THE DEMOCRATIC REPUBLIC OF THE SUDAN
MINISTRY OF NATIONAL PLANNING
(Project Preparation Unit)

NEW HALFA IRRIGATION PROJECT
REHABILITATION STUDIES
PHASE II
Support Measures
ANNEX 3
Agricultural Engineering
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AGRAR- UND HYDROTECHNIK GMBH
ESSEN - W. GERMANY

ANNEX 3

Agricultural Engineering

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1. Brief Description of Proposals for the Phase I Programme

1.1 Background

The main function of the New Halfa Agricultural Production Corporation's (NHAPC) machinery service has been the cultivation of the cotton crop only. Cultivations for the groundnut and wheat crop were supposed to be carried out by machinery from the private and cooperative sector. However, some wheat and groundnut tillage has, in the past, been done by the Corporation because of lack of machines in the other two sectors.

Up until 1975 all cultivations were carried out by wide level disc harrows, light disc harrows and ridgers. In 1975 there was a change to disc ploughs for the primary tillage. Only wheat is sown mechanically. The Corporation combines harvest half the wheat crop, the other half being carried out by the private sector

In 1978 the Corporation had 125 serviceable tractors. 49 combine harvesters and sufficient cultivation equipment for the tractors. There were also 127 planters and 30-35 groundnut lifters and strippers.

In 1978 the workshops had just been re-sited. New buildings constructed were open-fronted structures with only some having concrete floors. Dust is a major problem. There is a lack of tools, spare parts and special equipment for repair work. Only 11 (out of 19) of the Blocks have machine and implement sheds. These are open-sided structures. Facilities at the Blocks are either very poor or non-existent.

Fuel storage capacity is very limited at both central and Block level with only 12 days' storage at periods of peak demands. Supplies are erratic in arrival.

1.2 Comments on Cultivation Methods and Machine Numbers-Proposed in the Phase I Report

It was felt that one of the main reasons for poor yields of cotton and groundnuts was the very poor ridge formation resulting in waterlogged plants. The poor ridge formation was due in part to the nature of the soil and in part to inadequate cultivations. The soil, when saturated, tends to slump very easily, particularly when wetted from an absolute dry state. This, combined with the shallow tillage, has led to extremely poor ridge formation and consequent waterlogging of plants.

The use of the wide level disc harrow (WLDH) for wheat cultivation and sowing has led to three adverse conditions occurring. Firstly, the WLDH is a one way implement and, therefore, tends to be operated in a circular pattern. Soil has always been thrown towards the outside of the hawasha and has caused a depression to be formed in the centre. Secondly, because of the circular pattern, the corners of the hawashas tend to be missed, and,

thirdly the WLDH is not a precise implement and sowing depths tend to vary considerably leading to uneven germination, growth and ripening. The situation is further worsened by poor operation of the WLDH, and removal of the placement coulters.

Basically, the WLDH is an implement designed for the wide open prairies of North America where the main requirement is to cover as large an area of land as quickly as possible, and where depth of sowing and accurate seed rates are of secondary importance. The WLDH was not designed for, nor is it suitable for irrigated areas with (relatively) small fields. The WLDH is used in the extensive sorghum areas of Sudan, and, in the absence of correct machine selection, has been taken over by New Halfa for an entirely different operation.

Using as a basis for calculation the output figures for machinery supplied by the Corporation (see, however, Section 1.3), and following the present cultivation methods, total tractor number to cover the whole Project was assessed to be in the region of 450. To accomplish the proposed areas for 1978-79 the Corporation would have needed about 290 tractors. The rest of the area to be covered by the private and cooperative sector. (This is assuming hand planting of cotton and groundnuts in June and July.) It can thus be seen that the Project, if it continued to use the existing cultivation techniques, was seriously under-capitalized. This lack of machinery was a serious constraint for the maintaining and improving of production from the Project.

1.3 The Phase I Proposals

The purpose of the Phase I proposals was to

- review and critically analyse the existing Project
- identify the immediate inputs needed by the Project to ensure its stability and if possible provide modest increases in productivity.

From the mechanisation point of view there were found to be several fundamentally wrong aspects of the existing situation. These were briefly:

- poor tillage which, in combination with the soil type, leads to poor ridge formation and makes water control difficult
- late planting of cotton and groundnuts due to insufficient machines to finish the tillage in time
- poor plant populations
- poor tillage and sowing of wheat
- a labour bottleneck at groundnut and cotton harvesting times, partly caused by late planting.

- Wrong division of operations among the Corporation, co-operative and private sectors. Instead of the Corporation being responsible mainly for the cotton, and the wheat and groundnuts being the responsibility of the private and cooperative sectors, a far better machine utilisation would be achieved if each sector covered a percentage of all three crops.

- Extremely poor operation and supervision of all agricultural machinery operations.

To satisfy the purpose of the Phase I proposals (to be carried out over five years) it was felt that, to be realistic, only a part of the problems could be successfully tackled. These were as follows:

- Poor tillage was due to a combination of poor machine operation and wrong basic techniques. It was felt unrealistic to introduce new machinery and techniques, and train the operators over such a large project and in such a short period. Apart from this, new, better cultivation techniques would require new, larger tractors, and the investment cost would have been higher. However, to avoid the same situation arising in year 5 (i.e. many machines out of order and still poor tillage) it was felt that a model extension area should also be started from year 1 which would serve to act as a training programme for new operators and introduce them to new machinery. In other words, a start would be made on Phase II but commencing at the same time as Phase I.

  In this way Phase II would not have to start from the beginning again but would gradually take over from Phase I. Also for the same reason the effects of new techniques would have been evaluated in an experimental area.

  Thus for the Phase I Programme all calculations were based on existing machine types and outputs.

- Late planting of cotton and groundnuts was due in part to insufficient machinery. It was thus proposed to increase the machine numbers so that the Corporation programme could be carried out so that the groundnuts could be planted in June and cotton in July.

- Poor plant populations (cotton only) would have been improved by mechanical planting.

- Wheat tillage and planting would have been improved by disc ploughing and the introduction of grain drills which would replace the WLDH.

- The labour bottleneck at groundnut and cotton harvesting time would have been eased by partial mechanization of the lifting and the use of groundnut strippers.

2. Summary of Changes Occurring between Phase I Report and the Present Project Conditions

(Two years after the Phase I proposals)

There has been little or no further investment in machinery, spare parts or infrastructure in the last two years. The only major purchase has been twenty 75 H.P. second-hand tractors.

As a consequence there has been a serious decline in the numbers of operational tractors and the latest estimate by the Corporation is that only 77 tractors will be in running order for the 1980/81 season.

In 1979/80 the following areas were completed by the Corporation using 79 tractors (figures supplied by Corporation):

- disc ploughing 45,820 feddans
- disc harrowing 9,000 feddans
- ridging for planting 15,000 feddans
- split ridging 7,060 feddans
- primary ridging 22,160 feddans
- clod crushing (using iron bar) 20,000 feddans
- Abu Ishreens cleaning 103,000 feddans

In addition the private and cooperative sectors (see also Chapter 5) achieved the following (figures supplied by Corporation):

- first ridging (primary ridging) 36,035 feddans
- second ridging (split ridging) (after disc ploughing) 25,770 feddans
- clod crushing 23,990 feddans
- disc harrowing 4,000 feddans
- ridging (to kill weeds, "green ridging") 21,260 feddans
- ridging for planting 28,900 feddans

During 1979/80, 66,000 feddans of cotton was planted by 19th September. Planting finished on 2nd October when a total of 71,485 feddans had been completed (figures supplied by Corporation).

Due to lack of machinery the Corporation are planning to only carry out the operations of disc harrowing and ridging for the 1980/81 season.

There has been no increase in the number of tractors owned by the cooperatives.

There has been no improvement in the fuel supply situation, although with fewer operational tractors in the last two years the problem has not been so acute.

The purchasing procedure for spare parts has been altered. The procedure now is that the Corporation obtains a proforma invoice (p.f.i.) from the supplier. The p.f.i. is then approved by the Corporation after which the part can be purchased. Although this is an improvement over the old system a double journey to Khartoum is still required.

In conclusion it can be said that in the period since the Phase I Report there has been a drastic deterioration in the capability of the Corporation's machinery service, both in terms of area that can be covered and in quality of work performed. The Phase I proposals are not now sufficient.

2.1 Changes in Conditions which Affect the Support Measures for Phase I

Since the Phase I Report there have been the following changes which affect the machinery selection and numbers.

There will be no water available for pre-watering nor for pre-irrigation.

There has been a decline in the condition and numbers of the Corporation's machinery fleet.

There will be a difference in the area to be covered by the machinery fleet. The Phase I proposals only included the areas which the Corporation intended to cover. These areas are modified by the decrease in the water availability from the dam and by the inclusion of sorghum in the rotation. Also Phase I only specified the tractors to be supplied to the Corporation. The Support Measures would deal with the total tractors and machinery required and would recommend the way in which they should be dispersed amongst the Corporation, cooperative and private sectors. The areas to be covered are as follows:

Total Areas to be Covered
(in feddan)

Year	Cotton	Groundnuts	Wheat	Sorghum
1981/82	59,000	57,000	Nil	42,000
1982/83	57,000	56,000	Nil	44,000
1983/84	58,000	56,000	Nil	48,000
1984/85	60,000	58,000	Nil	54,000
1985/86	62,000	59,000	Nil	60,000

There would now be an area of sorghum (see above), and wheat will no longer be grown.

Cultivation and seeding for this occurs at the same time as the cultivation for cotton and groundnuts. Machinery requirements would, therefore, be higher.

3. The Revised Phase I Proposals

3.1 Machinery Selection

3.1.1 Tractor Size and Type

The present practice of the NHAPC machinery service is to provide machines to do the operations for cotton crop only. As was pointed out in the Phase I Report, this monopolizing of one crop by the Corporation leads to poor utilization of tractors. A much more efficient utilization could be achieved by each sector (NHAPC, private and cooperative) doing a proportion of each crop. If this were the case then the most suitable versatile tractor would be a 75 H.P. unit.

Since the Phase I Report, however, two factors have changed or become known:

- There is no water available for pre-irrigation or pre--watering. Seed-bed preparation would therefore have to be completed in dry soil conditions.
- The survey of machinery and operations in the private and cooperative sector has revealed that these sectors are unwilling to undertake primary tillage in dry soil conditions. This implies that they prefer that their tractors have a lower annual utilization and last longer rather than a few years of high utilization.

From the theoretical point of view the system that minimises the number of tractors required for the Project Area and also therefore increases individual tractor utilization is to be preferred. The private and cooperative sectors are, however,

unwilling to undertake primary tillage. The reason assumed for this is that primary tillage, using 70-75 H.P. tractors in dry soil conditions, causes excessive breakage and wear to the tractors, leading to shorter life, and that the rate of remuneration received for this work does not cover the extra wear and tear. Also primary tillage with a 75 H.P. tractor in the dry soil conditions prevailing at New Halfa, while being possible, requires skillful operators and a high standard of maintenance. If these were available then rates of work would decrease. For example, disc ploughing, if done correctly would take place at a maximum of about 0.6 feddan per hour or 6 feddans per 10 hour day; less than half of the rate now claimed to be achieved by the NHAPC.

If then the private and cooperative sectors wish only to do light operations then the most sensible solution is to let the Corporation cover all the heavy tillage operations of all the crops and the private and cooperative sectors would then do all the lighter operations. The Corporation could then choose the most suitable tractor for tillage and not a compromise as was the case in the extension area of the Phase I Report.

The changeover to this new system of tillage can obviously not take place in a short period of time, and it is proposed that it should be introduced over the five year period of the Support Measures. This is discussed further in Section 3.1.9.

The most suitable tractor for tillage would be an agricultural crawler tractor for the following reasons:

- Tillage occurs in the speed range 4-6 k.p.h. At those speeds the crawler tractor is more efficient than a wheeled tractor.

- Track wear, which can be a problem on some soils, would be very low in the fine clay soils at New Halfa.

- Crawler tractors are generally more rugged than wheeled tractors.

- They would be able to operate up and down the "numbers" and easily cross the Abu Sitas. A wheeled tractor would have difficulty. Similarly the crawler tractor would be able to cross the broad based beds when renewing the Abu Sitas after planting.

For these reasons a 100-110 H.P. direct drive crawler tractor is to be recommended. A larger one than this would not be able to cross bridges. It is also preferable in this situation to have several medium-sized machines rather than a few large machines as when one tractor breaks down it does not represent such a high proportion of the total fleet as it would with just a few machines.

As has been mentioned previously it would be advisable to introduce the crawler tractors on a phased basis. There would, however, be a reducing area of land which would still have to be cultivated. It is proposed that this diminishing area be still cultivated with 75 H.P. tractors as at present. As this area diminishes, the tractors released would take over the lighter duties of planting, etc.

3.1.2 Primary Tillage

Two primary tillage tools come into consideration for the use with a crawler tractor; the chisel plough and the ploughing offset disc harrow. It is felt that the chisel plough, when working in the dry soil conditions, would leave a far rougher surface than the ploughing disc harrow. For this reason the ploughing disc harrow is to be preferred. The implement is also used most successfully at the Sugar Estate. These implements are very rugged and simple to operate. Operator responsibility and skill would thus not be so demand ing.

A harrow with 32" (81 cm) diameter blades, with a width of cut of 3.2 metres would require a drawbar pull of about 4,500 kg. A 105 H.P. tractor would pull this at about 6 k.p.h. The harrow would have about 18 discs and a weight per disc of about 230 kg. The harrow would be trailed and mounted on hydraulically operated wheels. Maximum depth of work is estimated at 20-25 cm in dry soil conditions.

3.1.3 Secondary Tillage

As mechanical planting is to take place in dry soil conditions, it is very important that the soil tilth be as fine as possible. A trailed offset disc harrow would be the most suitable implement to achieve this. A 105 H.P. crawler could pull a 6.0 metre wide harrow having 40 discs of 66 cm diameter. Two passes will probably be required.

3.1.4 Ridging

In the Phase I Report it was proposed that single ridging should be continued until such time that an improved system (one of which was double ridging) could be evaluated in the experimental area. The main uncertainty was whether water would infiltrate sufficiently into a double ridge profile. Double ridging appears now, however, to be a practice already followed in the Scheme, particularly for vegetables. In ridges examined it would appear that the soil moisture content at the centre of such a double ridge system is ideal. It is, therefore, now proposed that double ridging be introduced from the start of the Phase I Programme. Double ridging has the following advantages:

- better ridge profile with less risk of flooding or moisture deficiency
- easier to mechanically plant onto
- fewer operations required to maintain the ridge.

It is proposed that the double ridges be formed with a rolling disc bedder, toolbar mounted, and that it be introduced along with the introduction of the crawler tractor.

3.1.5 Abu Sita Ditching

The Abu Sitas would be pulled after all the tillage and planting operations. The crawler has the advantage that it would be able to cross the beds without damage either to the tractors or the beds.

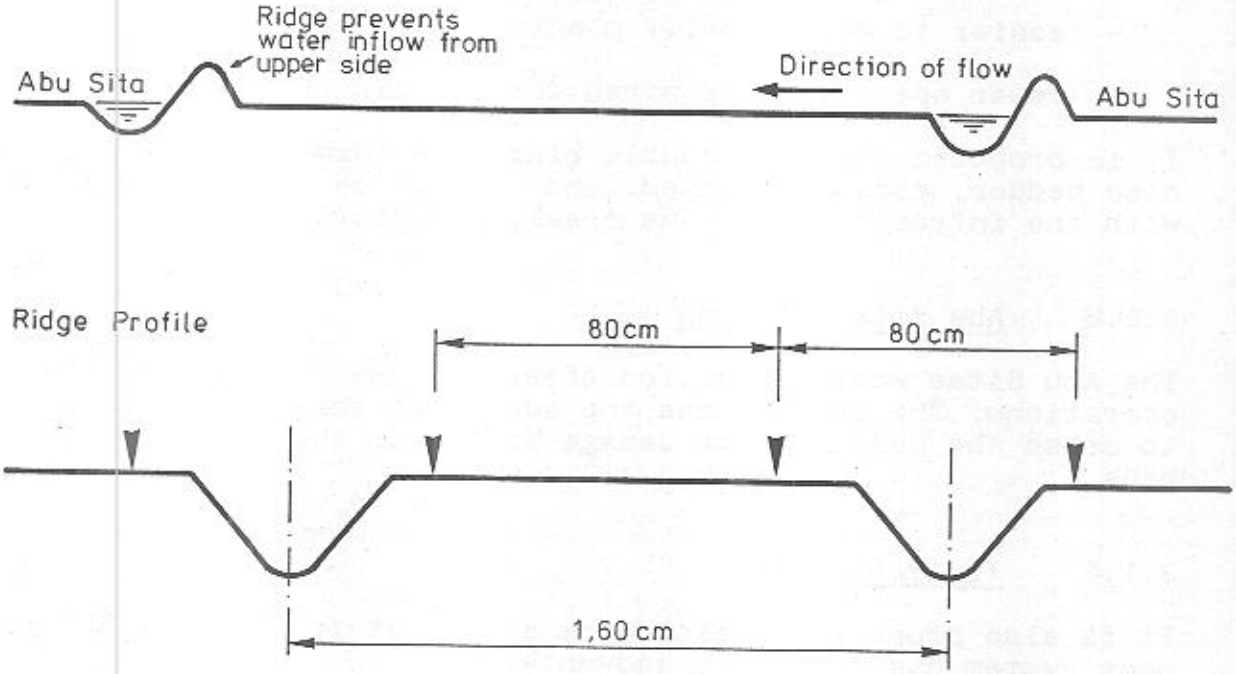
3.1.6 Irrigation

It is also proposed to alter the system of irrigation. The present system has several disadvantages:

- The small five feddan fields are not so well suited to larger machines.
- The unevenness of the fields makes it necessary to divide them into small basins involving considerable manpower to make the bunds and also making it difficult to carry out inter-row cultivations and harvesting. Water control is a problem with water-logged and dry patches over the hawashas.
- The circular pattern used now to sow wheat in the hawashas has meant a movement of soil out towards the ends. There are now strips of unused raised soil at the ends of the fields 5-10 metres wide which, in percentage terms, is a loss of 5-10 per cent of area and consequently production. Cultivating on a "number" basis would enable these hawashas to be levelled again.

It is proposed to change the system to that used by the Sugar Estate. This involves running the (double) ridges from Abu Sita to Abu Sita. The number (18 or 36 hawashas) would, for cultivation purposes, be treated as one field with the Abu Sita being remade after ridging and planting. Irrigation water would flow from the Abu Sita on the upper side of the hawasha. Length of run for the water would be about 75 metres. When the Abu Sitas are remade, soil would be thrown one way only so that one side of the channel is open to allow water into the furrow. The closed side of the channel (the upper side) would prevent water from the hawasha on the other side from draining into the channel (see Figure 1).

FIG. 1 RIDGE PROFILE AND IRRIGATION SYSTEM WITH FORMATION OF ABU SITAS



The ridges should be formed with a rolling disc bedder; a mould-board implement would not create large enough furrows. To level off the top of the beds heavy pieces of chain could be attached to the implement to cover each bed and pull the crests down. This system of irrigation would be introduced along with the new system of double ridging and tillage by crawler tractors.

3.1.7 Planting and Sowing

In the Phase I Report machine numbers were based on the area that the Corporation planned to plant in the 1978/79 season using the planters available on the Scheme. In that season or in subsequent seasons, however, no mechanical planting was carried out. There are a number of reasons for this:

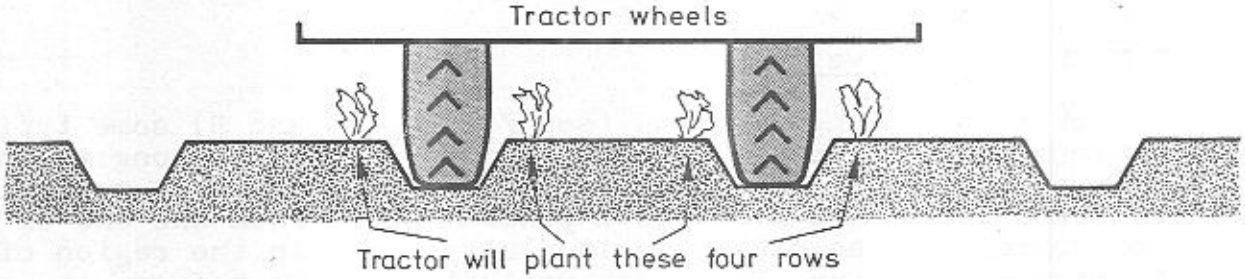
- unsuitability of planters
- lack of tractors
- drivers unable to operate the planters in the dry soil before the rainy season and then in the wet soil after the rainy season started
- lack of pre-watering and pre-irrigation to bring the soil to a state suitable for mechanical planting.

