuts by tenant farmers.

Group	Code No.	Dura		Wheat		Groundnuts	
		Production (ardabs)	Quantity sold through shail as % to total yield	Production (tonnes)	Quantity sold through shail as % to total yield	Production (Kantars)	Quantity sold through shail as % to total yield
II- NV MAS FY (Contd.)	46	10	-	5	-	25	-
	68	7	-	-	-	-	-
	72	7	-	2	-	30	-
	90	9.5	-	-	-	-	-
III- NV MAS FYT	4	4.9	-	4	-	37	-
	35		-	3	-	23	-
	36		-	5	-	35	-
	75	18	-	-	-	35	-
	86	9.50	-	-	-	-	-
IV- NV HAS FYT	3	3	-	1.3	-	27	-
	34	4.5	-	9	-	40	-
	54	10	-	4	-	20	-
	58	9	-	5	-	15	-
V- VG LAS FY	13	8.25	24	3.79	16.1	-	-
	14	9.5	31	3	35	17.50	-
	16	9.75	46	1.30	13.4	-	-
	18	3.75	-	1.5	13	-	-
	21	11.25	-	5.15	19	49.	-
	22	3.75	-	2.4	24.1	28	-
	35	7	57	2.5	80	50	70
	42	10	40	2.1	20	18	22
	45	12	116	3.51	29	-	-
	51	13	77	4.5	40	-	-
	52	3.375	104	2.6	26	-	-
	56	10.5	-	5.3	2	65	4.6
	11	4.875	-	1.5	6	-	-

Appendix 6-A (Contd.)

Total production and quantity sold in advance of dura, wheat and groundnuts by tenant farmers.

Group	Code No.	Dura		Wheat		Groundnuts	
		Production (Ardabs)	Quantity sold through shail as % to total yield	Production (Tonnes)	Quantity sold through shail as % to total yield	Production (Kantars)	Quantity sold through shail as % to total yield
V- VG LAS FY (Contd.)	71	3.5	22	-	-	-	-
	73	18	22.2	-	-	-	-
	64	6	-	4	-	-	-
	77	6	-	1	-	-	-
VI- VG MAS FY	15	[illegible]	-	2.4	58.3	-	-
	20	12	-	6.5	3	45.5	-
	76	10	-	-	-	-	-
VII- VG HAS FYT	47	14	36	3.5	77	39.75	137.5
	19	9	-	4.025	-	59.85	-
	23	7.5	-	2.3	-	-	-

Appendix 6-B

Variation in interest rate charged by shail merchant among tenant farmer, and its relation to certain variables.

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from Previous Season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No.of loans outstanding	Credit need Ls.	Interest rate per half month
222.95	442.17	5.35	188.18	1	0	5.60	8	8	5.5	1	162.01	10.89
				1	0	1.00	10	4	6.6	2	193.98	5.74
				1	0	3.75	10	6	10.35	3	193.98	13.46
				0	0	9.60	11	5	19.95	4	252.54	14.87
				1	1	4.00	14	9	22.95	4	319.23	5.33
				1	1	18.00	17	6	22.00	2	351.01	6.00
				1	1	13.50	18	5	35.50	3	370.93	7.25
				1	1	15.00	19	4	50.50	4	391.30	6.30
134.45	203.68	158.1	202.42	1	0	2.75	9	8	2.75	1	72.84	11.57
				0	0	13.5	11	6	16.25	2	136.03	12.25
				1	1	8.00	17	4	8.00	1	165.01	12.38
				1	1	5.00	19	2	13.00	2	196.54	12.96
373.37	658.54		90.8	1	1	15.00	18	4	15.00	1	443.17	6.29
				1	1	30.00	19	3	45.00	2	474.87	8.49
				1	1	10.00	20	2	55.00	3	238.16	12.99
372.29	787.46		320.21	1	0	15.20	16	11	15.2	1	203.36	7.55
				1	0	15.20	08	9	30.4	2	237.39	9.43
				0	0	4.00	12	5	34.4	3	416.64	17.61
176.14	144.68	56.90	106.44	1	1	35.00	19	13	50.0	1	98.61	4.73
				0	0	4.00	11	3	54.00	2	172.62	14.47
				0	0	10.00	20	2	10.00	2	245.01	12.99
221.74	5.65	6.50	142.89	1	0	4.00	9	5	16.00	1	181.33	4.56
				0	0	4.00	10	8	20.00	2	219.38	12.14
				1	1	10.50	10	13	30.5	3	219.38	5.85
				1	1	3.50	12	10	34.00	4	313.59	6.19
				1	1	14.00	15	7	44.00	5	375.33	8.97