For the duration, therefore, of the Phase I Programme, it is felt unrealistic to propose a universal change to mechanical planting of cotton and groundnuts.

Summer sorghum would then be the only crop to be sown mechanically. A normal, force feed, grain drill with fertilizer boxes would be the best method for this as proposed in the Phase I Report. Such a machine would eliminate the bad effects now experienced with the WLDH.

Mechanical planting of cotton, and groundnuts will, however, be introduced on the new areas to be cultivated using crawler tractors and having a double ridge. The better tillage, i.e. finer tilth, and the broad ridge means that the tractor will be able to straddle the ridge and plant two rows on that ridge and one each on the two outside ridges (see Figure 2).

Figure 2 MECHANICAL PLANTING WITH DOUBLE RIDGE SYSTEM.



3.1.8 Inter-Row Cultivation

It is proposed to use a rolling cultivator for weed control. This is a very fast and effective operation and has the added advantage that it builds up the beds as well.

3.1.9 Groundnut Lifting and Stripping

Despite the purchase in 1977/78 by the Corporation of groundnut lifters, there has been little or no use made of these machines in the last two years. Since the Phase I Report was written problems of operating groundnut digger-shakers have become apparent in the heavy clay soil found in the Project Area. The moisture content of the soil needs to be just right or else the digger share will not penetrate, soil will adhere to the nuts making mechanical stripping inefficient in that the machine will not be able to differentiate between nuts and soil particles. If, however, the soil is too wet it will not fall away from the nuts nor will it "scour" off the working parts of the digger-shaker. Another problem is that of variety. The variety at New Halfa is "Ashford", a spreading variety. With these types the digger-shaker tends to get blocked at the throat. The spreading of the nuts tends to cause bunching where it cannot be cut cleanly by the sides of the machine. The most effective way of harvesting the Ashford variety in these soils is by hand but being preceded by a tractor drawn share under the rows to cut the tap root and lift and loosen the ridge so that hand pulling is simplified.

Modern strippers can pick up the windrows and strip the nuts when the crop is either green or has been dried out.

If stripped green, the residual stover is much more valuable as an animal feed as the leaves are retained. This is not the case if the nuts are stripped dry. In either case, however, the sample of stripped nuts is very dirty. This cannot be avoided in the soils prevailing at New Halfa.

For these reasons it is proposed to alter the Phase I proposals so that lifting is done manually and stripping done mechanically. The green stover would provide a very valuable source of fodder for the livestock component.

3.1.10 Sorghum Harvesting

Sorghum would be cut by hand and transported by animal.

3.1.11 Land Levelling

In the accompanying diagrams (see Figures 3A and B) some typical cross-sections of hawashas can be found. Along the longitudinal axis of the hawasha there are found two ways in which variations in level occur. The first is a general slope from one end of the hawasha to the other. Maximum slopes are in the region of 85 cm per kilometer. The other variation occurs because the ends of the hawashas are raised. Typical raised ends are 20 cm above the central level of the hawasha, and are consistent with the usual observation that nothing is grown on these end high spots.

Within the hawashas micro variations in level are in the order of 5-10 cm. There are thus two distinct problems. The problem of raised ends and general slope differences across the hawasha can only be tackled by a machine that can shift soil sideways. For the problems occurring at New Halfa a motor grader should be used.

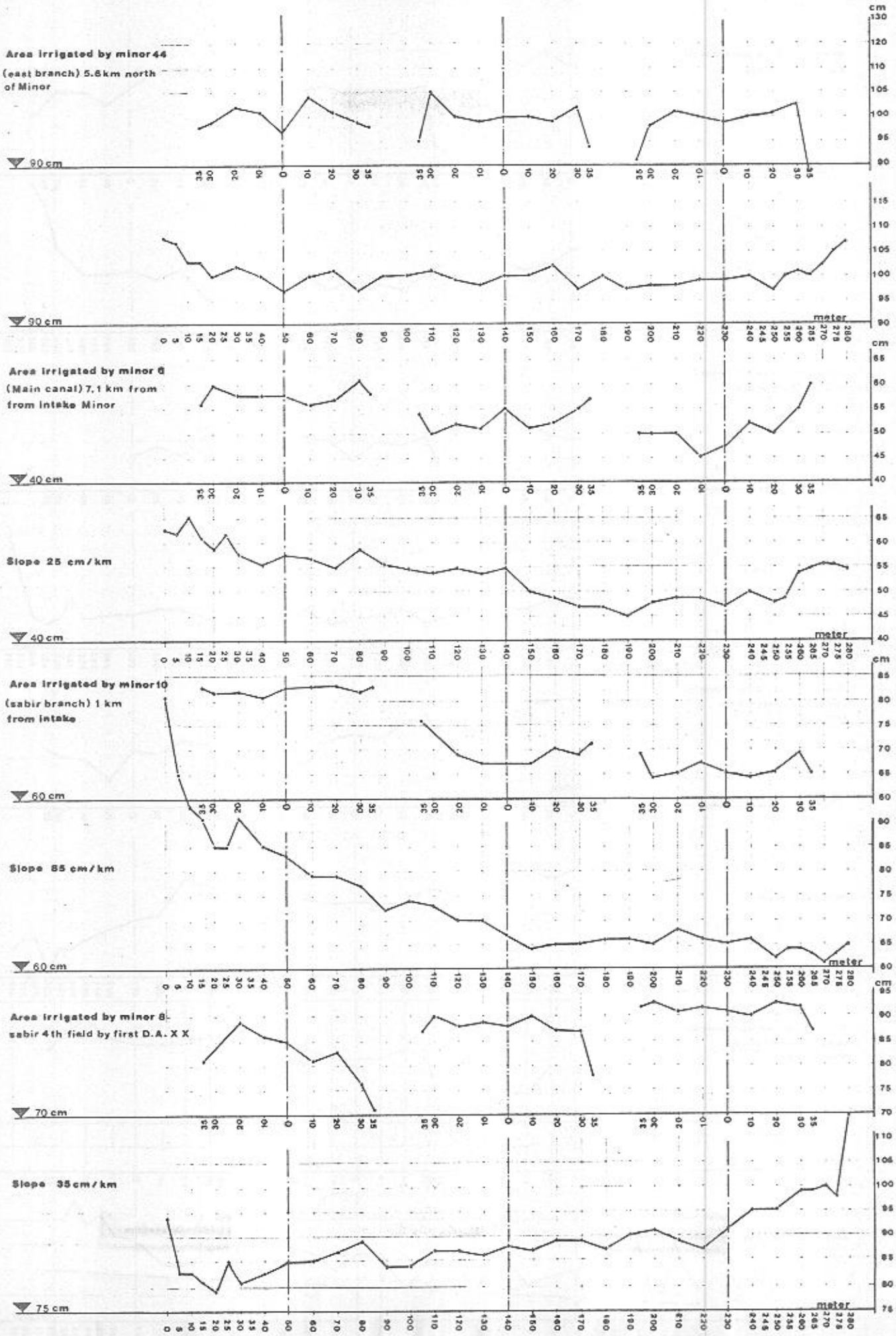
For the micro differences in level a cut and fill operation is required.

However, micro differences in level within the hawasha are relatively unimportant using the Tagnat and Gadwel System of irrigation. Of greater importance is that the ridge profile is well maintained. It is not worthwhile to attempt to correct micro differences in level before the major level differences have been corrected. Land planing is not therefore proposed for the Support Measures.

Slope difference correcting is a major undertaking and should be tackled in the Phase II Programme in conjunction with the introduction of new irrigation techniques. A motor grader would be required for this.

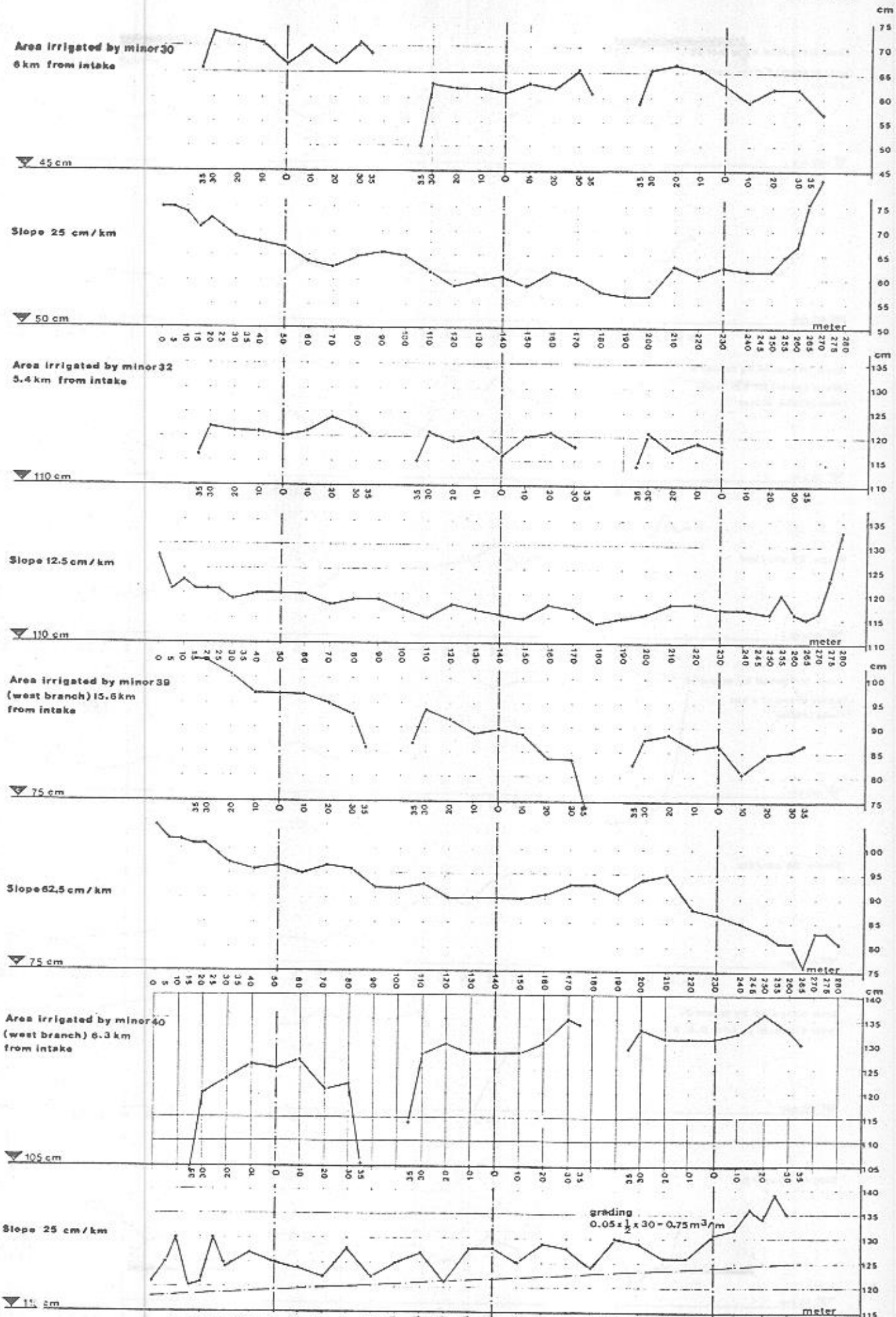
TYPICAL CROSS SECTIONS OF HAWASHAS

FIG. 3 A



TYPICAL CROSS SECTIONS OF MAWASHAS

FIG. 3B



- Groundnuts:
  Groundnuts would follow the cotton.

  The cotton should be cleared off the land by the end of February. There are, therefore, three months or about 75 working days available for tillage.

  Days available for each operation are therefore:

Operation	Unit time hrs/fed.	Days available
Disc ploughing	0.83	34
Disc harrowing (x2)	0.67	27
Ridging	0.33	14

  Inter-row ridging would be the same as for cotton.

- Sorghum:
  Tillage for sorghum should follow directly after the groundnut harvest to preserve residual moisture. This is also the best from the machinery utilization viewpoint as January and February are periods of low use. In the damp soil two disc harrowings would be sufficient to produce a seed bed. Time available is about 50 days.

Operation	Unit time hrs/fed.	Days available
Disc harrowing (x1)	0.33	25
Ridging	0.33	25

3.2.2.2 Machine Number Calculations

Machine numbers are calculated from Table 1. Theoretical numbers can be extracted from column 4. Maximum tractor demand can be seen in Figure 4 along with a graphical representation of the timing of the various operations. For calculation purposes a 10,000 feddan block has been taken. This is also so that calculations of total requirements for varying total areas can be easily calculated. It can be seen that the maximum theoretical demand for tractors is in March - April when 44 would be required (excluding service factor).

Areas to be planted in each year and covered by the above system are as follows:

ANNEX 3
Table 1

Machinery Number Calculations - Support Measures (10,000 Feddans Area of each Crop)

Operation	No.of fed.	No.of days available	Fed/ hour	Fed/day/ MC(10 hr)	Fed/MC	Theor. MC nos.	Actual MC nos.	MC days	MC hours	Hrs/MC	Actual days
Cotton:											
Disc ploughing	10,000	45	1.20	12.00	540	18.52	19	833	8333	439	44
Disc harrowing (x2)	10,000	37	1.50	15.00	555	18.02	19	667	6667	351	35
Ridging	10,000	18	3.00	30.00	540	18.5	19	333	3333	175	18
Inter-row ridging -1	10,000	20	3.00	30.00	600	16.7	17	333	3333	196	20
Inter-row ridging -2	10,000	20	3.00	30.0	600	16.7	17	333	3333	196	20
Abu Sita ditching	10,000	26	36	360.00	9360	1.07	2	28	278	139	14
Groundnuts:											
Disc ploughing	10,000	34	1.20	12.00	408	24.5	25	833	8333	333	33
Disc harrowing (x2)	10,000	27	1.50	15.00	405	24.7	25	667	6667	267	27
Ridging	10,000	14	3.00	30.00	420	23.8	24	333	3333	139	14
Inter-row ridging -1	10,000	20	3.00	30.00	600	16.7	17	333	3333	196	20
Inter-row ridging -2	10,000	20	3.00	30.00	600	16.7	17	333	3333	196	20
Stripping	10,000	25	2.2	22.00	572	17.5	18	455	4545	253	25
Abu Sita ditching	10,000	26	36	360.00	9360	1.07	2	28	278	139	14
Sorghum:											
Disc harrowing (x2)	10,000	50	1.5	15.00	750	13.3	14	667	6667	476	48
Sowing	10,000	26	2.7	27.00	702	14.3	15	370	3704	245	25

Source: Own calculations.

By the same reckoning the following implements will be required:

Year	Disc plough	Disc harrow	Ridger	Grain drill	Groundnut combine
1981/82	143	143	201	86	103
1982/83	105	105	146	63	76
1983/84	70	70	99	42	51
1984/85	37	37	51	22	27
1985/86	-	-	-	-	-

3.2.3 Summary of Machinery Requirements

Year	75 H.P. tractor	4 Furrow disc plough	Disc harrow	Ridger	Grain drill	Groundnut combine
1981/82	275	143	143	201	86	103
1982/83	202	105	105	146	63	76
1983/84	136	70	70	99	42	51
1984/85	70	37	37	51	22	27
1985/86	-	-	-	-	-	-

There has been only a very small investment in machinery in the last two years and it is considered that all the tractors and implements seen will be at the end of their practical economic life by the time the new machinery starts to arrive (now would appear to be 1981). As no more wheat would be grown (except on the freehold areas) the Corporation's Combine Harvesters would have no further use. It is proposed that they be sold to the private sector. As they are in relatively good condition, they should find a ready market from contractors in the sorghum belt. Alternatively some may be bought by farmers to harvest the freehold wheat area, and to assist in the harvesting of the grain sorghum.

The private and cooperative sectors also complete part of the work. The major contribution is in the ridging where the survey shows that nearly 160,000 feddans were covered. This, however, mostly involved three passes over the same ground so total effective area covered was just over 50,000 feddans. If this is repeated in 1981/82 the private and cooperative sectors would cover approximately one third of the ridging. It is not proposed to reduce the new tractors required by the Project to take into account these 50,000 feddans for three reasons:

- ridging occurs at a peak period and this would act as a safety factor

- many of the tractors in the private and cooperative sector are old. It is not known accurately how many feddans will be actually completed in 1981/82.

- it is not known how much of the 50,000 feddans was work done for the private plots of the tenants.

3.2.4 Using Crawler Tractors for Cultivation

3.2.4.1 Days Available for Each Operation (see Figure 5)

Tillage:

Cotton - Total days = 165 less say 10 days for holidays = 155 days

Groundnuts - Total days = 69 less say 4 days for holidays = 65 days

Sorghum - Total days = 57 less say 3 days for holidays = 54 days

The following tillage operations must be carried out:

	Cotton	Groundnuts	Sorghum	Output hrs/fed.
Ploughing disc harrow	1 pass	1 pass	-	0.39
Offset disc harrow	2 passes	2 passes	2 passes	0.21
Ridging	1 pass	1 pass	-	0.22
Abu Sita ditching	1 pass	1 pass	1 pass	0.02

The following days are therefore available for each operation:

	Cotton	Groundnuts	Sorghum
Ploughing disc harrow	61	24	-
Offset disc harrow (1)	33	13	23
Offset disc harrow (2)	33	13	23
Ridging	35	14	-
Abu Sita ditching	3	1	3
Total	165	65	49

The days available for other operations are tabulated in Table 3 and graphically represented in Figure 5.

3.2.4.2 Outputs of Machinery

These are calculated in Table 2. Field efficiencies are based upon normally accepted figures and take into account non-productive running such as turning and also stops for filling and emptying in such operations as planting and groundnut harvesting.

ANNEX 3
Table 2

Output of Machinery
(Based on 50 Min. Working Hour)

Machine	Field efficiency	Width	Working speed	Theor. output	Actual output
	Per cent	Metres	k.p.h.	f/hr.	f/hr.
4-row planter	65	3.20	4.0(G/N)	3.05	1.65
4-row planter	65	3.20	5.0(Cotton)	3.81	2.06
Inter-row cultivator	80	4.8	8.0	9.14	6.10
Grain drill	65	3.5	6.0	5.0	2.71
Groundnut combine	70	3.2	5.0	3.81	2.22
Ploughing offset Disc harrow	80	3.2	5.0	3.81	2.54
Offset disc harrow	80	6.0	5.0	7.14	4.76
Disc ridger	80	4.8	6.0	6.86	4.52
Abu Sita ditcher					50

3.2.4.3 Areas of Each Crop by Year(Full Water Supply)

	Cotton	Groundnuts	Sorghum
81/82 (20%)	11,800	11,400	8,400
82/83 (40%)	22,800	22,400	17,600
83/84 (60%)	34,800	33,600	28,800
84/85 (80%)	48,000	46,400	43,200
85/86 (100%)	62,000	59,000	60,000
86/87 full	74,000	71,000	71,000
87/88	86,000	83,000	83,000
88/89	98,000	95,000	95,000
89/90	110,000	110,000	110,000
90/91 onwards	110,000	110,000	110,000

3.2.4.4 Machinery Numbers

Machine numbers for a 10,000 feddans block are calculated in Figure 5 and Table 3.

Machine numbers for the years 1981-1985 are calculated in Tables 4, 5, and 6. Table 4 is a little complicated and is calculated from the maximum requirements for the 10,000 feddan block (Figure 5) and the area of each crop to be grown each year. For example, from Figure 5 it can be seen that the maximum demand for offset disc harrows is during April when 17 are required for groundnuts and 7 required for cotton, per 10,000 feddans. Total requirement for 1981/82 is therefore

$$\frac{17 \times 11{,}400}{10{,}000} + \frac{7 \times 11{,}800}{10{,}000} + 10 \text{ per cent service factor} = 31 \text{ machines}$$

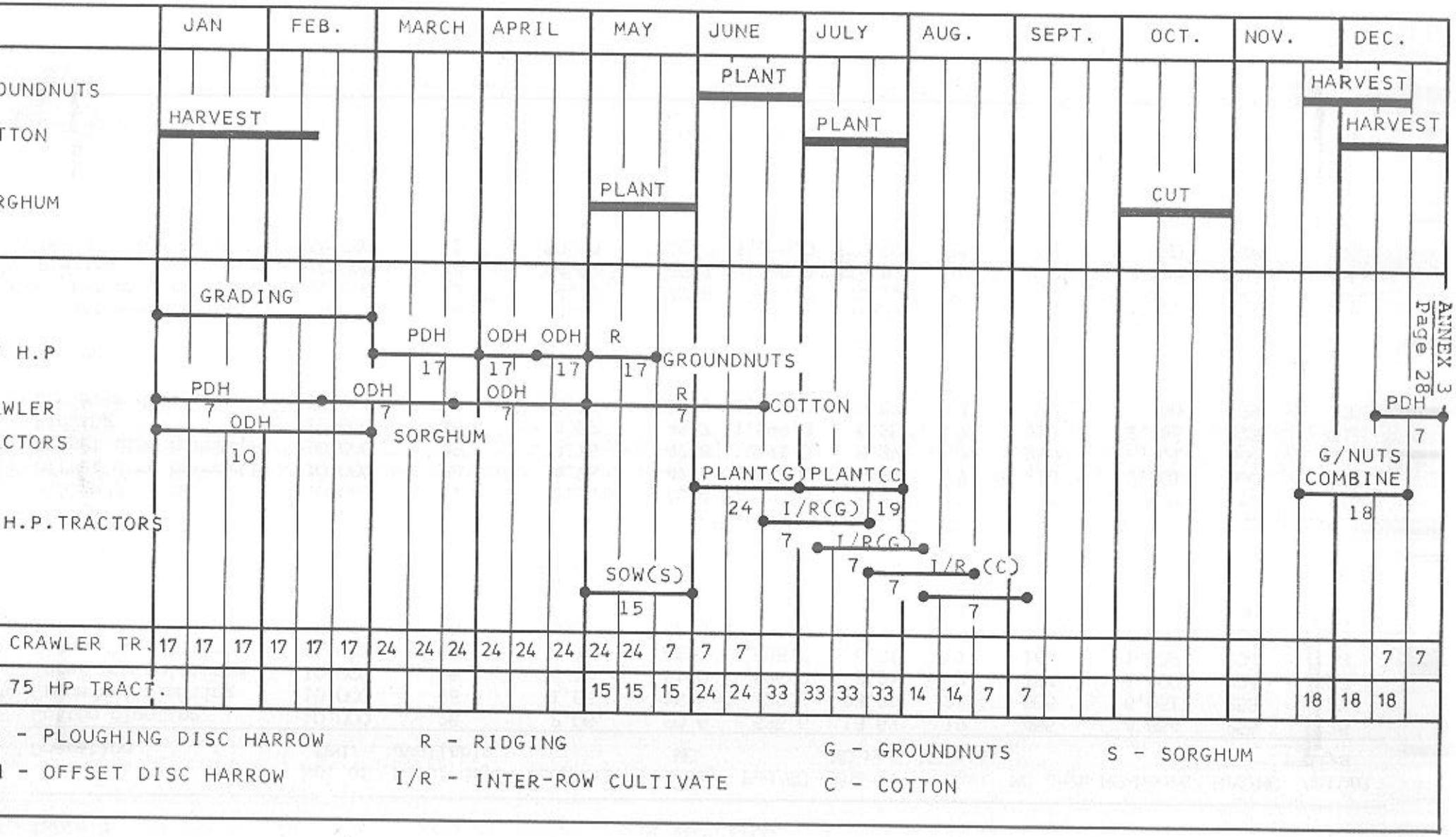
The individual crop areas for each year can be seen in Chapter 3.2.4.3. As the area using crawler tractors is expanding year by year so the area using the old methods is decreasing. Therefore, in addition to new equipment, some machinery would be released from the decreasing area. Machinery purchases for the expanding area using new methods are thus shown in Table 6. In this Table total number required is taken from Table 5.

ANNEX 3
Table 3

Machinery: Number Calculation - Based on 10,000 Feddans of Each Crop

Operation	No. of fed.	No.of days available	Fed/hour	Fed/day MC	Fed/MC	Theor. MC nos.	Actual MC nos.	MC days	MC hours	Hrs/MC	Actual days
Cotton planting	10,000	26	2.06	20.6	535.6	18.67	19	485	4,854	255	26
Groundnut planting	10,000	26	1.65	16.5	429.0	23.30	24	606	6,061	253	25
Inter-row cultivate 1	10,000	26	6.10	61.0	1,586.0	6.31	7	164	1,639	234	23
Inter-row cultivate 2	10,000	26	6.10	61.0	1,586.0	6.31	7	164	1,639	234	23
Inter-row cultivate 3	10,000	26	6.10	61.0	1,586.0	6.31	7	164	1,639	234	23
Inter-row cultivate 4	10,000	26	6.10	61.0	1,586.0	6.31	7	164	1,639	234	23
Sorghum drilling	10,000	26	2.71	27.0	705.0	14.20	15	369	3,690	246	25
Groundnut stripping	10,000	26	2.22	22.2	577.0	17.33	18	450	4,505	250	25
Cotton:											
Plough disc harrow	10,000	61	2.54	25.4	1,549.0	6.45	7	394	3,937	562	56
Offset disc harrow(1)	10,000	33	4.76	47.6	1,571.0	6.37	7	210	2,101	300	30
Offset disc harrow(2)	10,000	33	4.76	47.6	1,571.0	6.37	7	210	2,101	300	30
Ridging	10,000	35	4.57	45.7	1,599.0	6.25	7	219	2,188	313	31
Abu Sita ditching	10,000	3	50.00	500.0	1,500.0	6.67	7	20	200	29	3
Groundnut:											
Plough disc harrow	10,000	24	2.54	25.4	610.0	16.40	17	394	3,937	232	23
Offset disc harrow(1)	10,000	13	4.76	47.6	619.0	16.16	17	210	2,101	124	12
Offset disc harrow(2)	10,000	13	4.76	47.6	619.0	16.16	17	210	2,101	124	12
Ridging	10,000	14	4.57	45.7	640.0	15.63	16	219	2,188	137	14
Abu Sita ditching	10,000	2	50.00	500.0	1,000.0	10.00	11	20	200	18	2
Sorghum:											
Offset disc harrow(1)	10,000	23	4.76	47.6	1,095.0	9.13	10	210	2,101	210	21
Offset disc harrow(2)	10,000	23	4.76	47.6	1,095.0	9.13	10	210	2,101	210	21
Abu Sita ditching	10,000	3	50.00	500.0	1,500.0	6.67	7	20	200	29	3

FIG. 5 TRACTOR UTILIZATION - 10,000 FEDDANS OF EACH CROP.



- PLOUGHING DISC HARROW
- OFFSET DISC HARROW
R - RIDGING
I/R - INTER-ROW CULTIVATE
G - GROUNDNUTS
C - COTTON
S - SORGHUM

ANNEX 3
Table 4

Machinery Requirements by Year

Machine	1981/82	1982/83	1983/84	1984/85	1985/86
105 H.P. crawler	35	68	102	141	180
75 H.P. tractor	49	94	143	197	254
Ploughing offset disc harrow	22	42	63	87	111
Offset disc harrow	31	60	90	124	159
Abu Sita ditcher	16	30	46	63	81
4-row planter	31	60	89	123	156
Rolling cultivator	19	36	54	74	96
Grain drill	19	37	56	77	98
Groundnut combine	23	45	67	92	117
Ridger	31	60	90	124	159

25 per cent service factor on crawler tractors.
25 per cent service factor on wheel tractor.
10 per cent service factor on machinery.

ANNEX 3
Table 5

Machinery Available Each Year from Phase I
(Due to Reducing Area)

Machine	1981/82	1982/83	1983/84	1984/85	1985/86
75 H.P. tractor	-	73	139	205	275
Grain drill	-	23	44	64	86
Groundnut combine	-	27	52	76	103

ANNEX 3
Table 6

Machinery Purchases 1981 - 1985 (Initial Investment)

Year	1981/1982			1982/1983			1983/1984			1984/1985			1985/1986		
Machine	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
105 H.P. crawler	35	-	35	68	-	33	102	-	34	141	-	39	180	-	39
75 H.P. tractor	49	-	49	94	73	-	143	139	-	197	205	-	254	275	-
Ploughing offset disc harrow	22	-	22	42	-	20	63	-	21	87	-	24	111	-	24
Offset disc harrow	31	-	31	60	-	29	90	-	30	124	-	34	159	-	35
Abu Sita ditcher	16	-	16	30	-	14	46	-	16	63	-	17	81	-	18
4-row planter	31	-	31	60	-	29	89	-	29	123	-	34	156	-	33
Rolling cultivator	19	-	19	36	-	17	54	-	18	74	-	20	96	-	22
Grain drill	19	-	19	37	23	-	56	44	-	77	64	-	98	86	-
Groundnut combine	23	-	23	45	27	-	67	52	-	92	76	-	117	103	-
Ridger	31	-	31	60	-	29	90	-	30	124	-	34	159	-	35

A = Total number required(1).
B = Total number released from Phase I(2).
C = Number to be purchased.

1) From Table 4.
2) From Table 5.

3.3 Machinery Specifications

3.3.1 Tractor

Engine	4 cylinder, water cooled diesel
Horsepower	73 - 78 DIN
Type	Standard row crop 4-wheel - 2-wheel drive
Electrical system	12 Volt electrics
Clutch	Dual
Transmission	8 forward, two reverse gears differential lock
PTO	540 rpm
Hydraulic system	3 point linkage Cat II with draft, position and pressure control, conforming to OECD test requirements, double action spool valve
Tyres	750 x 16 - 8 ply tractor/trailer front tyres, 13.6/12 - 38 6 ply rear
Air cleaner	Oil bath, with pre-cleaner
Wheels	Cast p.a.v.t. rear wheels variable tread 150 - 220 cm

Swinging H.D. drawbar

Set front end weights and rear wheel weights - maximum permitted.

Power steering

R.O.P.S. with sun shade.

3.3.2 Disc Plough

4 furrow, mounted disc plough.

Cat.II linkage. 762 mm diameter discs, without scrapers, with frame weights. Furrow width 267 - 387 mm.

3.3.3 Offset Disc Harrow

Trailed 2.5 - 2.7 m wide 610 mm diameter discs, 225 mm disc spacing. 1100 - 1300 kg weight. Scalloped front discs, plain rear.

3.3.4 Ridger

Approximately 4 m wide toolbar. Fitted with North American No.2 ridging bodies. With row marker, and support wheels. Cat.II linkage.

3.3.5 Grain Drill

17-20 row trailed grain/fertilizer combine drill, suitable for drilling sorghum, 175 mm row spacing, with tine coulters, with 7.50 - 16 wheels and tyres, with blanking-off plates to increase row width.

3.3.6 Groundnut Combine

With pick-up reel 150 - 180 cm wide, trailed, p.t.o. driven, 540 rpm p.t.o., 9.00 - 24 wheels and tyres, tank capacity 2 - 2.5 m^3.

3.3.7 Crawler Tractor

105 - 115 H.P. diesel engine, oil bath air cleaner, direct drive transmission, with hydraulically operated 3 point linkage, drawbar, two external hydraulic services, sun canopy. 40 - 50 cm wide tracks.

3.3.8 Ploughing Offset Disc Harrow

Working width 3 - 3.5 m, with 16 80 - 85 cm diameter discs, scalloped front and rear. With hydraulically operated transport wheels. Weight per disc about 150 kg.

3.3.9 Offset Disc Harrow

Working width about 6.0 m. 65 cm diameter disc with about 25 cm disc spacing. Scalloped part disc plain rear. Hydraulically operated transport wheels. About 75 kg per disc weight.

3.3.10 Ridger

Disc ridger capable of forming 3 beds 1.6 m wide. If necessary fitted with chains or similar devices to flatten the top of the bed. Toolbar mounted, capable of being attached to the 105 H.P. crawler tractor.

3.3.11 Ditcher

Toolbar mounted, capable of pulling ditch approximately 1.0 m wide and 50 cm deep. Should throw the spill one way. If necessary may be disc implement.

4. Costs

4.1 Using Wheeled Tractors (Old Method)

Costs of operations are calculated in Table 7 and Table 8.

The service factor referred to in Table 7 is greater than for the new method using crawler tractors for primary tillage (see Section 4.2). This is because using wheeled tractors for primary tillage causes breakages which puts the service factor up. Also it is to be hoped that the training component for the new methods would also help to reduce the downtime of the machines. Costs per feddan are calculated in Table 9.

ANNEX 3
Table 7

Hours per Machine

Machine	Theor. no.(1)	Service factor %	Total nos.	Total hrs(2)	Non-Prod. hours(3) %	Total hours	Hrs.per machine
75 H.P. tractor	44	35	60	65470	30	85111	1419
Disc plough	25	25	31	16666	-	16666	538
Disc harrow	25	25	31	20001	-	20001	645
Ridger	34	25	43	19998	-	19998	465
Groundnut combine	18	25	23	4545	-	4545	198
Combine drill	15	10	17	3704	-	3704	218
Abu Sita ditcher	2	10	3	556	-	556	185

Source: Own calculations.

1) Per 10,000 feddans, see Figure 4.
2) From Table 1, column 6.
3) Includes other operations such as Abu Sita ditching and non-productive transport, etc.

ANNEX 3
Table 8

Estimated Hourly Operating Costs for Farm-Machinery (in LS)

Item	Purchase cost	Est. annual hrs.use (6)	Tot.hrs economic life	Fuel and lubricants (1)	Repair & mainte-nance (2)	Repair & mainte-nance cost	Depre-ciation (3)	Inte-rest (4)	Over-heads (5)	Total cost (7)
75 H.P. tractor	9500	1419	6000	2.14	150%	2.38	1.58	0.30	0.63	7.03
Disc harrow	3300	645	4000	0	50%	0.41	0.83	0.23	0.15	1.61
Disc ridger	1200	465	4000	0	50%	0.15	0.30	0.12	0.06	0.62
Abu Sita ditcher	800	185	3000	0	50%	0.13	0.27	0.19	0.06	0.65
Groundnut combine	10000	198	2000	0	50%	2.50	5.00	2.27	0.98	10.75
Disc plough	1250	538	3000	0	50%	0.21	0.42	0.10	0.07	0.80
Combine drill	6000	218	2500	0	50%	1.20	2.40	1.24	0.48	5.32

Source: Own calculations.

1) 0.15 x p.t.o. H.P. x price/litre Lubricants 0.2 x fuel cost.
2) As a percentage of capital cost over life of machine.
3) $\frac{\text{Capital Cost}}{\text{Life in hours}}$
4) $\frac{\frac{\text{Capital cost}}{2} \times \text{interest (9\%)}}{\text{Annual hours use}}$
5) Insurance, tax, etc.
6) See Table 7.
7) Excludes Operator.

ANNEX 3
Table 9

Cost of Operations per Feddan (in LS)
(Total Cost Includes Interest and Depreciation)

Operation	Machine cost per hour(1)	Tractor cost per hour(1)	Total cost per hour	Total hours(2)	Total cost	Total feddans(3)	Cost per feddan
Disc ploughing	0.80	7.03	7.83	16,666	130,495	20,000	6.52
Disc harrowing	1.61	7.03	8.64	20,001	172,809	60,000	2.88
Ridging	0.62	7.03	7.65	19,998	152,985	60,000	2.55
Drilling	5.32	7.03	12.35	3,704	45,744	10,000	4.57
Abu Sita ditching	0.65	7.03	7.68	556	4,270	20,000	0.21
Groundnut combining	10.75	7.03	17.78	4,545	80,810	10,000	8.08

Source: Own calculations.

1) From Table 8.
2) From Table 7.
3) Based on 10,000 feddans each groundnuts, cotton and sorghum.

ANNEX 3
Table 10

Cost per Crop per Feddan
(Old Cultivating Method)

Crop	Operation	Costs LS/feddan
Cotton:	Disc ploughing	6.52
	Disc harrowing (x2)	5.76
	Ridging	2.55
	Inter-row ridging (x2)	5.10
	Abu Sita ditching	0.21
		20.14
Groundnuts:	Disc ploughing	6.52
	Disc harrowing (x2)	5.76
	Ridging	2.55
	Inter-row ridging (x2)	5.10
	Stripping	8.08
	Abu Sita ditching	0.21
		28.22
Sorghum:	Disc harrowing (x2)	5.76
	Sowing	4.57
		10.33

Source: Table 9.

4.2 Cost of Operation Using Crawler Tractors

The hourly costs of operation are calculated in Table 12. The annual hours of use are taken from Table 11. The costs per feddan is taken from Table 12 and the cost of mechanized operations per crop is shown in Table 13.

ANNEX 3
Table 11

Machine Quantification and Hours per Machine for 10,000 Feddans of Each Crop

Machine	Theoretical number (1)	Service factor %	Total numbers	Hours (2)	Non-prod. hours %(3)	Total hours	Hours per m/c
105 H.P. crawler tractor	24	25	30	25,456	10	28,002	933
75 H.P. tractor	33	25	41	25,666	30	33,366	814
Ploughing offset disc harrow	17	10	19	7,874	-	7,874	414
Offset disc harrow	17	10	19	12,606	-	12,606	663
Ridger	24	10	27	4,376	-	4,376	162
Abu Sita ditcher	11	10	13	600	-	600	42
4-row planter	24	10	27	10,915	-	10,915	404
Rolling cultivator	14	10	16	6,556	-	6,556	410
Seed drill	15	10	17	3,690	-	3,690	217
Groundnut combine	18	10	20	4,505	-	4,505	225
Motor graders							

Source: Own calculations.

1) See Figure 5.
2) See Table 3, column 6.
3) Miscellaneous transport, etc.

ANNEX 3
Table 12

Machinery Running Costs in Sudanese Pounds

Item	105 H.P. crawler tractor	75 H.P. tractor	Ploughing offset disc harrow	Offset disc harrow	Ridger	Abu Sita ditcher	4-Row planter	Rolling cultivator	Seed drill	Ground-nut combine	Motor grader
Capital cost in LS	33,000	9,500	5,000	5,000	4,000	2,000	1,900	2,000	6,000	10,000	65,000
Life in hours	12,000	8,000	4,000	4,000	4,000	4,000	2,000	2,000	2,500	2,000	10,000
Annual use in hours	933	814	414	663	162	46	404	410	217	225	2,000
Fuel cost 0.15 x p.t.o. hp x price/litre	2.42	1.79	-	-	-	-	-	-	-	-	3.83
Lubricant cost 0.20 x fuel cost	0.48	0.36	-	-	-	-	-	-	-	-	0.77
Repairs and maintenance and capital cost over life of machine	100%	150%	50%	50%	50%	50%	50%	50%	50%	50%	100%
Repairs and maintenance per hour	2.75	1.78	0.63	0.63	0.50	0.25	0.48	0.50	1.20	2.50	6.50
Total variable costs	5.66	3.92	0.63	0.63	0.50	0.25	0.48	0.50	1.20	2.50	11.10
Depreciation = $\frac{\text{capital cost}}{\text{life in hours}}$	2.75	1.19	1.25	1.25	1.00	0.50	0.95	1.00	2.40	5.00	6.50
Interest = $\frac{\frac{\text{capital cost}}{2} \times \text{interest}}{\text{annual hours use}}$	1.59	0.53	0.54	0.34	1.11	1.96	0.21	0.22	1.24	2.00	1.46
Total fixed costs	4.34	1.72	1.79	1.59	2.11	2.46	1.16	1.22	3.64	7.00	7.96
Unallocated costs (10%)	1.00	0.56	0.24	0.22	0.26	0.27	0.16	0.17	0.48	0.95	1.91
Total hourly cost	11.00	6.20	2.66	2.44	2.87	2.98	1.80	1.89	5.33	10.45	20.96
Life in years	13	10	10	6	10(1)	10(1)	5	5	10(1)	9	5

Source: Own calculations.