Key : A) Crops 0= Dura or groundnuts
1= Wheat

B) Kinship 0= No blood relationship
1= Blood ties

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from Previous Season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No.of loans outstanding	Credit need Ls.	Interest rate per half month
197.33	208.68	-	143.74	0	0	4.00	7	7	4.00	1	107.54	5.97
				0	0	7.50	7	9	11.50	2	107.54	9.52
				0	0	3.75	9	7	17.25	3	104.48	12.40
				0	1	3.00	11	11	20.25	4	153.46	7.11
				0	1	4.00	14	8	18.25	4	195.86	3.13
				0	1	15.00	20	3	23.00	3	240.15	8.49
617.45	193.73	217.75	262.96	1	1	3.00	10	12	3.00	1	98.65	6.49
756.36	912.68	700.00	866.25	1	0	20.00	11	7	20.00	1	252.00	10.41
				1	0	4.00	12	3	24.00	2	312.86	4.01
				0	0	50.00	13	5	74.00	3	261.92	14.87
				1	1	80.00	13	9	154.00	4	261.92	5.33
170.69	197.31	27.75	126.44	1	0	2.00	9	5	2.00	1	126.75	6.60
				0	0	1.00	11	3	3.00	2	150.00	11.24
467.52	283.33	-	258.8	1	0	6.00	6	8	6.00	1	195.69	13.90
				1	1	25.00	18	4	25.00	1	692.71	6.78
530.93	413.38	176.32	345.85	1	0	16.00	9	5	16.00	1	164.60	11.84
				1	1	15.00	16	6	15.00	1	347.18	9.27
				1	1	16.00	17	5	31.00	2	378.26	9.80
				1	1	27.00	18	4	58.00	3	418.58	9.14
389.58	91.02	160.00	273.76	0	0	2.00	8	9	6.00	1	161.24	14.94
				1	1	4.00	18	4	10.00	2	195.72	12.91
				0	1	4.00	19	3	14.00	3	197.19	17.57
585.35	330.26	132.00	292.48	1	0	8.00	7	7	8.00	1	183.18	5.96
				1	0	8.00	9	5	16.00	2	236.22	8.45
290.60	542.88	72.00	201.14	0	1	21.00	11	5	21.00	1	279.44	14.87
				1	0	6.00	11	11	27.00	2	279.44	7.11
				0	0	12.00	13	3	39.00	3	358.72	14.47
				1	1	27.00	13	9	66.00	4	358.72	8.75
				1	1	6.00	14	8	72.00	5	389.02	9.90
				1	1	27.00	15	7	66.00	4	406.32	11.39
				1	1	10.00	19	4	76.00	5	573.68	6.30
				0	1	12.00	20	3	88.00	6	386.97	16.86

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from previous season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No. of loans outstanding	Credit need Ls.	Interest rate per half month
				1	1	20.00	15	7	60.00	3	183.02	6.91
				1	1	16.00	17	5	75.00	4	232.69	9.80
				1	1	15.00	19	3	90.00	5	324.18	8.49
				1	1	15.00	20	2	105.00	6	375.11	12.99
477.56	326.83	42.00	225.79	1	0	17.50	6	10	17.50	1	140.89	7.18
				1	1	10.00	9	13	27.50	2	180.61	7.48
				1	0	4.00	10	6	31.50	3	196.95	9.78
				1	0	8.00	11	5	39.50	4	210.48	11.84
				1	1	24.00	15	7	34.00	2	167.31	6.91
				1	1	12.00	17	5	46.00	3	215.63	9.80
				1	1	10.00	19	3	56.00	4	280.18	8.48
469.37	520.60	60.00	380.00	1	1	8.00	15	8	8.00	1	408.69	6.02
				1	1	4.00	16	7	12.00	2	428.51	6.91
				1	1	12.00	17	6	24.00	3	449.76	8.10
				1	1	8.00	18	5	42.00	4	511.57	7.25
60.89	239.13	55.70	107.05	1	1	24.00	9	13	49.00	1	71.09	5.98
				1	1	3.00	11	11	52.00	2	94.72	7.17
				0	1	6.00	14	8	58.00	3	123.54	13.41
				0	1	3.00	17	5	61.00	4	160.29	16.30
1070.00	772.36	120.00	527.51	1	0	7.00	9	5	7.00	1	692.81	11.38
				1	0	15.00	9	9	22.00	2	692.81	8.01
				0	0	5.25	11	3	27.25	3	923.74	19.68
				1	0	15.00	11	7	42.25	4	923.74	10.41
				1	1	7.00	11	12	49.25	5	923.74	5.14
				0	0	5.00	12	6	54.25	6	981.46	12.25
				1	1	16.00	12	11	70.25	7	981.46	4.34
				1	1	40.00	15	8	98.00	5	1095.87	6.02
				1	1	32.00	17	6	95.00	4	1309.41	8.10
				0	1	35.00	19	3	130.00	5	1450.20	13.42