1) Obsolescence.

ANNEX 3
Table 13

Cost of Operations per Feddan (in LS)
(Total Cost Includes Depreciation and Interest)

Operation	Machine cost/hr. (1)	Tractor cost/hr. (2)	Total cost/hr.	Total hours (1)	Total cost	Total feddans (2)	Cost per feddan
Ploughing disc harrow	2.66	11.00	13.66	7,874	107,559	20,000	5.38
Offset disc harrow	2.44	11.00	13.44	12,606	169,425	60,000	2.82
Ridging	2.87	11.00	13.87	4,376	60,695	20,000	3.03
Abu Sita ditching	2.98	11.00	13.98	600	8,388	30,000	0.28
Planting	1.80	6.20	8.00	10,915	87,320	20,000	4.37
Rolling cultivator	1.89	6.20	8.09	6,556	53,038	40,000	1.33
Seed drill	5.33	6.20	11.53	3,690	42,546	10,000	4.25
Groundnut combine	10.45	6.20	16.65	4,505	75,008	10,000	7.50

Source: Own calculations.

1) From Table 12.
2) Based on 10,000 feddans of each crop.

ANNEX 3
Table 14

Costs of Operation per Crop

Crop	Operation	Costs LS/feddan
Cotton:	Ploughing disc harrow	5.38
	Offset disc harrowing (x2)	5.64
	Ridging	3.03
	Abu Sita ditching	0.28
	Planting	4.37
	Rolling cultivation (x2)	2.66
		21.36
Groundnuts:	Ploughing disc harrow	5.38
	Offset disc harrow (x2)	5.64
	Ridging	3.03
	Abu Sita ditching	0.28
	Planting	4.37
	Rolling cultivation (x2)	2.66
	Groundnut combine	7.50
		28.86
Sorghum:	Offset disc harrowing (x2)	5.64
	Sowing	4.25
		9.89

Source: Own calculations.

Cost of grading = 6.99 LS per feddan or LS 2,306,700 for 330,000 feddans (graded once only).

5. The Private and Cooperative Sectors

5.1 Machinery Existing

A survey of the machinery in the private and cooperative sectors and the work completed in the 1979/80 season gave the following results:

- Cooperative Sector

There are a total of 59 operable tractors with attachments of wide level disc harrows with seeding attachments, ridgers, Abu Sita ditchers and trailers. There were also three operating combines in the cooperatives.

In the 1979/80 season the cooperatives completed the following work (figures taken from survey):

. disc harrowing	37,483 feddans
. ridging	90,515 feddans
. Abu Sita ditching	14,270 feddans
. seeding	15,443 feddans
. combining	2,200 feddans

Three cooperatives also seeded 400 feddans (presumably of sorghum) outside the New Halfa Scheme.

It is not clear from the survey figures which operations were for which crops and also how many of the operations were covering the same ground twice or more times. The figures are, however, some indication of the outputs which are being achieved using present techniques.

- Private Sector

There are 91 tractors privately owned by people living in the Scheme. Many of these tractors are, however, old (some sold second-hand by the Corporation) and must be regarded as near or at the end of their economic life. The normal implements owned are ridgers, wide level disc harrows with seed boxes and Abu Sita ditchers. Eighteen combines, all in operating condition, are also owned by the private sector.

The private sector covered the following areas in 1979/80:

. disc harrowing	27,450 feddans
. seeding	10,485 feddans
. ridging	66,715 feddans
. combine harvesting	16,650 feddans

(These figures do not include 10 private owners who could not be contacted.)

The private sector also covered small areas of cultivation and combine harvesting outside the Scheme.

In addition to tractors owned by people living in the Scheme, there were also about 40 tractors and 7 combines which did work in the Scheme but whose owners lived outside the Scheme. The area covered by these machines is unknown, but it is probable they did only work on the wheat crop. This is because the most likely implement to be owned by external owners is the wide level disc harrow, used exclusively for sorghum sowing (and wheat sowing in the Scheme).

5.2 Comments

It can be seen that apart from the Corporation's tractors there are about 150 privately or cooperatively owned tractors working in the Scheme, and about 25 combine harvesters. The tractors do mostly light work such as ridging, disc harrowing, seeding, ditching and trailer work. There are similarly about 21 operating combines also working in the Scheme.

It can also be seen that the areas given in the survey do not correspond to the areas as given by the Corporation's records. In fact the private and cooperative sectors appear to do much more work than is recorded by the Corporation. Corporation figures were compiled from fuel allocation records and it would appear that the private and cooperative sectors manage to buy fuel despite the control exercised by the Corporation, or else they make their fuel go much further than the areas taken by the Corporation.

5.3 The Future Role of the Cooperatives and Private Sector

From the work done by the private and cooperative sector there would seem to be an increasing expertize and willingness amongst these two groups to organize their own operations. A continuation of this trend is to be recommended.

There now appears to be a natural partition of operations done by the Corporation and the other two sectors, with the Corporation doing mainly primary and secondary tillage and the private and cooperative sectors doing secondary tillage only. This is discussed more fully in Chapter 3.1.

If this split in work is accepted then it means that the Corporation is free to choose the best tractor and implements to do tillage. It is recommended that there be a change to the use of crawler tractors and heavy disc harrows for tillage as is now the practice at the Sugar Estate. The cooperative and private sector would take over the work done by the wheeled 65-75 H.P. tractors. This does not lead to optimum use of tractors but would be acceptable to the Corporation and to the other two sectors and also would lead to much more effective tillage, one of the major requirements for increased yields.

This quite radical change cannot occur all at once, and it has been proposed that it should take place at the same rate as the change to new tillage and irrigation practices i.e. 20 per cent change per year over five years, and also to fit in with the development of the cooperatives.

The proposed Cooperative Development Programme would be implemented as follows (see ANNEX 6, Chapter 3.6.2):

Year 1	8 Cooperatives
Year 2	19 Cooperatives
Year 3	2 Cooperatives
Year 4	2 Cooperatives
Year 5	4 Cooperatives
Total	35 Cooperatives

If it is assumed that each cooperative has 3,000 feddans then they would require the following machine numbers:

- 5 75 H.P. tractors
- 2 rolling cultivators
- 2 grain drills
- 2 groundnut combines
- 3 trailers
- 3 planters

The optimum changeover in terms of machinery numbers is as follows (if 20 per cent change in area per year is to occur):

Year	Cooperatives		Corporation	
1981	49	75 H.P. tractors to be purchased plus implements	35	Crawlers and implements 75 H.P. tractors to be purchased plus attachment
1982	45	75 H.P. tractors plus implements to be purchased from Corporation	33	crawlers and implements to be purchased
	94 =	total tractors	68 =	total crawlers
			230 =	total wheeled tractors
1983	49	75 H.P. tractors plus implements to be purchased from Corporation	34	crawlers and implements to be purchased
	143 =	total tractors	102 =	total crawlers
			181 =	total wheeled tractors
1984	54	75 H.P. tractors plus implements to be purchased from Corporation	39	crawlers and implements to be purchased
	197 =	total tractors	141 =	total crawlers
			127 =	total wheeled tractors
1985	57	75 H.P. tractors plus implements to be purchased from Corporation	39	crawlers and implements to be purchased
	254 =	total tractors	180 =	total crawlers
			70 =	total wheeled tractors (may also be sold)

It can be seen that this does not fit exactly into the cooperative expansion. The main difference being the sudden increase in cooperatives in year 2, and relatively small increase in year 3. This means that some cooperatives would receive their equipment one year before the proposed changeover to new methods. In practice, however, all of the machinery, except the planters, can be used with the old methods.

By Project year 5 the development of the cooperatives would not have been sufficient to take over all the operations of 75 H.P. tractors. In practice they would be running 175 tractors out of a total of 324, and be covering about 60 per cent of the total areas to be cultivated in year 5. This means the Corporation would still do all operations over a substantial part of the Project Area.

It is to be recommended that 19 new agricultural machinery supervisors be recruited, one for each Block. This would overcome the conflict of interests at present existent with the present system of supervision by the agricultural supervisors, whose main interest is for the machinery to cover as large an area as possible, with little regard for machine condition.

6.3.2 Operator

Operator training should take place at Block level with one Section being covered each year of the first four years and two sections covered in the fifth year. Most of the training of the operators should be in-field, with only the minimum of class work.

The operators should become skilled in tractor handling, machine setting and routine maintenance.

Numbers of operators to be trained annually are as follows:

	81/82	82/83	83/84	84/85	85/86
No. of operators	126	117	125	139	144

6.3.3 Mechanic

Two internationally recruited specialists (over three year period) would organize the mechanics' training. In a project with ongoing work it is impossible to take the mechanics away from their work for too long. Training should therefore be "on the job" interspersed with short specialist courses given both by the experts and by personnel from the equipment supplies (see Phase I ANNEX 10). Block and cooperative mechanics would be brought to New Halfa for short courses over the three years.

7. Fuel Supplies and Workshops

7.1 Fuel Supplies

This remains as proposed in the Phase I report, ANNEX 10.

7.2 Workshops

7.2.1 Main and Block Workshops

These remain basically as proposed in the Phase I Report.

7.2.2 Cooperative Workshops

A workshop for the cooperatives is being built at New Halfa. This will be a modern, extensively equipped workshop and should be able to cope with the additional repair work which would result from the increased role of the cooperatives. It is to be recommended, however, that all machining, such as crankshaft regrinding, reboring, etc., should be carried out at the Corporation workshops, so as not to duplicate facilities.

Staffing requirements according to the numbers of machines to be serviced would be:

- 8 senior mechanics
- 10 mechanics
- 20 assistant mechanics
- 3 storemen

A further cooperative workshop should be built at El Sabaat which forms a natural centre for operations in the northern part of the Project. This should be of similar construction to the Block workshops. Total investment would be about LS 42,500 including equipment. The whole workshop need not be built at once as cooperative expansion takes place only slowly over the five year period. The advantage of the Block-type workshop is that it can be expanded as and when required.

Staffing would be as follows:

- 1 senior mechanic
- 4 mechanics
- 5 assistants

8. The World Bank Proposals and Support Measures Required For Them

8.1 Machinery Selection

The World Bank have completely altered the machinery proposals put forward in the Phase I Report. The new proposals are briefly:

- Disc ploughing would only occur once every three years and then before the wheat crop.
- Primary tillage for cotton and groundnuts would be carried out only using light disc harrows followed by direct ridging, using lister bodies.
- Land levelling, using a land plane, would be a regular operation once every three years.

- Two ridgings will occur, one in which fertilizers would be incorporated and second in combination with mechanical planting.

- The above proposals have been put forward on the assumption that pre-watering and pre-irrigation is available.

- These proposals have been put forward as both a short and long-term solution to the tillage problems.

8.2 Machinery Quantification

Using an 80 per cent service factor a maximum of 300 70 H.P. tractors is proposed by the World Bank. Calculations were based on the following outputs for a 10 hour day:

- disc ploughing	12.5	feddans/day
- disc harrowing	25	feddans/day
- ridging (plus fertilizing or planting)	40	feddans/day

8.3 Comments

The World Bank are proposing a reversion to practices carried out before 1975 and abandoned then in favour of the present use of disc ploughs for primary tillage.

The absence now of pre-watering and pre-irrigation would make the proposed practices even more unsatisfactory than they were before 1975.

Whereas the Phase I machinery requirements were based on outputs similar to those proposed by the World Bank, it was recognized that improvements in tillage could only occur through the introduction of different methods and a long-term operator and management training programme. The machine numbers in the Phase I Programme were put forward to enable the NHAPC to cover their work plan for 1978/79. In recognition of the impossibility of attempting to train operators over the Phase I Programme time period, outputs provided by the Corporation were used to calculate the Phase I requirements, even though these outputs were far too high and achievable only by excessive forward speed and poor work. The real improvement would then take place over the Phase II Programme with the introduction of new machinery and a long-term training programme.

As a long-term solution, therefore, the World Bank proposals are considered far too optimistic. Even if the tillage methods put forward are successful, it is certain that no improvements would occur if the machines are operated in such a manner as to try and achieve the outputs proposed. This can be easily

demonstrated by a simple calculation, e.g. disc ploughing. To achieve 12.5 feddans (5.25 ha) per 10 hour day, a disc plough 1.0 m wide would have to travel continuously at a forward speed of 5.25 k.p.h. with no stops for turns, adjustment, etc. Taking an 80 per cent field efficiency, travel speed would have to be 6.56 k.p.h. If deep ploughing is to be achieved (over 20 cm deep) a more realistic and necessary forward speed is about 4.0 k.p.h. Taking into account travel time to the field and stops, etc., a more reasonable output is 6-7 feddans per day (or 2.5-3.0 ha).

8.4 Support Measures for the World Bank Proposals

8.4.1 Breakdown by Cost of World Bank Proposals

	Amount US$ in millions
Tractors - NHAPC	1.6
Tractors and machinery for NHAPC and cooperatives	2.2
Replacement tractors and machinery	4.8
Spare parts	4.0
Workshops	1.6
Tools and block workshops	0.08
Fuel supplies	0.9
Training centre	0.5

No support measures are required for the spare parts, workshops, tools and block workshops, fuel supplies and training centre.

The only items, therefore, to which alterations or additions must be made are the farm machinery. There are two points about the World Bank proposals:

- the prices
- the quantities.

8.4.1.1 Prices

The only price indications given in the World Bank proposals are for the 113 tractors. The total price for these is US $ 1.6 million, giving a price per tractor of US $ 14,159. It is very difficult to judge prices that manufacturers quote for a large tender as they can vary to such a large degree depending upon the manufactuerers' motives for tendering. It is, therefore, wise to take prices which machines are selling for from the local distributors. In February 1980, a 75 H.P. tractor was selling for LS 9,500 or US $ 19,000. Therefore, for US $ 1.6 million only 84 tractors would be able to be purchased. There is no breakdown by machine type of other proposed investment, so no comments can be made.

THE DEMOCRATIC REPUBLIC OF THE SUDAN

MINISTRY OF NATIONAL PLANNING

(Project Preparation Unit)

NEW HALFA IRRIGATION PROJECT

REHABILITATION STUDIES

PHASE II

Support Measures

ANNEX 4

Sociology

August 198o

AGRAR- UND HYDROTECHNIK GMBH

E S S E N - W.-Germany

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New Halfa Irrigation Rehabilitation Project

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SUMMARY

The sociological survey executed in Phase I Study covered all aspects of the Scheme. For the Phase II Study four items were included in the T.O.R. (1) for further in-depth study.

- population distribution, demographic trends and labour availability
- analysis of needs for Nomad settlements
- tenants attitude towards livestock
- present and future role of cooperatives and private sectors

This ANNEX deals only with the first three items; the analysis of the cooperatives and private sectors has been included in ANNEX 6, Cooperatives and Private Sectors.

In total 265 questionaries (18 pages each) were executed and analyzed of which 65 samples in 6 Halfawyeen villages and 200 samples in 26 Nomad villages covering the following main topics:

- demographic data
- labour requirements for present grown crops
- tenants attitudes towards livestock
- cooperative and private sector level of interference in crop production.

All villages were identified, located and their ethnic relations established. To obtain migrant labour availability data, an additional survey was carried out. A total of 100 samples were executed on a prepared questionary (4 pages) covering two labour camps in the Nomad area and three labour camps in the Halfawyeen area. The topics involved were:

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1) Terms of Reference.

- identification
- family size
- flow of labour in New Halfa Scheme
- education level
- employment and income as generated by migrant labour from the three crops: cotton, wheat and groundnuts
- future trends.

The survey was supported by guided interview sheets. They were designed to orient researchers to areas of emphasis during the course of the survey, so as to collect the general and statistical data required to support the questionaire findings. This was particular needed for the study of income of tenants and migrant labour and cooperatives.

The results of the sociological survey shows:

- Population distribution, demographic trends and labour availability.

  The average tenant family size was found to be 8.6 persons which is consistent with the Phase I Study. The total population in the Scheme (including the Sugar Estate) is 266,31o persons of which 51,1o6 are Halfawyeens, 139,689 Nomads, 4o,515 Migrant Labourers and 35,ooo inhabitants of New Halfa Town. As compared with the Phase I Study a reduction of 24,721 persons occured over the last 2.5 years. This trend will continue when no new incentives for increased crop production are introduced in the Scheme.

  An alarming trend is the rapidly increasing average age of the tenants. In the case of the Halfawyeens more than 5o per cent of tenants is older than 5o years, while for the Nomads the figure amounts to 4o per cent.

  The migration figures from the survey show that 22 per cent of the Halfawyeens live outside the Scheme and 12 per cent of the Nomad population.

  The average labourer family size was found to be 5 persons and the majority of the labour originates from the Western Sudan of which 5o per cent from Darfur and 2o per cent from Kordofan. The labour availability survey revealed that only 38 per cent of the Halfawyeen population participates directly in the farm operations. For the Nomads a figure of 29 per cent was found. The majority of the tenants employ labour from the camps or migrant labour in increasing numbers which is related to the increasing weed problem in the Scheme.

  Labour availability as such as not considered to be a problem as soon as adequate remuneration can be provided for the required operations.

- Analysis of needs for Nomad settlements

From the survey it became clear that under the present conditions the tenants of nomadic origin, who live at present partly outside of the Scheme, half way their tenancies and their rainfed dura fields, are not interested in being resettled. However, from the agricultural production point of view, the Nomads should be resettled near their tenancies and according to their ethnic origin, implying an important reallocation of present tenancies. Similar facilities as those allocated to the Halfawyeen population together with a major favourable change in the present agricultural production with a fully integrated livestock component would increase the motivation of the tenants of nomadic origin for such a systematic resettlement . It is recommended that improvements envisaged for "Nomad villages" such as water supply, schools etc. should only be allocated to those villages which are suitably located in the neighbourhood of the tenancies.

- Tenants' attitude towards livestock

The number of livestock in the Scheme is increasing dramatically. Both the Halfawyeens and the tenants of nomadic origin and also the migrant labour have steadily increased their cattle numbers. The originally allowed one animal unit per tenant is not anymore respected. The increasing numbers of cattle require ever increasing quantities of fodder which become very scarce in the months of May until August. The interest of fodder growing on the tenancies is hence very much supported by the tenants. Under the present situation with a rapidly declining agricultural production and an increase in livestock numbers, a balanced approach must be elaborated in which both agricultural production and animal husbandry have their place. It is excluded that the farmers will return to the original one animal unit per tenancy as introduced at the start of the Scheme.

1. Demographic Trends, Population Distribution, and Labour Availability

1.1 General

Under this chapter the three above topics are dealt with in turn. Except for that on population distribution which entails furnishing data at the level of the section, the block, and the settlement, the other three shall be treated mainly at the household level, with the results attained extrapolated to cover the other macrolevels when necessary.

Emphasis on the household is held to be essential for two reasons:

- It is the basic economic and social unit in the Scheme, and as such the success or failure of any future inputs will very much depend on the receptivity of the tenant and his family and their ability to cope with planned changes.
- The household has been the unit adopted in the surveys conducted, being the centre of economic and social interaction, directly affected by the present performance of the Scheme.

The present survey is a continuation of that undertaken in Phase I, conducted with the purpose of illuminating some aspects presented generally in the previous phase.

The strategy adopted in designing the present survey and writing its results centres on investigating what are the possibilities for introduction of planned inputs at family level. Hence, it aims at indentifying the social problems of agricultural production at the household level, as conveyed by survey results and the attitudes of the tenant. Based on the exposition of problems, policy guidelines for future action are attempted.

1.2 Demographic Trends

1.2.1 General

Under this topic the main items that are discussed for the Halfawyeen area, the Nomad area and the migrant labour (ML) camps are:

- tenants/ML distribution by main and subsidiary occupation
- tenants/ML distribution by age and sex
- tenants/ML distribution by marital status
- family composition
- migration trends.

For comparison, the above five fields of study are discussed under the three areas identified (the Halfawyeen, the Nomad, the migrant labour camps).

1.2.2 The Halfawyeen Area

1.2.2.1 Tenant Distribution by Main and Subsidiary Occupation

The data from the Halfawyeen area for the six villages surveyed reflect the distribution of population by main occupation for the 61 respondents interviewed:

Respondents by main occupation	% of sample
Tenant	82.0
Government official	8.2
Teacher	4.9
Worker in government	3.3
Merchant	1.6
Total	100.0

On interviewing the same respondents on the other subsidiary occupation they hold in addition to the main ones, the answers received show the following picture:

Respondents by subsidiary occupation	% of sample
Tenant	32.5
Government worker	29.4
Merchant	17.7
Driver	8.8
Farm labour	2.9
Welder	2.9
Village head	2.9
Housewife	2.9
Total	100.0

It is apparent from the above figures that though most tenants in the Halfawyeen area claim that they practice agriculture as their main occupation in the Scheme, a sizeable number of them pursue as well other economic activities in the form of main or subsidiary involvements. In the Halfwyeens case, this has been aided by many factors including their past cultural heritage in being an advanced population both prior to their coming to the Scheme as well as at present. Occupational diversity is aided by

the availability of jobs created in the villages and New Halfa Town in the government service, the public sector or commerce, as a result of the rise of the Scheme. It is, therefore, evident that besides the tenancy the Halfawyeen tenant is involved in other economic pursuits that shall be more elaborated upon when one considers the family income.

1.2.2.2 Tenant Distribution by Age and Sex

Table 1 gives the tenant distribution by age and sex. It is apparent from the table that over 86.8 per cent of the tenants surveyed fall in the age group 35 to above 7o; and only 13.2 per cent are less than 35 years old. This is mainly due to the fact that at the resettlement phase tenancies were allocated to adult population who owned property in Old Halfa: mainly heads of households. Since then, no new tenancies have been distributed, nor any changes effected through reallocation of old tenancies to new beneficiaries. If the latter has been necessitated for one reason or another, the new holder is always an adult member of the same family.

ANNEX 4
Table 1

Halfawyeen Tenants Respondents by Age and Sex

Age group	Male		Female		Total	
	No.	%	No.	%	No.	%
15 - 19	-	-			-	-
20 - 24	2	3.3			2	3.3
25 - 29	3	4.9			3	4.9
30 - 34	3	4.9			3	4.9
35 - 39	6	9.8	1	1.65	7	11.5
40 - 44	8	13.1			8	13.1
45 - 49	5	8.2			5	8.2
50 - 54	11	18.o	1	1.65	12	19.6
55 - 59	5	8.2			5	8.2
60 - 64	7	11.5			7	11.5
65 - 69	5	8.2			5	8.2
70 +	4	6.6			4	6.6
Total	59	96.7	2	3.3	61	100.O

It is interesting in this respect to examine Table 1 for a second time to find out the size of the aging population, 50 and above, out of the total number of the cases studied. This comes to 54 per cent of the whole sample distributed as follows:

Age group	% of sample
50 - 54	19.7
55 - 59	8.2
60 - 64	11.5
65 - 69	8.2
70 +	6.4
Total	54.0

Coupled with the factors that the tenancy is held with other major or subsidiary occupations, the families are keen on sending their children to schools, and the jobs in government or other sectors are preferred to agriculture; the situation of the aging population (which makes more than 50 per cent), stands as an important question that deserves more consideration in relation to the future of farming in the Halfawyeen area.

Because of the interplay of the above factors emerged, the share-cropping system, the system of entrusting tenancies to resident agents in the villages, being the agricultural cooperative or relatives, and the resort to more mechanization in the Halfawyeen area. With the same forces operating in future as present trends show, it is most liable that the Halfawyeen tenants' role in production shall be only limited to supervision.

Considering the distribution of tenants by sex, Table 1 shows that for the 61 samples surveyed in the Halfawyeen area only two tenants are females; one of them has a disabled husband, while the other belongs to a husband who immigrated to Saudi Arabia. The latter one holds a government job as well. Both ladies claim that they participate in farm operations, however they admit that they almost wholly depend on migrant labour as their main source of farm hands. Both complain that hired labour in their tenancies is reluctant to receive instructions from females.

Actually the above are cases that happened to be part of the sample surveyed. Observation and discussions carried in the Halfawyeens villages substantiate further that in most villages there are many tenancies in which agricultural production is in fact supervised by ladies though tenancies might not be registered in their names. These are the resident wives of absentee tenants, a phenomenon that can be traced in most villages. Their job is more facilitated in these villages where the agricultural cooperatives are operating. The coherence of the Halfawyeen village societies, being inhabitated by same related neighbours in Old Halfa, has aided the rise of cooperative systems whether at families level or at that of the whole village. This same factor

could be tapped in future for further advancement of cooperative systems of production.

1.2.2.3 Tenant Distribution by Marital Status

Table 2 gives the marriage status of the tenants surveyed and the number of wives married by each tenant. The data furnished shows consistency with the picture displayed in Table 1, i.e. since most tenants come from the adult age groups they are nearly all married, except for three cases.

As for number of wives 10 out of the 61 cases studied have more than one wife. As most of these fall in the age groups 45 and above, this is an indication that polygamy is disappearing among the younger generations. Hence the age when the many wives, sons and daughters were counted upon as ready source of farm labour as it was the case in most rural areas, has gone for ever in the Halfawyeens case.

1.2.2.4 Family Composition

Table 3 gives the family composition for the sample surveyed.

ANNEX 4
Table 3 Halfawyeen: Population of Sons and Daughters

Age group	Sons		Daughters		Total	
	No	%	No	%	No	%
Less than 5	24	15.6	26	15.6	50	15.6
5 - 9	26	16.9	30	18.1	56	17.5
10 - 14	25	16.2	34	20.5	59	18.4
15 - 19	28	18.2	35	21.1	63	19.7
20 +	51	33.1	41	24.7	92	28.8
Total	154	(48.1)	166	(51.9)	320	100.0

The totals in the table furnish the following picture:

Heads of households (tenants)	61
Wives	65
Sons	154
Daughters	166
Male relatives	23
Female relatives	53
Total	522

ANNEX 4
Table 2

Halfawyeen Tenants Respondents by Marital Status

Age group	Married			Widowed		Never married		Divorced		Total	
	No.	%	No. of wives	No.	%	No.	%	No.	%	No.	%
15 - 19	-	-	-	-	-	-	-	-	-	-	-
20 - 24	-	-	-	-	-	2	-	-	-	2	3.2
25 - 29	2	3.6	2	-	-	1	-	-	-	3	5.0
30 - 34	3	5.4	3	-	-	-	-	-	-	3	5.0
35 - 39	6	11.0	6	1	-	-	-	-	-	7	11.5
40 - 44	8	14.5	9	-	-	-	-	-	-	8	13.1
45 - 49	5	9.1	6	-	-	-	-	-	-	5	8.2
50 - 54	11	20.0	11	1	-	-	-	-	-	12	19.7
55 - 59	5	9.1	7	-	-	-	-	-	-	5	8.2
60 - 64	6	11.0	8	1	-	-	-	-	-	7	11.5
65 - 69	5	9.1	7	-	-	-	-	-	-	5	8.2
70 +	4	7.2	6	-	-	-	-	-	-	4	6.4
Total	55	(90.0)	65	3	(5.0)	3	(5.0)			61	100.0

The above total divided by 61, the size of the sample surveyed, gives an average family size of 8.6 persons. This is consistent with the figure given in the Sociological Report Phase I, which ranged between 8.1 and 9.4 persons as the average size of the household.

The average figure of 8.6 persons indicates a large size household, however from the angle of agricultural production, the contribution of the family in farm operations is very limited, only to supervision, as the data on family labour contribution furnished by the survey establishes this fact. Of all household members the one mostly involved in the tenancy is the head of the household. The wife is preoccupied with the home affairs, while the children are fully enrolled in schools being located in the village or New Halfa Town. Hence the large size of the household should not be cited as indicative of availability of family labour for agricultural production.

1.2.2.5 Migration Trends

Migration of family members inside and outside the Scheme is indicative of the social and economic mobility of the population. For those physically resident at homes at the time of the survey, for the 61 households investigated the following composition out of the total has been furnished by the survey results:

	%
Heads of households (tenants)	14.5
Wives	11.2
Sons	28.8
Daughters	30.5
Dependants	15.0
Total	100.0

The number of those physically resident at homes is found to be 406 persons, out of a total figure of 522 persons who make the population of the 61 families surveyed. This indicates that 116 (22.2 per cent) live away, for one reason or the other, from their original homes.Of these 10 per cent have established homes within same village. This last percentage is mainly made of daughters who got married to people from same village. Definitely there are many sons who got married but since these accomodate their wives in the same homes of their father, they appear disguised as physically residing in the original family homestead.

Those establishing homes outside villages of origin but inside New Halfa Scheme constitute 12.7 per cent of the persons not physically residing at homes at the time of the survey. The rest 77.3 per cent are found to be living outside the Scheme.

surveyed as compared to 54 per cent in the case of the Halfawyeen area. Again the average age of the tenant furnishes another indicator where it is 43 years in the Nomad area (findings of Phase I gave it as 39.5)(1) against 49 (again findings of Phase I gave it as 49)(1) in the Halfawyeen area.

As for the sex of tenants all respondents surveyed were males. This does not exclude that some female tenants exist in the Nomad area, however, for social barriers they were not approached, as the latter community is close to outsider when compared to the Halfawyeen area. Furthermore, the interplay of the extended family system with internal economic and social dependencies of members on each other disguises the presence of lady tenants to the outsider.

It is most liable that the present generation of tenants in the Nomad area, being younger than the Halfawyeen one, shall persist longer. The place of the Halfawyeens shall be taken by a generation of tenants who will be more occupationally diversified and who will resort more and more to farm mechanization and hired labour if the present trends continue.

1.2.3.3 Tenant Distribution by Marital Status

Table 5 gives tenants distribution by marital status. All tenants surveyed are married. Same as in the Halfawyeen case, there is tendency for the rate of polygamy to decrease in the younger age groups. Compared to the former the ratio of husbands to wives in the sample surveyed is 1 : 1.23 in case of Nomads, against 1 : 1.18 for the Halfawyeens. As remarked earlier, it is less liable that in future farm operations will find many wives, sons and daughters in the household, as it is used in the past in rural Sudan.

Examining the data in Table 2 for the Halfawyeens against that in Table 5 for the Nomads shows that the latter marry younger as compared to the former. Hence the Nomads liability for reproducing future tenants is better than that of the Halfawyeens.

1.2.3.4 Family Composition

It could be gathered from survey findings that the Nomads families studied are composed of the following categories of population:

Heads of households (tenants)	184
Wives	218
Sons	587
Daughters	507
Male relatives	63
Female relatives	106
Total	1,665

1) This should not pass without commenting from the angle of research methods. Because the Halfawyeens are more knowledgeable about exact ages the repeated survey gave the same figure, while because of lack of knowledge, the repeated survey gave different results for the Nomad area.

ANNEX 4
Table 4

Nomad Tenants Respondents by Age and Sex

Age group	Male		Female		Total	
	No.	%	No.	%	No.	%
15 - 19	2	1.1	-	-	2	1.1
20 - 24	4	2.2	-	-	4	2.2
25 - 29	12	6.5	-	-	12	6.5
30 - 34	18	9.8	-	-	18	9.8
35 - 39	29	15.8	-	-	29	15.8
40 - 44	23	12.5	-	-	23	12.5
45 - 49	21	11.4	-	-	21	11.4
50 - 54	25	13.4	-	-	25	13.4
55 - 59	9	4.9	-	-	9	4.9
60 - 64	22	12.0	-	-	22	12.0
65 - 69	6	3.3	-	-	6	3.3
70 - +	13	7.1	-	-	13	7.1
Total	184	100.0	-	-	184	100.0

ANNEX 4
Table 5

Nomad Tenants Respondents by Marital Status

Age group	Married			Widowed		Never married		Divorced		Total	
	No.	%	No. of wives	No.	%	No.	%	No.	%	No.	%
15 - 19	-	-	-	-	-	2	1.08	-	-	2	1.1
20 - 24	3	1.6	3	-	-	1	0.54	-	-	4	2.1
25 - 29	12	6.5	12	-	-	-	-	-	-	12	6.5
30 - 34	17	9.2	18	-	-	-	-	1	0.54	18	9.7
35 - 39	29	15.8	30	-	-	-	-	-	-	29	15.8
40 - 44	22	12.0	24	1	0.54	-	-	-	-	23	12.5
45 - 49	21	11.4	29	-	-	-	-	-	-	21	11.4
50 - 54	24	13.0	29	-	-	-	-	1	0.54	25	13.6
55 - 59	9	4.9	11	-	-	-	-	-	-	9	4.9
60 - 64	22	12.0	34	-	-	-	-	-	-	22	12.0
65 - 69	6	3.3	7	-	-	-	-	-	-	6	3.3
70 +	12	6.5	21	1	0.54	-	-	-	-	13	7.1
Total	177	(96.2)	218	2	(1.08)	3	(1.62)	2	(1.08)	184	100.0

Out of the above total, dependants make 10 per cent. Apart from being constitued of aging population, their small number signifies a low labourpotential from this group, while with the extended family system, one would have expected that the size of this category of population is larger than what is actually the case.

For the age structure of sons and daughters in the family, see Table 6. The data in the table shows a tendancy for clustering in the younger age groups, reflecting that tenancies were accorded in the resettlement phases in the Nomad area to applicants of younger age as compared to the Halfawyeens.

ANNEX 4
Table 6

Nomad: Population of Sons and Daughters

Age group	Sons		Daughters		Total	
	No.	%	No.	%	No.	%
Less than 5	126	21.5	126	24.9	252	33.1
5 - 9	143	24.4	122	24.1	265	24.3
10 - 14	107	18.1	100	19.7	207	18.9
15 - 19	85	14.5	63	12.7	148	13.5
20 +	126	21.5	96	18.9	222	20.2
Total	587	(53.7)	507	(46.3)	1,094	100.0

The above total of 1,665 population for the sample surveyed when divided by the 184 households studies gives 9 persons as an average size for the household. The findings of Phase I gave a figure that ranged from 7.4 to 11.4 persons. The mean for these two figures (9.4) is very close to the average reached during the present survey. Compared to the Halfawyeen area the Nomads' household is larger, but by a small difference.

As in the Halfawyeen case, the figure of 9.4 persons as an average size of the household in the Nomad area is not indicative of a large potential labour pool available in the family for farm operations. In the Nomads case there is a division of labour between agriculture and livestock, with some of the family members outside the Scheme in the period August - February. Again among some tribes (those of Eastern Sudan origin) female involvement in farm operations is socially stigmatized. Besides, many families send their children to schools.

	Tribe	Area
i.	Fur	
ii.	Zaghawa	
iii.	Bargo	Darfur (Western Sudan)
iv.	Masalit	
v.	Bergid	
vi.	Nuba	
vii.	Gawaama	Kordofan (Western Sudan)
viii.	Beni Ameir	
ix.	Hadandwa	Kassala & Red Sea (Eastern Sudan)
x.	Amrar	
xi.	Dinka	Lakes, Tonglei (Southern Sudan)

It is evident that the migrant labour in the Scheme could be broken intro three groups on basis of area of origin: Western Sudan, Eastern Sudan, and to a very limited degree, Southern Sudan. Of the three, the majority of labour comes from Western Sudan. Among the latter the most dominant tribes are the Zaghawa and Fur. The Sahelian drought of the 1970's which hit the Zaghawa area very hard has very much contributed to the mass migration of this tribe to the Scheme area.

The data from the 100 samples surveyed in five labour camps substantiates the above picture, as their percentage distribution by area of origin reveals that:

Darfur	Kordofan	Kassala & Red Sea	Gezira	Khartoum
50 %	30 %	8 %	1 %	11 %

Migrants reporting Khartoum are of diverse origin, dominated by elements from Western Sudan; however they have not entered the Scheme directly from area of origin, but stayed in Khartoum for some time as their last destination, prior to their coming to the Scheme. Looking for employment opportunities in other areas, before coming to the Scheme, seems to be the case for most migrants; since 52 per cent of those questioned reported that they have not moved to the Scheme directly from area of origin. The following centres of attraction in which the 100 samples surveyed sought employment opportunities in the period 1973 - 1978 reflect the situation better.

Percentage of respondents reporting employment in each of the following centres during 1973 - 1978

Year	Khartoum	Gedaref	Gezira	Sennar
1973	2.50	-	8.75	1.25
1974	9.00	5.00	3.75	2.50
1975	12.50	5.00	7.50	2.50
1976	8.75	3.75	2.50	1.25
1977	2.50	-	5.00	-
1978	5.00	2.50	5.00	1.25

On questioning migrants about reasons that attracted them to New Halfa Scheme the answers received convey that they have chosen the Scheme because of:

- Learning about job opportunities in New Halfa.
- Hearing about high wages in the Scheme.
- The possibility of share-cropping in groundnuts and "amlak" free lease land.
- The presence of communities of relatives in the Scheme.

In fact, this last factor is an important one, because relatives working for some time in the Scheme and returning home, are good informants about employment opportunities in New Halfa; and of the expected prosperity if a migrant comes to the Scheme.

On asking migrants whether they are planning to continue their stay in the Scheme next year, 86 per cent of the answers received confirm their continuity in future; which is reflection of the degree of satisfaction attained. The study on income shall tackle this aspect in more detail.

ANNEX 4
Table 7

Population Distribution by Settlement

(H) = Connotes Halfawyeen; (N) = Nomads; (M) = Migrant Labour Camp

Section	Block	Settlement		Household	Population
I. Debaira	1. Faras	Village (1)	(H)	25o	2,15o
		Village (2)	(H)	25o	2,15o
		Village (3)	(H)	25o	2,15o
		Village (33)	(H)	248	2,129
		Village (6)	(H)	225	1,935
		1 Block Camp	(M)	45o	2,25o
		2 Kimeilab Camp	(M)	125	625
		3 Farm Camp	(M)	35o	1,75o
		4 Village (1)	(M)	12o	6oo
		5 Forest Camp	(M)	65	325
	2. Hagir	Village (4)	(H)	174	1,496
		Village (7)	(H)	25o	2,15o
		Village (1o)	(H)	25o	2,15o
		Village (12)	(H)	18o	1,548
		6 Camp (28)	(M)	66	33o
		7 Camp Falasteen	(M)	17o	85o
		8 Camp Double	(M)	5o	25o
		9 Camp 1	(M)	2o	1oo
		1o Mattar Camp	(M)	1o	5o
		11 Block Camp	(M)	45o	2,25o
	K 14 Gorashi	Khor El Laben	(N)	77	693
		Sarroba	(N)	65	585
		Gorashi	(N)	186	1,674
		Sarroba Kassala	(N)	117	1,o53
		Koraj	(N)	6o	54o
		26 Arab	(N)	78	7o2
		Korak	(N)	4o	36o
		Umm Gamis	(N)	27	243
		12 Canal Camp	(M)	15o	75o
		13 Faras Camp	(M)	45	225
		Ard El Hagar Camp	(M)	4oo	2,ooo

ANNEX 4
Table 7 contd.