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from previous season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No. of loans outstanding	Credit need Ls.	Interest rate per half month
181.61	538.40	-	300.11	1	1	5.00	11	10	19.00	1	287.14	9.83
				1	1	12.00	13	8	31.00	2	324.13	6.02
				1	1	8.00	17	4	39.00	3	452.70	12.40
256.62	163.60	-	208.28	1	1	3.50	9	10	13.50	1	130.90	6.20
				1	0	2.40	11	14	15.90	2	171.10	3.72
				1	1	14.00	11	12	29.90	3	171.10	5.14
				1	1	3.50	17	6	33.40	4	272.60	10.54
				1	1	5.00	19	4	38.40	5	268.34	6.30
				1	1	5.00	20	3	41.40	5	288.22	8.49
63.75	184.97	31.75	87.42	1	0	6.00	7	7	6.00	1	69.55	5.97
117.50	137.02	60.40	62.74	1	0	2.00	11	3	6.50	1	97.83	7.72
200.10	138.16	57.55	135.55	1	0	6.10	11	6	6.10	1	212.44	11.94
				1	1	6.00	11	11	12.10	2	212.44	7.11
				0	1	8.00	19	3	14.00	4	322.06	16.87
248.70	191.21	154.00	236.41	0	0	12.60	9	7	29.00	2	97.14	16.18
				1	0	7.70	10	6	42.70	4	123.74	19.12
				1	1	3.00	11	10	49.70	6	137.88	7.84
				1	1	20.00	15	6	33.00	2	106.11	8.10
				1	1	12.00	17	4	45.00	3	139.29	12.40
				1	1	15.00	19	2	60.00	4	193.40	12.99
66.87	200.70	15.10	78.71	1	0	12.00	7	9	37.00	1	97.67	8.01
				0	0	4.00	10	5	41.00	2	124.36	14.87
				1	1	17.50	15	8	53.00	1	149.43	7.80
				1	1	18.50	17	6	71.50	2	184.54	9.52
				1	1	13.50	19	4	85.00	3	217.69	9.14
295.35	666.45	27.30	171.79	1	0	15.00	2	14	20.50	1	32.21	7.26
				1	0	8.00	3	13	28.50	2	58.04	5.48
				1	0	4.00	9	7	32.50	3	140.22	10.41
				1	1	10.00	9	13	42.50	4	140.22	7.48
				0	0	16.00	11	5	58.50	5	188.71	14.87
				1	1	15.50	11	11	74.00	6	188.71	4.64

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from previous season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No.of loans outstanding	Credit need Ls.	Interest rate per half month
107.18	213.01	12.00	124.78	1	1	6.00	10	12	19.00	1	112.66	6.50
				0	0	5.60	11	6	24.00	2	145.39	15.94
				1	1	10.50	11	11	35.10	3	145.39	5.62
				1	1	15.53	15	7	52.53	4	179.28	7.36
				1	1	4.00	18	4	49.73	4	197.93	12.40
				1	1	10.00	19	2	59.73	5	207.63	12.99
102.74	235.27	-	111.07	0	0	2.00	7	7	12.00	1	90.48	16.99
				1	0	4.90	9	9	16.90	2	114.99	12.37
				1	1	10.50	9	14	27.40	3	114.99	4.39
				1	1	13.50	15	8	44.90	5	251.69	7.80
				1	1	8.00	19	4	44.00	4	255.04	12.40
				1	1	10.50	20	3	54.50	5	286.84	12.99
341.40	327.48	41.50	227.16	1	0	4.00	10	4	4.00	1	251.06	10.67
227.10	179.45	11.20	103.49	1	0	2.25	9	7	2.25	1	144.76	10.41
338.65	133.30	144.00	218.47	1	0	12.00	9	6	16.00	1	132.99	6.99
39.16	18.57	29.50	69.49	1	0	10.00	5	9	22.00	1	57.18	4.61
				1	0	2.00	9	5	24.00	2	79.64	8.45
				0	0	2.00	11	3	36.00	3	104.71	14.47
125.52	-359.66	68.7	138.49	1	0	8.00	7	7	8.00	1	123.62	11.37
465.80	-93.32	399.00	235.64	0	0	2.00	11	3	2.00	1	219.48	14.47
84.05	-14.96	264.50	156.32	1	0	15.00	7	7	40.00	1	104.69	5.96
				1	0	10.00	9	5	5.00	2	83.54	8.45
348.77	158.50	158.50	238.83	1	0	5.25	8	6	5.25	1	97.88	9.40
				1	1	8.00	16	6	8.00	1	144.30	8.11
168.09	423.04	-	224.94	1	0	6.00	7	9	6.00	1	134.39	6.42
				1	0	4.00	9	7	10.00	2	151.52	6.96
				1	0	1.00	9	7	11.00	3	151.52	5.96
				1	0	8.00	10	6	19.00	4	171.41	6.99
				1	0	4.00	11	5	23.00	5	198.06	8.45
				1	1	4.00	13	9	27.00	6	264.49	5.32