Section	Block		Settlement		Household	Population
II. Sasraib	5. Deghaim		Village (14)	(H)	264	2,270
			Village (15)	(H)	250	2,150
			Village (18)	(H)	250	2,150
			Village (19)	(H)	250	2,150
			Shalake	(N)	237	2,133
			El Gafala	(N)	200	1,800
		26	Deghaim Camp	(M)	60	300
	6. El Aidag		Village (22)	(H)	250	2,150
			Village (23)	(H)	250	2,150
			Village (26)	(H)	300	2,580
			Wad Nabar	(N)	450	4,050
			Giraigis	(N)	250	2,250
		27	Kilo 51 Camp	(M)	1,350	6,750
		28	Gash Camp	(M)	200	1,000
		29	Gabarona Camp	(M)	150	750
	4. El Madina		Village (16)	(H)	180	1,548
			Village (20)	(H)	235	2,021
			Village (21)	(H)	170	1,462
			Village (24)	(H)	250	2,150
		15	Geneid Camp	(M)	600	3,000
		16	Canal 31 Camp	(M)	130	650
			Village (20)Camp	(M)	105	525
III. Sedaira	10. Umm Gargour		Rimatgaid	(N)	237	2,133
			Umm Reika	(N)	301	2,700
			Umm Gargour	(N)	400	3,600
			Abu Usher	(N)	200	1,800
		45	Shabara Camp	(M)	30	150
		46	Camp	(M)	15	75
		47	Camp	(M)	25	125

contd.

ANNEX 4
Table 7 contd.

Section	Block	Settlement		Household	Population
	11. Salama Sarouba	Salama Sarouba	(N)	126	1,134
		El Azaza	(N)	222	1,998
		Abu Harira	(N)	179	1,611
		Masak	(N)	156	1,4o4
		4o Block Camp	(M)	75	375
	7. Umm Rahaw	Umm Rahaw	(N)	31o	2,79o
		El Sedeira	(N)	179	1,611
		Umm Melih	(N)	12o	1,o8o
IV. Demyat	14. El Shebeik	Gamaloon	(N)	32o	2,88o
		Ugda Tawila Arab "A"	(N)	56o	5,o4o
		Shebeik	(N)	128	1,152
		Batahin "19"	(N)	115	1,o35
		49 Wohda Camp	(M)	75o	3,75o
		5o Camp	(M)	375	1,85o
	15. El Rataga	Rataga East	(N)	217	1,953
		Rataga	(N)	233	2,o97
		Rashaida	(N)	65o	5,85o
		54 Rataga Camp	(M)	15o	75o
	16. El Elew	El Elew	(N)	1o5	945
		Sobagh El Gedid	(N)	4o6	3,654
		Dukhun	(N)	57	513
		55 Taganu Camp	(M)	12o	6oo
		56 Canal 37 Camp	(M)	15	75
		57 Double 24 Camp	(M)	17	85

contd.

ANNEX 4
Table 7 contd.

Section	Block		Settlement		Household	Population
V. Raira	18. El Sabaat Gharb		El Mazar	(N)	5oo	4,5oo
			El Selaim	(N)	3oo	2,7oo
			Dar El Salam	(N)	5oo	4,5oo
		59	Zagawa Map	(M)	2o	1oo
	17. El Sabaat Sharg		El Arial	(N)	2oo	1,8oo
			Hayakalla	(N)	3oo	2,7oo
	8. El Sufia		El Sufia			
			El Gedida	(N)	235	2,115
			Gaili El Gedida	(N)	696	6,264
			El Amlat	(N)	636	5,724
			Umm Gargour			
			El Gedida	(N)	317	2,853
		58	Dinkawi Camp	(M)	1oo	5oo
	9. El Sabaat El Om		Raira El Gedida	(N)	3oo	2,7oo
			El Arid	(N)	35o	3,15o
			El Sabaat	(N)	25o	2,25o
		66	Block Camp	(M)	2oo	1,ooo
VI. Sheikh Omer	3. Argin		Village (9)	(H)	18o	1,548
			Village (5)	(H)	266	2,288
			Village (11)	(H)	251	2,159
			Village (8)	(H)	25o	2,15o
			Village (13)	(H)	27o	2,322
		3o	Zagawa Camp	(M)	7o	35o
		32	Shaboura Camp	(M)	4oo	2,ooo
	13. Abu Nagma		El Bresi	(N)	8oo	7,2oo
			Arid El Shukriya	(N)	73o	6,57o
			Arab Ugda			
			Tawila "B"	(N)	57o	5,13o
			Shagarab	(N)	58o	5,22o
		38	Camp	(M)	15o	75o

ANNEX 4
Table 7 contd.

Section	Block	Settlement		Household	Population
	12. El Butana	Umm Aranib	(N)	55o	4,95o
		Warshalat	(N)	2oo	1,8oo
		Koraj El Gedida	(N)	5oo	4,5oo
		42 Kilo 9 Camp	(M)	13o	65o
		43 Kilo 18 Camp	(M)	4oo	2,ooo

New Halfa town	35,ooo
Halfawyeens	51,1o6
Nomads	139,689
Migrants labourers	4o,515
	266,31o

New Halfa Agricultural Scheme

	Population	No. of Settlement
Halfawyeen settlement population	51,1o6	25
Nomadic settlement population	139,689	52
Migrant labour camps population	4o,515	39
New Halfa town population	35,ooo	-
Total population	266,31o	

1.4 Labour Availability

1.4.1 The Halfawyeen Area

1.4.1.1 Family Labour

The following data obtained from the 61 samples surveyed in the Halfawyeen area furnishes a quantitative picture of the involvement of the family in farm operations, given as percentages of those involved, out of the categories of population in the family:

- 50.76 per cent out of 65 wives
- 32.47 per cent out of 154 sons
- 22.89 per cent out of 166 daughters
- 17.10 per cent out of 76 male and female relatives.

Out of the whole population of sample surveyed (522 persons) the percentage involved in farm operations comes to 38.3 per cent including the head of the household as a tenant.

Taking the age structure of the above categories contributing their labour as given in Table 8, it emerges that among wives those that are mostly involved fall in the age brackets 20 to 49, and not beyond that. For sons, daughters, and relatives, the age groups are even narrowed down to less than 29, with clustering in the age bracket 10 - 19.

ANNEX 4
Table 8 — The Halfaweeyn Area: Age Structure of Family Members Contributing their Labour to Farm Operations

Age group	Wives	Sons	Daughters	Relatives	Total
1 - 9	-	5	5	-	10
10 - 19	-	24	26	13	63
20 - 29	8	14	7	5	34
30 - 39	14	7	-	-	21
40 - 49	10	-	-	-	10
50 +	1	-	-	-	1
Total	33	50	38	18	139

and try to assess to what degree the family contributes its labour. This has been attempted in the previous analysis on the three crops.

Even this partial participation is preconditioned from the side of the tenant. Though the majority of respondents literally agreed that family members may contribute to farm operations, they forwarded one condition with regard to children, the farm work should not detain them from schools. Hence the education of children is a priority, expressed by a community to whom involvement in the farm should come next, if the time of children allows.

In the frame of this partial participation, the degree of involvement of families in agricultural work varies considerably from one case to the other. The variation could be referred to one of the following factors:

- The perception of some Halfawyeen tenants to work in the field as being tough especially for females.

- The individual family composition by sex, age, and status of education, in the sense that families with more male members are apt to contribute more. Those with male children are again anticipated to avail more labour for the tenancy, while families that received better education are expected to behave inversely.

- Families with many children at school are anticipated to contribute less, and with that goes the unpreparedness of many families to involve the children in the tenancies.

- Again the distance to the tenancies plus the illusion about the environment surrounding the villages, still held by the Halfawyeens as unsafe, besides bad roads, have been mentioned by some families as reasons behind the non-participation of family members in farm operations.

- The income of the tenant and his general financial ability are influential on the question of family labour participation i.e. those who are financially able resort more to migrant labour.

- The full engagement of the housewife in home acitivities which could be reflected against the larger size of children in the family being 6.6, a factor mentioned by many respondents.

- Finally to many families, and through experience the tenancy is not economically remunerative. The return from agriculture is not an attractive incentive to families to engage the labour potentially available in farm operations.

It is, therefore, evident that the Halfawyeens' engagement in agriculture is partial. Their degree of participation could be judged from the operations which they undertake at farm level. The evidence collected reveals that their main task is the supervision of the tenancy. The operations they contribute to are limited to light weeding and irrigation.

1.4.1.2 Labour from Outside Family

The information furnished by the survey reveals, that the majority of the 61 tenants interviewed in the Halfawyeen area employ migrant labour, to undertake farm operations for the production of the three crops. Of the total sample 75 per cent reported employing migrant labour for wheat production during last harvest, 61.7 per cent for groundnuts production and 96.6 per cent for cotton production.

Table 10 gives the number of migrant labour employed by operation for the three crops. It is apparent from the table that the crop for which the tenant employs migrant labour mostly is cotton, followed by groundnuts, with wheat registering the smallest size of migrant labour employed. The above percentages and the figures furnished by Table 10 are self-explanatory. The tenant employs the largest number of labour in the cotton crop because its production is obligatory to all tenants. The number employed in groundnuts might match that of cotton, however, part of the reality is disguised by the share-cropping system, which does not appear in the above calculations; since they only focus on the labour employed by the tenant for production under his direct management. Wheat being fully mechanized, accounts for the small size of labour employed by the tenant in its production.

Of all operations for which the tenant employed migrant labour, the leading ones are weeding and cotton picking. Being the ones that entail much physical exertion, point out to how far is the Halfawyeen tenant away from working with his hands in his tenancy. It is interesting in this connection to find out the family contribution of the 61 households surveyed in relation to the size of labour employment. Going back to Table 9, one finds that all those contributing to the production of the three crops from the available family labour are 407 persons, compared to 2,431 employed by the same families for the same crops as exhibited in Table 10. This gives a ratio of 1:6, i.e. every member contributing in the family has to be met by six from outside the family.

In tracing employment of migrant labour in time perspective, 44 respondents (73.3 per cent) reported that they began employing migrant labour since they entered the Scheme in 1962. The other 17 respondents (26.7 per cent) claimed that they adopted this practice only recently. It seems that for some operations such as cotton picking, all tenants hired migrant labour as from the beginning. On the whole the question has been influ-

ANNEX 4
Table 10

The Halfawyeen Area: The Situation of Migrant Labour Employment for the Three Crops

Operations	Number of labour and percentage per operation by crop					
	Wheat		Groundnuts		Cotton	
	No	%	No	%	No	%
Land preparation	94	21.8	51	7.5	87	6.6
Sowing	4	0.9	34	5.0	114	8.6
Irrigation	107	24.8	36	5.3	106	8.0
Weeding	48	11.1	176	26.0	651	49.2
Fertilizers (applying)	80	18.6				
Thinning			25	3.7	83	6.3
Harvesting	3	0.7	137	20.2		
Threshing			94	13.9		
Picking	27	6.3			150	11.3
Packing			85	12.6		
Bailing					132	10.0
Transportation	68	15.8	39	5.8		
Total	431	100	677	100	1,323	100

enced by many factors that urged hiring labour in the earliest stages of the Scheme, or deploit that to latter stages. These include:

- The Halfawyeen tenant by virtue of his peasantry skills is not accustomed to specific operations, such as cotton picking or groundnuts harvesting, which induces him to hire labour as from the date of the introduction of those two crops in the Scheme.

- The Halfawyeens, being an alien population in the area, had mistrust in foreign elements, the main suppliers of the required labour. Hence, they needed some time to know more about their neighbours and to mix with them. This might accounted for the gab of five years, as reported by most respondents, when they began employing migrant labour more effectively.

- Some time had to elapse before conditions took shape in the Scheme. As observed many families few years after the resettlement had left the Scheme, entrusting their tenancies to those staying behind, to carry production on their behalf. Hence with the years the demand for hiring labour increased.

- Linked to the above is the emergence of the agricultural cooperative, attempted by the Halfawyeens as a form of management and production system to solve in part the absenteeism of those who left, and to cope with farming for those even living in the villages. Again this demanded employment of large numbers of migrant labour.

- Coming from a traditional peasantry agriculture, where production was based on the small holding, the Halfawyeen tenant could not cope through his family labour with the large 15 acres tenancy, entailing on him employment of migrant labour.

- With settlement in the Scheme, and the emergence of employment opportunities other than agriculture (in services, local industries, commerce, transportation, etc.) many tenants acquired jobs outside agriculture, with the time devoted to the latter becoming even more limited, necessitating thus the employment of migrant labour to look after production.

- The planned service facilities that came with the Scheme have increased the chances of children to enrol in schools, hence with time decreasing the size of labour available within the family.

- As has been reported in all villages surveyed, weeds have become the number one problem of the tenant, more particularly in the last five years, demanding the employment of more labour.

- attraction by newly established Schemes: 59.2 per cent
- lack of money in hands for immediate payments: 11.2 per cent
- being attracted to the Nomads part of the Scheme where tenancies are rented or obtained through share cropping system: 9.2 per cent
- immigration of labour to neighbouring countries: 7.5 per cent
- those seeking employment as casual labour decreased in number in last years: 5.6 per cent
- seasonality of labour: 1.8 per cent
- those who do not know the reasons behind scarcity: 5.5 per cent

Finally under the labour situation the Study investigated whether labour wages have risen in recent years, and whether the rise has affected the income of the tenant from agriculture. Of all answers received in the Halfawyeen area, 93.3 per cent of those interviewed confirmed rises in labour wages during the last five years, with 83.3 per cent of them emphasizing that the rise in wages has decreased their income from the tenancy. Reasons for rise of wages by percentage of answers received are:

- rise in costs of living: 65.8 per cent
- scarcity of labour and competition among tenants: 29.3 per cent
- increase of weed infestation: 3.7 per cent
- the recent government job evaluation Scheme which raised minimum wages: 1.2 per cent

1.4.2 The Nomad Area

1.4.2.1 Family Labour

The data furnished by the survey for the 184 samples studied, reflects the following situation, of the involvement of family labour in farm operations in the Nomad area, given as percentages of the various categories of population making the 184 households:

- 25.69 per cent out of 218 wives
- 27.60 per cent out of 587 sons
- 13.41 per cent out of 507 daughters
- 10.65 per cent out of 169 relatives.

Considering the size of family involvement, out of the total population (1,665 persons) making the sample surveyed, this comes to 29.3 per cent including the heads of households contribution as tenants.

The age structure of those rendering their labour is given in Table 11. It is apparent from the table that effective contribution comes mostly from the age groups in the brackets 10 to 39. It is evident from the preceding analysis that the involvement of the Nomads families in farm operations is very low, being limited to 29.3 per cent of those making the homestead. Compared to the Halfawyeen area it is even lower by 9 per cent. Again as in the case of the Halfawyeens, the role of the Nomad tenant is rather a participative one in production and not full involvement as could be depicted from Table 12, furnishing data on family labour input for the three crops: wheat, groundnuts and cotton.

ANNEX 4
Table 11 — The Nomad Area: Age Structure of Family Members Contributing their Labour to Farm Operations

Age group	Wives	Sons	Daughters	Relatives	Total
1 - 9	-	18	26	6	50
10 - 19	-	93	42	12	147
20 - 29	16	29	-	-	45
30 - 39	22	22	-	-	44
40 - 49	15	-	-	-	15
50 +	3	-	-	-	3
Total	56	162	68	18	304

In the Nomad area, the involvement of family members is limited to the head of the household; as a tenant supervising production, carrying some of the irrigation operation, and in some areas doing part of the weeding. As for wives, sons, and daughters, their contribution is again very low, being limited to the two crops groundnuts and cotton, directed mainly to irrigation, picking and harvesting.

The Nomads participation is more narrow than that of the Halfawyeens, since at least for the last two years only two crops are produced in their area. Even for those two crops, labour availability from the family for farm operations is very much determined by three factors. Among these is the level of the economic prosperity of the family. Poor families are observed to contribute more, undertaking most of the farm operations by their own hands, and even selling their own labour to others. It is also determined by the size of the family, since large families have more hands that can be involved in farm operations. Finally, it is linked to the livestock wealth owned by the family, i.e. families with large herds give more priority to their animals as compared to the tenancy, especially if the number of male members in factor family is limited. In relation to the latter fector it is observed that, tenants in the Nomad area, devote more attention to the cotton picking operation. However, they are not motivated in that by an interest to achieve high yields, but rather to gain an early access to the cotton plot to feed their animals on the remains of the produce; and to raise some cash from the cotton picking loans made available by the Corporation.

On researching the attitude of the tenant towards the involvement of family labour in farm operations, same as in the Halfawyeens case the overwhelming majority (90.8 per cent) stated that the do not object to making available their family members for farm work. However, this answer is given for an abstract situation, as if means for those outside the respondents family. Female involvement is welcomed by a lesser number of tenants (78.8 per cent), which again should be taken literally. Those objecting to engagement of family labour in farm operations gave the following arguments:

- it is our tradition that females do not work in tenancies: 58.3 per cent
- working in tenancies is very hard for females: 19.5 per cent
- the first priority for children is to go to schools: 13.9 per cent
- tenancies are far away: 8.3 per cent

ANNEX 4
Table 12

The Nomad Area: Family Labour Contribution in Farm Operations by Crops:

Wheat

Operation Number	Wife	Son	Daughter	Relative
Land preparation	5	39	7	-
Sowing	-	-	-	-
Irrigation	7	52	4	3
Weeding	16	62	24	3
Fertilizers	4	91	26	-
Harvesting	-	-	-	-
Packing	-	-	-	-
Transportation	-	-	-	-
Total	32	244	61	6
Percentage	9.3 %	71.2 %	17.8 %	1.7 %

Groundnuts

Operation Number	Wife	Son	Daughter	Relative
Land preparation	5	24	3	-
Sowing	6	39	11	2
Irrigation	2	35	3	2
Weeding	13	61	19	-
Thinning	3	9	17	-
Harvesting	17	5o	18	-
Threshing	16	21	2	2
Packing	14	2o	3	-
Transporation	1	1o	3	-
Total	77	269	79	6
Percentage	17.9 %	62.4 %	18.3 %	1.4 %

contd.

ANNEX 4
Table 13

The Nomad Area: The Situation of Migrant Labour Employment for the Three Crops

Operations	Number of labour and percentage per operation by crop					
	Wheat		Groundnuts		Cotton	
	No.	%	No.	%	No.	%
Land preparation	51	12.1	94	5.5	119	3.2
Sowing	52	12.3	193	11.3	172	4.7
Irrigation	2o	4.7	4o	2.3	53	1.5
Weeding	9o	21.3	834	48.8	2,296	62.6
Fertilizers (applying)	61	14.4				
Thinning			33	1.9	184	5.o
Harvesting	59	14.o	23o	13.5		
Threshing			15o	8.8		
Picking					332	9.1
Packing	45	1o.6	98	5.7		
Bailing					246	6.7
Transportation	45	1o.6	38	2.2		
Pulling of cotton trees					264	7.2
Total	423	100	1,71o	100	3,666	100

- For some families, especially the poor ones, cotton loans are a secured source of cash in meeting living expenses.
- To guarantee for his livestock a source of fodder during the most critical period of grazing, March onwards, when natural grazing becomes scarce.

Of all operations in which migrant labour is employed, weeding (55.5 per cent of all labour employed) is the leading one, followed by harvesting (6.5 per cent) and picking (5.5 per cent).

Relating the labour contributed by the families surveyed; making a total of 1.825 persons, to that employed by same families: 5,799, for the three crops, we arrive at a ratio of 1:3.2, i.e. every member contributing in the Nomads families is met by three employed persons from outside the family. This last figure is half that established for the Halfwyeen area, which is quite valid since:

- The agricultural situation is more degenerating in the Nomad area with almost one crop missing.
- The Nomads are less prospereous than the Halfawyeens, with limited access to cash.
- Almost all of the poor tenants in the Nomad area cultivate their tenancies through their own labour.
- Much of the cotton picking operation in the Nomad area is done through family labour, gaining the cost of picking as an income.
- Leasing tenancies or entering into share-cropping systems decreases the number of tenants directly producing and hence the number of migrant labour employed.

On the question of employment of migrant labour, by the Nomads tenants in time perspective, 53.9 per cent of all respondents stated that they resorted to this exercise from the first year they entered the Scheme. While 46.1 per cent mentioned that they began employing labour only during the last five years. In this connection, the Nomads tenants reason that, compared to the first years of the Scheme when migrant labour was employed in small numbers and for specific operations, present day situation demands employment of larger volumes of migrant labour.

Factors listed include:

- Overlapping of operations required for production of groundnuts and cotton, which entails weeding, harvesting and picking in a short span of time. Again between cotton and wheat which requires picking, clearing of fields, and preparation in a short period.

- Lack of preparation in the right time accompanied by urgency from the side of the corporation to seed fields under cotton within a short notice, causing competition among tenants to recruite labour.
- Intensity of weeds during the last four years, believed to have resulted from:
  - . seeds carried by irrigation water and propagated by breaks in canals, especially in fallow areas
  - . improper cleaning of grasses on canal banks
  - . inefficiency in preparation of fields for a number of successive years.
- The priority given to animals being traditionally livestock raising communities.
- The limited contribution of females in general, and more specifically housewives, being preoccupied with home affairs as well as women involvement, is socially stigmatized among some tribes.
- The enrollment of more children in schools and the change in outlook towards agriculture as an inferior occupation.

In a more quantified form the above reasoning is given in the following percentage of all answers supplied:

- because the tenancy is too big for the labour available in my family: 42.9 per cent
- because of intensity of weeds: 24.6 per cent
- because crops are many: 21.9 per cent
- because I am engaged in other occupations such as livestock raising: 7.8 per cent
- because my family is not for agricultural work: 2.8 per cent

The situation of labour availability registers shortage same as in the case of the Halfawyeen area. Of the 184 tenants questioned, 77.3 per cent conveyed that they do not find the required labour easy, while 22.7 per cent claimed that they do not face problems in obtaining labour. Scarcity of labour began to show itself about seven years back, as could be depicted from the following percentages in reply to the question; since when labour has become scarce in the Scheme:

- 2-3 years: 12.7 per cent of all answers
- 4-5 years: 57.2 per cent of all answers
- 6-7 years: 25.5 per cent of all answers
- since the rise of the Scheme: 4.6 per cent of all answers.

The reasons given by Nomads for scarcity of labour include:

- Increase in weeds, discouraging labour from taking jobs in tenancies, and instead seeking employment opportunities in nearby Schemes especially Rahad.
- Competition for labour between New Halfa Scheme and mechanized agricultural schemes, more particularly affecting the southern parts of New Halfa Scheme, being close to Gadaref area.
- Rise in labour costs, contributed to in part by the high wages promised by NHAPC, which secures labour for those operations directly falling under the responsibility of the Blocks offices.
- Competition between tenants, especially the financially able ones offering higher wages.
- The delay in payment of agricultural loans, resulting in non-equal opportunities between tenants in recruitment, i.e. those who are financially able have more accessibility to labour compared to poor tenants.
- The confinement of the Eritrean refugees movement, part of them former temporary labourers, in specific camp sites, depriving the Nomad area from a source of labour that was more available in the past.
- In the fringe areas of the Scheme whether in the east, north, or west, there are large areas cultivated with dura which compete with the Nomads over the available labour.

An attempt at quantification of the above parameters behind labour scarcity, is computed from the answers received in the following percentages:

- no available cash in hands of tenant: 28.2 per cent
- attraction by other production schemes: 27.1 per cent
- intensity of weeds: 12.o per cent
- seasonality of flow of labour into Scheme: 9.8 per cent
- competition by NHAPC: 8.6 per cent
- migration outside Scheme: 5.5 per cent
- decrease in volumes of migrant labour entering the Scheme: 5.5 per cent
- low wages in the Scheme: 3.3 per cent

With scarcity in labour goes rise in wages, as has been confirmed by 97.8 per cent of all respondents interviewed. Reasons given relate very much to the factory analyzed above that are behind the scarcity of labour.

As to whether the rise in wages has decreased income from tenancy, of all answers received 94.1 per cent emphasized that their incomes have decreased as a result of payment of higher wages.

Variations in ranges of size of human settlements could be explained in terms of the planning principles which accompanied the rise of each category of settlement.

The Halfawyeen settlements being physically planned to accommodate 175 to 25o tenant families with their tenancies and their freehold lands surrounding each of their villages are inevitably of similar population size. With no more relatives coming in and with no alien elements allowed to build on the village land the Halfawyeen settlements have almost kept their initial shape, except for very limited additions of one house or two, cited in some of the villages surveyed. True there are a few houses in some of the villages, deserted by the original tenant owners who live outside the Scheme; however these are not empty, being rented either to relatives or in some cases to migrants from Kassala Province who are cattle breeders selling milk to the Halfawyeens.

The Nomad settlements on the other hand, fall into two categories: the old traditional villages on the eastern banks of river Atbara, and the emergent villages that came as the Scheme spread on its western fringes and northern parts. Neither has been guided by controlled physical planning. The traditional villages came through evolutionary development as mentioned before with some of them in existence as early as the beginning of the century. The emergent villages again developed in an evolutionary way but on sites specified by the authorities where some community services were provided and tenant families were directed to build their homes. Since in the two cases no comprehensive planning controlling size of settlement and relating it to tenancy acquisition has been applied as in the Halfawyeens case, there emerged variant sizes of populations with wide ranges as exhibited by the previous figures.

To some degree the same factors that shaped the rise of the emergent villages apply to migrant labour camps, in being unplanned settlements built on sites where certain conditions allowed. However, they are less permanent in terms of structures and population size and being mobile, exhibit wide range in settlement size.

Nomads villages on the western and eastern sides of the Scheme should be considered as an integral part of the population of the Scheme, though in terms of geological location some of these villages are far removed from the irrigated land of the Scheme, particularly so in the case of the settlements to the east. Because of this factor, of the 184 respondents interviewed in 25 Nomads villages, 48.4 per cent reported that their families live in villages outside the boundaries of irrigated land. Definitely this habitation on the fringes of the Scheme has direct influence on distances to tenancies which shall be considered in more detail under the next topic.

2.3 Village Location in Relation to Tenancy

With the exception of those living on the eastern boundaries of the Scheme, the distribution of Nomad tenants in the Scheme has been influenced by two main factors: proximity to tenancy and relatives presence in the sites specified by the authorities for resettlement.

The latter consideration in selection of where to live is an essential one that deserves more elaboration.
The Nomads societies based on tribal bonds show social and economic solidarities that are reflected in inter-family production through mutual help. Absent members could find relatives who look after their tenancies and supervice production for them. Those with large herds of livestock could entrust some of their animals to poor relatives to graze them on the remains of crops in the latters' tenancies. Through these and other means, the Nomad tenant societies at the individual tribal sub-group level achieve integration and give security to their members.

However, the same tribal forces may lead to disintegration of communities at village level, if the latter is inhabited by more than one tribal grouping. This is evidenced in a number of villages especially some of those inhabited by the Shukriya and the Lahawyeen, where settlement are seen distinctively made up of two quarters with each having its own headmen, though tenants families occupy the same sites. This latter factor disintegrating village unity is a negative force that undermines collective action at village level and might have its repercussions on agricultural production if for example we cite co-operative formation at village level, as an example impeded by such disunifying forces.

If not for the livestock economy, which has dictated the location of the Nomad villages on the outskirts of the Scheme as points in space linking the tenancy to the traditional grazing lands outside the Scheme, coupled with the search for familial groupings to live among, the distribution of Nomad population would have been more balanced.

In about 14 out of the 25 villages surveyed (62.9 per cent of all respondents) tenants reported crossing more than one block to reach their tenancies. Distance to tenancy is considered as an obstacle to farm operations by many tenants, especially in the case of the eastern villages. Of all respondents 38.5 per cent gave answers that distance wastes time that could have been utilized in working the tenancy. For this latter category of tenants apart from the lost time, about 18.5 per cent reported that with long distances they can not supervise their tenancies efficiently.

The low rating of 38.5 per cent attributed to distance has its explanation in the solution annually adopted by Nomads tenants. Being keen on fully utilizing the remains of the groundnuts and cotton crops as fodder for his animals the Nomad tenant either moves alone or with his family accompanied by his herd to live on the tenancy from the beginning of the groundnuts harvest in November, throughout the cotton picking period to return back to the villages in March. Through this arrangement the tenant is in fact physically residing in the tenancy for half the operations demanded by the groundnuts and cotton crop. The following percentages computed from the answers given to the question "What measures do you like to solve the problem of distance to the tenancy" confirm the occurence of the above phenomenon:

- I do nothing: 7.1 per cent
- I live for some time in the tenancy: 6o.7 per cent
- I hire others to live in the tenancy: 15.5 per cent
- part of my family lives in the tenancy: 16.7 per cent.

What has been analyzed above applies to Nomads villages in the northern half and the western fringes of the Scheme. The villages to the east have a different case. To start with, the Halfawyeen tenancy lands extend right to the eastern boundaries of the Scheme, thereby limiting the number of tenancies east of that line available for tenants from the eastern villages. The problem itself arose in the later implementation phases of the Scheme and some ideas developed to put under irrigation the land further east of the Halfawyeen zone, so as to be distributed as tenancies to population from the eastern villages. However, the same population was reluctant to concede their traditional land under terrace cultivation to be incorporated in the Scheme and distributed as tenancies. Their main argument presented before, and emphasized again during this survey, is that the available land is limited. If developed and distributed on basis of 15 feddans tenancies many of the present day beneficiaries of the same land under rainfed conditions, will not acquire tenancies.

Through political pressure, representatives of the eastern villages succeeded in stopping the incorporation of this land into the Scheme. With the Halfawyeens tenancies occupying the eastern irrigated parts of the Scheme, and with the areas under rainfed agriculture forming a buffer zone between the irrigated areas and the eastern villages, tenants from the latter had no alternative but to acquire tenancies in other parts of the Scheme, where conditions permitted. As a result they have to travel long distances to reach their tenancies.

Since is was not possible to find tenancies for all tenants from the same village on the same block, the system adopted in distribution of tenancies was based on groups of tenants under one headman. The twin factors of being given land away from their villages in other parts of the Scheme, and on the basis of

small groups rather than whole villages, have worsened very much the locational situation of tenancies in relation to villages, demanding of the tenant from the east that he travel long distances. Apart from travel expenses, other extra-costs are involved since the tenant incurs living expenses during the periods he is away, in addition to what he normally spends on this family left behind at home. Besides the remoteness of the tenancy deprives him of the benefits of mutual co-operation such as supervision extended by relatives as in the case when his tenancy is close to his original village.

In illustration of the above presentation, data from the survey reveals that out of 23 Nomad villages fringing the Scheme from the south, south-east, and east (El Mugataa, El Shagarab, El Rimeila, Khashm El Girba, Andala, El Sharafa, Sarroba Kassala, Ghorashi, Khor El Laben, Sarroba Tawai, Koraj, Asobri, Niema, El Gafala, Shalake, Sasraib, Kindowa, El Liderwagi, Giraigis, Wad Nabar, and El Sedeira), only five have sizeable number of tenancies holdings close to village sites namely: Ghorashi, Sarroba Kassala, El Sharafa, Andala and Khor El Laben. For the rest, their holdings are to be found in the following Sections as part of the tenancies of following villages:

	Location of holding	Villages
Section:	1. Demyat	El Shebeik, and Rataga East
	2. Sheikh Omer	El Bresi (Village 18), Koraj El Gedida, Shagrab El Gedida, Villages 3 and 4,
	3. Sedaira	Umm Gargour, Salama Sarrouba, Masak, Abu Harira,
	4. Raira	El Sabaat Sharg, El Sabaat Gharb.

From the geographical distribution of the above villages it is apparent that tenants from the east travel in all directions in the Scheme, outside the Halfawyeen settled zone, to reach their tenancies. The cases of villages Giraigis, and El Sedeira are illustrative in this respect. Out of 181 tenants from Giraigis about 1oo have their tenancies within walking range of the village, 5o have their tenancies at Umm Gargour, 22 at El Shebeik, and El Sabaat Sharg. In the case of El Sedeira, out of 885 tenants only 165 have their tenancies within walking distance to the village with the rest distributed as follows: 3oo cultivating at Umm Rahaw, 25o at Umm Gargour, and 17o at El Shebeik.

The situation in these eastern villages present a problem to agricultural production, since farm operations are hampered by the absence of tenants who are separated from their tenancies by travelling and not walking distances. From the tenant point of view however, interviewees were not at all willing to desert their existing villages for new sites. They favour continuing to live in their settlements for the following reasons:

settlers and tenants is passing. The tent is a stage closer to nomadism, while the hut and the dry earth room connote settlement.

The dominance of wood and grass huts over most of the Nomad area with the exception the villages to the east is due to one main factor that it is the structure most suited to the soil and wet conditions of the clay plain as compared to dry earth buildings which tenants in the northern and western parts of the Scheme consider as undurable and frequently requiring maintenance.

The villages to the east contain much of the dry earth structures reported in the sample because of favourable construction conditions for this type of building. Among these are the siting of villages on Karab lands which are gravely and well drained, the proximity to river Atbara which supplied the villages with a ready source of water during dry season for construction purposes, the abundance of wood for roofs, and the long evolution of these settlements being founded prior to the rise of the Scheme with the cumulative effect of time generating more units in each house.

The fact that types of structures in villages are reflective of the transitional stage towards full settlement through which Nomads are passing, is further emphasized by the date of construction of housing for 184 samples surveyed. Of the latter 2o.7 per cent had constructed their houses for the first time in early 196o's, 56.7 per cent in late 6o's, 13.4 per cent in early 197o's, and 9.2 per cent in late 7o's. The case of those building houses during the 6o's does not need much explanation since this period falls within the development phases of the Scheme. As for the 22.5 per cent reporting building their houses for the first time during the 197o's, their case could only be explained in terms of late settlement. With time the 5.6 per cent still living in tents will gradually settle.

It is worth remarking in relation to the above that at a time when all emphasis is given to questions of productivity and increasing production from the land, important parameters are overlooked that the Nomads tenant making 52.4 per cent of all Scheme population is still passing through a transitional stage from nomadism to full settlement. It is to be stressed here that in transforming Nomads into productive tenants the element of time should be incorporated in the planning considerations. True the process could be accelerated, but is should not defy certain economic and social laws.

Furthermore the progress of the Nomads towards settlement can be judged from the additions made to the initially built units in their houses as an indication of attained prosperity, and valued comforts of settled life. Of the 184 samples studied 4o.3 per cent reported adding units to their houses, with the remaining 59.7 per cent contented with what they had built at first.

Reasons given for making these additions are:

- For some, that they were initially living in tents and with time decided to change for a permanent structure.
- To others, the increase in size of family dictated the addition of more rooms.
- For a third group the marriage of a son necessitated the building of a new quarter in the house.
- Finally, there are those who added a reception place to the already existing house.

The composition of the house goes with the tribal origin of the resident population. Two categories of population could be distinguished in this respect: the settled population irrespective of the stage of settlement attained, and those who are still perdominantly nomadic. The data furnished by the survey gives 2.13 rooms as the component units making the house of the former group. Normally, one of the rooms as a standard is used in all houses as a sleeping place. The use of the other rooms varies from one family to the other, in some cases utilized as a reception place, in others as a cooking place. As for the predominantly Nomads families it is observed that their home tends to be composed of one room house being a tent or a hut used for all purposes.

In support of the preceding analysis the survey data reveals that all of the 184 respondents questioned reported that their houses contain a sleeping place, yet only 24.5 per cent and 22.9 per cent of them stated that they have reception places and kitchens, respectively. Taking the number of sleeping rooms (184) and adding to it the value of 24.5 per cent for reception places (45 huts) and 22.9 per cent for cooking places (42 huts) as both of the latter two might possibly be used for sleeping, this gives a total of 271 sleeping places. For an average size family of 9 persons this gives an occupancy rate of 6.1 persons (184 x 9/271). This last figure is a very high one compared to the Halfawyeens where it is in the range of 4.3 persons to the room, reflecting the inadequate housing condition in the Nomad area. This is further emphasized by the answers received for the question: "Is your present home adequate for meeting the accommodation needs of your family?" Those answering "No", amounted to 89.2 per cent of all respondents.

The inadequacy shows itself also in the absence of basic utilities from houses. None of the villages surveyed have running water, except for El Gafala in the east where the system partially covers some houses.

For the 184 samples studies only 26 per cent reported as having a water source inside the village, with 58 per cent depending on canals, and the remaining 16 per cent obtaining their water from sources ouside village other than canals. Again toilets are absent in most houses with only 1o.9 per cent of the samples reporting having toilets at home.

2.5 Planning of Settlements

2.5.1 Present Sites

Villages in the east, as mentioned previously, had grown on their present sites as traditional settlements prior to the rise of the Scheme. The rest of the Nomads settlements have grown on the sites prescribed by the authorities. Each of these new sites has been given a number-name same as in the Halfawyeens case with the label Arab to differentiate it from the latter. However, most of the villages now carry the number-name and the original name of the village from which the population moved to the Scheme area, prior to resettlement with the label "New" added to the name of the old village. Hence we come on El Sufia, El Gedida (New El Sufia), Raira, Koraj, Umm Gargour, etc. which are names for old settlements, many of which moved from El Butana plain to the Scheme land.

On the sites of Nomads villages one finds the built-up area of the village houses, plus the few services in existence, surrounded by wide empty spaces on all directions separating the village complex from the tenancies. An attempt at planning Nomads villages was carried out in the late 196o's with residential plots of 4oo m^2 allotted to tenants plus their sons in all settlements. However, none of the latter adopted the plan, and present day layouts of all villages reflect the old traditional village set-up with its irregularities inherited from the patterns of habitation prior to resettlement in the Scheme. The built-up area in any direction where space allows with vacant areas in between separating the extended family complexes from each other. Few of the houses have distinguishable court yards enclosed by fence walls. In most villages enclosures of thorn walls or just open spaces for keeping animals form part of the homestead. It could be safely concluded that none of the Nomads villages is built according to a plan. The governing principle is the kinship ties of the extended family which direct where an individual puts his home.

The survey gave attention to the question of suitability of present village sites for continuity of habitation in future, in case Nomads villages are to be replanned. The issue has

been approached through surveying the tenants' attitude towards this issue. Of all answers received 9o.5 per cent of the respondents favour living on present sites. The remaining 9.5 per cent gave a negative attitude on considerations of remoteness of tenancy from village, and not on unfavourability of site for habitation.

Reasons behind the preference of Nomads for continuing to live on present sites are attributed to the following:

- As implied by the population structure of the nomadic villages and their social organization, actually every tenant is living among relatives; hence familiarity with the place and the village community is established.
- With the above factor goes the security and safety of property especially livestock, which to many tenants might not be guaranteed if moved to a new site and settled with foreign elements of population.
- As could be depicted from the location of most of the nomadic settlements whether in the west, north, north-east, or east, they are sited on the fringes of the Scheme. This fringe situation maintains for Nomads villages a continuity between tenancies inside the Scheme and grazing lands outside.
- The same fringe location of settlements give people accessibility to their dura cultivation outside the Scheme.
- The present sites of villages provide ample space for livestock keeping in the village yard.

To the above should be added the reasons given by the Nomads tenants inhabiting the eastern villages along river Atbara, which were listed earlier.

Of the other supporting evidence that the above reasoning reflects the true attitude of the tenant is the preference of the tenant to live in the same village site if settlements in the Scheme are replanned, supplied by 98.2 per cent of the respondents questioned on this issue as against 1.8 per cent who prefer to move to new sites.

2.5.2 Plot Size and Housing Costs

As mentioned before, all Nomads villages are planned on basis of 4oo m^2 residential plots. However, this grid-iron layout is not physically apparent in any of the villages surveyed. In its place, and as explained, Nomads villages are characterized by an irregular layout governed by traditional housing needs and livestock requirements for ample space.

The above two factors of living close to relatives and having sizeable space for the herds should be given consideration in future planning. It seems that applying a grid-iron plan at present to Nomads villages at this stage of their development might not yield the expected results. Also specifying special sheds or places or quarters in the village for keeping the livestock of the whole settlement in one place would not work, because people like to see their animals under their eyes, and individually cater for them. It should be more practical to prepare a complete layout plan for each village, distribute plots to families, yet leave the progress of building to the gradual social and economic advancement of the population.