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from previous season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No.of loans outstanding	Credit need Ls.	Interest Rate per half month
				1	1	8.00	15	7	4.00	2	255.53	0.89
422.79	581.27	351.00	341.45	1	0	16.00	6	10	16.00	1	95.29	4.14
				1	0	20.00	9	9	36.00	2	117.32	8.01
				1	1	7.00	9	13	43.00	3	117.32	4.73
				1	0	15.00	11	7	58.00	4	174.34	10.41
				1	1	32.00	13	9	90.00	5	221.67	5.33
				1	1	12.00	17	5	32.00	3	89.85	9.80
				1	1	35.00	19	3	67.00	1	137.41	8.49
266.98	155.61	55.5	171.35	1	1	10.00	16	6	10.00	1	248.22	4.16
				0	1	3.50	17	5	13.50	2	255.77	17.71
292.02	652.52	-	206.90	1	0	2.25	6	11	5.75	1	192.07	7.43
				1	1	3.00	13	8	8.75	2	436.98	9.89
169.36	402.83	58.20	143.46	1	0	9.00	5	7	15.50	1	82.50	0.13
				1	0	3.60	8	9	18.10	2	117.80	6.97
				1	0	2.40	9	8	21.50	3	128.40	7.79
				1	1	21.00	13	10	37.47	3	204.01	6.47
				1	1	12.00	15	7	50.47	+	225.31	4.96
				1	1	15.00	20	2	54.50	3	117.16	5.97
279.05	537.91	-	367.75	1	0	20.00	4	11	36.00	1	107.94	3.76
				1	0	16.00	8	7	30.00	2	271.29	5.96
				1	0	8.00	9	6	18.00	3	296.55	6.99
				1	0	4.00	10	5	12.00	4	333.07	8.45
				1	0	8.00	11	4	18.00	5	404.55	10.67
				1	1	20.00	17	5	37.92	1	586.89	9.80
				1	1	25.00	19	2	37.92	2	599.64	12.99
				1	0	25.00	7	8	40.00	1	247.67	4.30
933.01	561.36	997.00	532.84	1	0	22.50	9	8	37.50	1	49.59	10.50
				1	0	30.00	20	7	67.50	2	79.31	10.41

Appendix 6-B (Contd.)

Value of Assets Ls.	Farm Income Ls.	Off-farm Income Ls.	Profits from previous season Ls.	Kinship	Crop	Size of loan Ls.	Date of lending	Duration in half months	Debt Ls.	No.of loans outstanding	Credit need Ls.	Interest Rate per half month
				1	1	4.00	17	5	19.00	1	29.28	9.80
				1	1	35.00	18	4	54.00	2	72.75	6.30
				1	1	50.00	19	3	104.00	3	85.42	8.49
				1	1	20.00	20	2	134.00	4	151.47	12.99

Appendix 7A.

The Estimation of Production Functions (PF)

The formulation of an economic model of the production process involves three aspects as described by Heady and Dillon (1961): (i) The logic underlying the production process, (ii) relevant set of variables and (iii) appropriate algebraic form of equation to represent the model.

The estimation of PFs in this study was carried out under the assumption of a single functional relationship, applying to all farms and the variables used were observations of this production function. For this assumption to be realistic, it must satisfy two conditions of the variable being both complete and correct or specification errors may arise. The first condition may be violated by difficulty in increasing unobserved variables. The second refers to the aggregation of inputs. The cost of complete and correct specification of the variables is prohibitive. The construction of a computationally feasible model necessitated a compromise between the theoretical ideal and an empirically feasible specification of the variable.

The variables included in this study were gross farm output (the dependent variable) regressed on land, labour and capital (the independent variables)

Gross Farm Output (Y)

The dependent variable was the gross farm output of each tenant farmer represented in Ls. A value was preferred due to the diversity of crops cultivated and the different uses to which farm products were put which would limit their aggregation on physical basis. Gross farm output does not include off-farm income and was computed by summing the total value of crop and livestock production.

products consumed by the family, paid as wages in kind, tax or gifts,

Land

The difficulty in specifying land on grade and inherent fertility necessitated its treatment as one variable. This variable measures the total cultivable area including fallow in the rotation and was measured in feddans.

Labour

Labour was separated into three groups of actual family labour, actual hired labour and actual total labour used. To express the variation in the quality of labour more realistically as between age and sex, both family and hired labour used were standardised on man-hour equivalents. The basis and methods of standardisation were discussed in Chapter 2.

Working Capital

Working capital included crop and livestock costs like seeds, fertilizers, chemicals, contract work, feeds and marketing charges and other general expenses. Cash and kind wages to hired labour were not included because this would have resulted in double counting.

Management

Management was handled through dummy variables, introduced in the PF analysis, which are related to the farmer's average cotton yield over the last five years. The individual tenant's 5 years average was expressed as per centage to the total sample average. However, a high correlation is expected to occur between yield and gross farm putput. Furthermore, these yield variations could be due to factors other than management.

A Cobb-douglas PF linear in(2)logarithms was used for this analysis. The general form of the Cobb-douglas PF is:

$$\text{Log } Y_i = \log a + bi \log Xi + E$$

Where Y = the dependent variable

Xi = Set of explanatory variables

a = Constant term

bi = Set of regression coefficients giving elasticities of production

E = Error term denoting variation not explained by the variables included in the function.

The most important statistics to be derived from this function and the relevant values to be computed from these statistics are:

a) Production elasticities (b_i)

The Cobb-douglas PF yields regression coefficients (bi) in the above equation) for each input factor which can be interpreted directly as the elasticities of production indicating a percentage change in put it that would occur if the amount of the input factor was changed by 1%, other inputs levels being held constant. In the Cobb-douglas PF these estimates of production elasticities remain constant.

The relative importance of the individual variables is determined by their net or standardized regression coefficients computed from the estimated regression coefficients and the standard deviations (SD) of the independent and dependent variables. The formula used to derive the standardized beta coefficients for a Cobb-douglas function is as follows:

$$Ei = bi \frac{S\ Xi}{S\ Yi}$$

Where Ei = The standardized regression coefficient for input Xi

bi = The estimated regression coefficient for input Xi

SXi = SD of independent variable Xi (in logarithm)

Sy = SD of dependent variables (in logarithms)

b) <u>Sum of elasticities</u> $\sum_{i=1}^{n} bi$

The sum of beta coefficients gives an indication of the returns to scale. It could be less than equal to or greater than unity indicating decreasing, constant or increasing returns to scale respectively, under the assumption that no relevant variable have been excluded and that almost perfect aggregation of inputs is used.

c) <u>Coefficient of multiple determination</u> = R^2

The coefficient of multiple correlation (R) shows the correlation between the n observed values of Y and the estimated Y ($\hat{Y}$). That of multiple determination R^2 is a measure of goodness of fit of the estimated regression and indicates the percentage change of the variation in the n observed values of Y that is explained by regression. The following formula is used to derive R^2:

$$R^2 = \frac{\sum_{j=1}^{n} y_j^2 - \sum_{j=1}^{n} (Y_j - \hat{Y}_j)^2}{\sum_{j=1}^{n} y_j^2}$$

Where: R^2 = Coefficient of multiple determination

$\sum_{j=1}^{n} y_j^2$ = Corrected sum of squares of Y attributed to regression.

This formula tends to over-estimate R^2 when there is a large number of parameters or a small number of observations. In this case R^2 is adjusted for the size of the sample and the number of observations to give the adjusted coefficient of multiple determination. R^{-2} calculated as:

$$R^{-2} = 1 - (1 - R^2)\left(\frac{n - 1}{n - k}\right)$$

Where: n = number of observations

k = number of parameters

c) Marginal value product (MVP)

The MVP of each input factor is computed directly from the elasticities of production (bi) using this formula:

$$MVPi = bi \frac{\bar{Y}}{\bar{X}_i}$$

where: $\bar{Y}$ = geometric mean of gross farm output

$\bar{X}i$ = geometric mean of the ith independent variable, Xi

The ratio of this MVP to marginal cost (MC) provides a measure of efficiency of resource use prevailing on the average throughout the sample studied and is referred to as the efficiency index of resource use. It could be less than, equal to or greater than unity, indicating too much, maximum efficiency or too little of the resource being u...