With regard to size of plot to be allotted to the family, the Nomads look for bigger spaces. From the kind of areas indicated during the survey, a plot of 600 - 800 m^2 should be considered, since all respondents clearly emphasized that the Halfawyeens housing of 400 m^2 is far below their requirements. The Halfawyeens themselves complain of the small plots they were given. They remark that those who planned for them had not projected the future needs of their sons and daughters. The latter can not at present physically build near their fathers. In the few cases where such a demand arose, as recorded in two of the Halfawyeens villages surveyed, the new houses have been constructed away from the original families at the outskirts of the villages.

The Nomad tenant presents his spatial requirements for housing on grounds similar to the Halfawyeen. Normally he is not thinking of his nuclear family alone but as well of his married sons at present and in the future. Among the Nomads, a head of a household is in fact a head of a family that consists of his married sons and the latters' wives and children if they are physically residing with him in the same compound. With no new hawashas available for distribution to enable sons to establish independent houses, and with the vested interest of the father and sons in the same herd, the homestead, the tenancy, and the herd become the centre of interest of the father and his sons up to the time the former dies. Hence the need for large size plots should be viewed in light of the social and economic solidarity of the members of extended family.

To what degree the Nomad tenant is prepared to build new homes if villages are replanned on same sites, is an issue that raised a controversial reaction among Nomads. From the 184 tenants interviewed 52.9 per cent showed readiness to undertake the task if villages are replanned. However, many among those agreeing qualified their answers by statements such as "if this is the government wish". The remaining 47.1 per cent objected straight to the proposal. They argued that they are poor, and that they are not financially able to spend on housing. They went further, indicating that they have waited for long for the government to build housing for them, same as it did for the Halfawyeens.

Those who agreed to build their houses if settlements are re-planned intend to construct them from same local material prevalent in the area, wood and grass in majority of answers received and dry earth, to a lesser degree. In this connection some respondents doubt the future of the Scheme and link this to the risk of investing in buildings which might prive with time to be an uneconomic undertaking. With the rising costs of buildings (LS 150 for a grass and wood hut, LS 250 for a dry earth room, and LS 700 for a red brick room with corrugated iron roof), the non-durability of dry earth constructions, and the uncertainity of income from crop production under present scheme conditions, grass thatched huts seem to be the most suitable type of building in the present stage of housing development in the Nomad area.

2.6 Service Facilities

Table 14 and Map 2 give a detailed picture of the distribution of the basic services for the 52 Nomads villages in the Scheme. From the Table and the Map it is clear that many of the Nomads villages lack basic facilities; at least 19 of them do not possess any facilities. The ones that are relatively present in most villages are water-supply from filter-stations, dispensaries or dressing-stations, shopping centres, primary schools for boys, and mosques.

Taking the various categories for more consideration the following picture emerges:

(i) Water supply: Out of the 52 Nomads villages, only 6 have water sources in the form of filter stations with the rest depending on river Atbara for their supply, or directly taking their water from canals within or near the village. For those that have filter-stations, most of the existing facilities are not functioning. Nearly all villages complain of the quality of water and the walking distance to the source, especially in those villages where the filter-stations are located 1 - 2 km away. Furthermore, most villages in the northern parts of the Scheme suffer from shortage of drinking water during the peak of the dry season (April to June), when water in the canals falls short of reaching those norhtern parts. Of all villages surveyed, only one has tapped water connected to houses, as compared to the Halfawyeens settlements, where all houses enjoy this privilege.

ANNEX 4
Table 14 contd.

Section	Block	Village	Water Supply: Filter Station	Water Supply: Canal	Water Supply: River Atbara	Primary Schools	Dispensaries & Dressing Stations	Veterinary Dispensaries	Police Posts
1	2	3	4	5	6	7	8	9	1o
	9. El Sabaat El Om	43. Raira El Gedida	O	O		O			
		44. El Arid		O					
		45. El Sabaat	O	O		O	O	O	O
	13. Abu Nagma	46. El Bresi		O					
		47. Arid El Shukriya		O		O	O		
		48. Arab Ugda Tawila "B"		O					
		49. Shagarab		O					
	12. El Butana	5o. Umm Aranib		O		O			
		51. Warshalat		O					
		52. Koraj El Gedida		O		O	O		

(ii) Electricity: None of the Nomads villages is electrified compared to 4 in the Halfawyeen area.

(iii) Primary Schools: Out of the 52 Nomads villages 15 have primary schools operated on the co-education system incorporating boys and girls, with limited numbers from the latter. Most schools show increasing rates of drop-out in the higher classes as illustrated by the following cases studied:

- Umm Rahaw (two-stream school with boarding facilities)

Boys		Girls		
Class	No. of pupils	Class	No. of pupils	Total per class
1st	6o	1st	55	115
2nd	45	2nd	15	6o
3rd	35	3rd	2o	55
4th	3o	4th	3o	6o
5th	22	5th	12	34
6th	29	6th	2o	49
Total:	221		152	373

- Umm Gargour (one-stream, day school)

Boys		Girls		
Class	No. of pupils	Class	No. of pupils	Total per class
1st	48	1st	12	6o
2nd	36	2nd	4	4o
3rd	22	3rd	-	22
4th	2o	4th	2	22
5th	19	5th	2	21
6th	17	6th	3	2o
Total:	162		23	185

Other examples could be drawn as well, however the above two cases are adequate to illustrate the problems faced by primary education in the Nomad area. The first of the two schools has boarding facilities, hence capable of drawing children from a wider area (El Sedeira, Umm Rahaw, Umm Reika, El Sufia, Gaili: in fact, from El Sabaat Rural Council). Though faced by the problem of

drop-outs, yet it is the kind of school recommended by nearly all headmasters questioned; since the latter see that the Nomad tenant is not keen on educating his children. As an inducement boarding facilities in fact attract many of them to bring their children to schools, and hence are regarded by school headmasters as an important factor in encouraging education in the area. If the system of boarding could not be easily extended, headmasters recommend supplying a meal during the school day, essentially required to support those commuting daily for long distances between schools and villages and inducing them to come regularly. Headmasters reason that Nomads are not keen to education because:

- The Nomads society is not yet convinced of the benefits of education. When it comes to taking a decision between continuation of a child at school, or the need for his labour to look after the herd, the latter often wins. It has been emphasized by some respondents that children frequently disappear during a scholastic year to re-appear the next, reporting that they were with livestock in the Butana.
- The inconvenient geographical location of existing schools for some of the remote villages, coupled with the mobility of families to meet the requirements of the herds, entail some children having to walk for long distances to reach school. Due to this, headmasters recommend boarding facilities or a day meal as a solution.
- Tribes of Eastern Sudan origin have more preference for the traditional religious education of "Khalwas" and therefore many of them do not bring their children to schools.
- Considering girls education in particular, first there are no girls schools in the whole area, except for Umm Rahaw and El Gafala, both of which are old centres that existed prior to the rise of the Scheme. Girls enrollment in schools registers an accelerated drop-out when they reach the 5th and 6th classes.
  The reason given is early marriages.

(iv) Health Services: Out of the 52 Nomads villages 13 have dispensaries or dressing-stations, with the rest depending on other villages in proximity for medical treatment. The two most prevalent diseases in the area are malaria and bilharzia. The Nomads tenants complain of the performance of the existing health facilities; being faced by shortages in drugs and personnel, and not equipped with ambulances. Furthermore, the one hospital existing in all of New Halfa Scheme area is located at New Halfa Town, more than 60 kms from the fringe settlements in the northern, north-eastern, and north-western parts of the Scheme. This poses a difficulty for the village population in cases of emergency of when better treatment is sought, more specifically during rainy season, with roads becoming muddy.

(v) Veterinary Services: There are only 3 veterinary dispensaries in the 52 Nomads villages. The service provided by these centres is limited to minor treatments, and Nomads do not rely on them very much, as it has been reported in most villages that for obtaining treatment, drugs, vaccines, and advice, tenants travel to the main service at New Halfa Town. On the other hand, the vaccination teams visiting the Nomad area operate directly from New Halfa Town.

(vi) Shopping facilities: There is a shop or two in every Nomad village selling the main day-to-day necessities. Centres with sizeable shopping activity coupled with a rural marketing service, mainly livestock, are to be found in 12 out of the 52 Nomad villages. Some of these market-centres are planned especially the ones in the eastern area, El Gafala, El Sedeira for example of Shebeik and El Sabaat in the western and central parts of the northern area. Apart from the dependancy of some of the above centres on New Halfa for whole-sale supply of goods, many villages reported reaching directly for their requirements, New Halfa Town, the Sugar State Village, or to a limited degree El Sabaat. However, they complain of high prices, and of transportation costs between villages and the above mentioned centres.

(vii) Police Posts: Of the 52 Nomads villages 5 have police posts. Apart from routine cases that usually arise in any rural community demanding the intervention of the police, the peak time of the activity of this service comes during the period following the harvest of the groundnuts and cotton picking, when encroachment of herds on tenancies increases. As had been found, much of the violation does not occur when the crops are young but after harvest, since tenants during these acute

ANNEX 4
Table 15

Types of Service Facilities requested, and Community Priorities as Judged from the Number of Responses under each Category of Service, for the 25 Villages Surveyed

	Type of Service and Responses received														
	Water Supply	Primary Schools f. Boys	General Secondary Schools f. Boys	Dispensary	Dispensary/ Veterinary	Police Post	Mosque	Electricity	Roads	Consumers' Co-operative	Agricultural Machinery Co-op.	Flour Mill	Planning of Market place	Livestock Market	
	1	2	3	4	5	6	7	8	9	1o	11	12	13	14	
1. Masak	5		1			2				1	1			1	
2. Abu Harira	4	2	2		3										
3. Salama Sarrouba	7	3	1	2			1	1			1				
4. Hayakalla	6	5	1	6							1				
5. El Mazar	4	4		2									1		
6. El Sabaat	5		2				1	4		2	3				
7. El Arid	7	3		5	1		1			1			1		
8. Umm Gargour	6	4	2	4			1						1	1	
9. El Sufia	5	5	6			1			1						
1o. Raira	7	4	2	7		1	1								
11. Umm Rahaw	5	3	2	4											
12. El Sedeira	5	1	1	2	1	1									
13. El Elew	4	2		2	1						1				
14. Rataga	3	3	1	5						2					
15. Shebeik	7	3	5	6							1		1		
16. Gamaloon	5	4	1	6						1					
17. Arid El Shukriya	5	2		3											
18. Giraigis	8	2	2	6								1			
19. El Gafala	1	1	5	4		1		1					1		
2o. Shagarab	8	3		2	1			1		1	3		2		
21. Um Arabik	6	1	2	2	1	1				1	1				
22. Karaj El Gedida	4	2	1	3				1							
23. Khor El Laben	6	2	2	3			1								
24. Arab 26	4	4		5	1							1			
25. Koraj	8	6	4	7			1			1					
Total Responses:	135	69	43	82	9	7	7	8	1	1o	12	2	7	2	= 394
% of overall Responses:	34.3	17.5	1o.9	2o.8	2.3	1.8	1.8	2.o	o.3	2.5	3.o	o.5	1.8	o.5	

Primary education on the other hand falls far short of the requirements of Nomads communities. There are 16 primary schools in the 52 Nomads settlements for a population of about 14o thousands, giving an index of 8,75o inhabitants per school. The latter figure compared to the standard optimum population size (Ministrv of Education) of 2,5oo persons per school shows the wide discrepancy between what is available and that which is required. The shortage is further magnified if the walking distance to schools, which is in many case an impeding factor, and the inadequacy of boarding facilities are taken into consideration. The same shortage is apparent for general secondary education since there is not one single school of this level in all of the Nomad area, which has to depend wholly on New Halfa Town.

Health facilities again reflect shortages. A 13 dispensaries and dressing stations so far exist in the Nomad area giving an index of 1o,769 population per facility. With the prevalence of diseases like malaria and bilharzia, the long commuting distance to facilities, the difficult accessability during rainy season and the accute shortage in rural doctors, auxilary trained medical personnel and drugs, it is realistic that the Nomad tenant requests health facilities as his third priority.

Other than the above top priorities some of the Noamds tenants requested: electricity, veterinary dispensaries, livestock markets, planning of market places, mosques, agricultural machinery co-operatives, consumers' co-operatives, and flour mills. Except for veterinary dispensaries and livestock markets which might emerge as important ingredients of the livestock development programme, the remaining first four services are not held as of urgency to be catered in immediate rehabilitation programmes. As for the latter three (agricultural machinery co-operatives, consumers' co-operatives, and flour mills), these shall be examined in more detail in the coming section on co-operatives.

On investigating the preparedness of the Nomad tenant to contribute to provision of community services through self-help effort, is has been found in almost all villages surveyed that inhabitants have adopted this system in some of the village projects already undertaken. They mentioned mosques, building of new schools, or completion of the 5th and 6th classes (to complete the recent education ladder) in existing schools, dressing-stations, and housing for medical staff, through self-help project.

When asked about their attitude to contributing in future, the majority of respondents gave a positive reaction. However, they remarked that their contribution would very much depend on the kind of projects proposed and on the means available to them.

3. Tenant Attitude Towards Livestock

3.1 The Halfawyeen Area

3.1.1 General

As explained earlier, although the Halfawyeens had few head of animals (mainly goats) in their former land, they cannot be considered as livestock breeders by origin in the same sense as the Nomads communities in the Scheme. However, as remarked, many of the Halfawyeen tenant families have gradually taken up livestock raising, due in part to the new environment they found themselves in, which was completely different in this respect from the land they used to inhabit; and in part to the opportunities they saw in this kind of economy, aided by the availability of pastures and fodder within reach of their settlements.

As reported by many respondents the Halfawyeen tenant during the first years of resettlement attempted livestock raising starting with sheep and goats. But soon he became hesitant because of numerous thefts of his animals, and the illusion he held about the human and natural environment surrounding him. Comparing the past situation with the present where animals are found among most families both as a source of milk but of income, one concludes that the Halfawyeen tenant has adopted livestock raising through a long process of experimentation, which sets the stage for full adoption of this economy by the whole community in future, as present trends show.

3.1.2 Livestock Ownership

The results from the 61 tenants interviewed in the Halfawyeen area as to whether they own livestock are:

affirmative:	49 tenants	8o.3 per cent
negative:	12 tenants	19.7 per cent

As to the types and numbers of animals owned by the 49 tenants, these are given as follows:

Livestock by type	Respondents owning: 1-4	5-9	1o and over	Total tenants owning	% of all tenants surveyed	Total number of livestock
Cattle	18	5	1	24	39.3	111
Sheep	2o	6	2	26	42.6	91
Goats	38	1	2	41	67.2	138
Camels	-	-	-	-	-	-
Donkeys	7	-	-	7	11.5	1o
Poultry	7	5	12	24	39.3	-

The majority of families who reported possessing livestock, explained that they adopted this type of economy after they entered the Scheme. Of the three types of animals possessed, cattle is claimed to be the most profitable animal since it is a ready source of cash through the milk it provides for sale, and its off-springs which could be sold when need arises. There is a ready market for milk in the Halfawyeens villages aided by their proximity to each other and in the boarding houses of the general secondary schools found in some of the villages, as well as in New Halfa Town.

With regard to sheep it is again bred as a source of cash and as a slaughter animal needed in the house for social and religious occasions. However, some respondents speak of sheep as a delicate type of animal often open to less through disease or theft.

In the previous figures, goats are the most numerous among the animals reported, being owned by 41 respondents out of the 61 tenants interviewed. This is true since goats are found in most houses especially those which do not own the previously mentioned two types of livestock, reported as the animal of the housewife. Some of the respondents view goats as delicate animals, being susceptible to disease in the same way as sheep.

Donkeys are owned by a fewer number of tenants making only 11.5 per cent of those questionned. This is explained by the fact that there is not such pressing need for this kind of animal for transportation. Tenancies are close to settlements. Not many of the Halfawyeens tenants do work by their hands or carry produce from the tenancy to the villages since the latter is done by tractor and trailer. Commuting to New Halfa Town is carried out by car transportation.

Other than the above types of animals the Halfawyeens families own poultry, mainly chickens and ducks, both of which are raised for home consumption.

Relating the number of tenants owning livestock to the numbers owned from each category as supplied by survey results presented previously, it could be concluded that the average tenant cattle herd size in the Halfawyeen area is in the range of 4.6 heads for those reporting cattle ownership; dropping to 1.8 head for the whole sample of 61 tenants surveyed. For sheep and goats the figures are respectively 3.5 and 1.5, and 3.4 and 2.3.

Figures that exceed the above ranges, especially in the case of cattle, are reported for some tenants in Halfawyeens Villages: 5, 11, 12, 3, 16, 21, 22, 6, and 13. Investigating the case of Village 21 as an illustrative example it has been found that out of 38 tenants owning cattle, 8 own 1o heads on the average, 15 own 5 on the average, and the other 15 own 1-2 heads.

In Village 21 one tenant exceeds all averages by owning 4o heads of cattle. He is taking up cattle raising on a commercial basis, claiming that it is more rewarding than production from the tenancy, a fact which he only discovered very recently. He revealed that of his 4o heads of cattle, 7 calved this year, and that he sold 3 male beasts for LS 244 (12o + 84 + 4o). His herd still includes 7 males which he has not yet sold. His livestock is tended through a shepherd who gets LS o.75 per head of cattle per month (o.75 x 4o = LS 3o x 12 = LS 36o per annum). The herding of this cattle follows a system similar to that practised by the nomad breeders. From beginning of July up to March the cattle graze on natural pastures to the east of the Scheme up to the Eritrearian border, then gradually back to enter the Scheme by end of March to graze for the rest of the year, which is the critical period, in the vicinity of the village.

While interviewing the above respondent, the herds owned by tenant families of same Village 21 were driven back from pasture into the village. On counting them is was found that the 2oo tenants inhabiting this village own 27o heads of cattle, 4oo sheep, and 6oo goats. Another attempt at average livestock ownership per family from the figures supplied by this village gives 1.4 head for cattle, 3 for goats and 2 for sheep, which are close to the averages worked out previously from the results of the whole sample.

On asking Halfawyeens tenants why they raise animals the total response received for the 81 tenants interviewed amounted to 67, since some tenants supplied more than one answer. Broken by percentages from all answers received the following picture could be supplied:

- because livestock is profitable (supplying milk and cash): 76.1 per cent
- because I am a livestock owner by origin: 9.o per cent
- because there is much land that can be grazed: 4.5 per cent
- because they can be looked after by members of family: 4.5 per cent
- because of other reasons (slaughter on social occasions, does not need much of my labour, return from agriculture not enough, etc.): 5.9 per cent.

3.1.3 Grazing Situation and Problems

The information collected points to two distinct periods of grazing in the Halfawyeens villages, concerning animals directly owned by the Halfawyeens, or herds owned by other populations but affecting the Halfawyeens tenancies. The two periods run as follows: July - January as a season of grazing outside the Scheme (for Nomads, this extends up to March), with the months February - June as a season of grazing inside the Scheme.

During the earlier season the few of the Halfawyeens who acquired large herds of cattle participate in the move to the Butana through entrusting their herds to shepherds. As for the majority of the Halfawyeens tenants who own livestock, the information given by the survey confirms that their herds graze during the same period within the Scheme boundaries in the vicinity of villages. Though during this period (July - January), 2/3 of the tenancies are under groundnuts and cotton which minimize the area under grazing, there is all the time for village animals the fallow part of the tenancy which remains unused up to October when preparations for the wheat crop start; providing thus arable land for grazing. As well, there is the grass growing on the fringes of canals giving additional grazing. Furthermore, they have the 'Amlak' lands available around all villages, being mostly uncropped. The three sources seem to provide adequate grazings for the Halfawyeens herds during the period July - January.

As for the critical period February and on, again the Halfawyeens herds do not suffer from scarcity of grazing as such. However, all tenancies suffer from the encroachment of animals from outside the Halfawyeens villages attracted to the Halfawyeen area by the remains of the cotton crop. Being different from the Nomads in not adopting the system of living in the tenancy during the cotton picking period and afterwards to utilize the residues of the cotton crop for their animals, the Halfawyeens tenancies become open to animals from outside their villages. This is the period reported to witness some degree of scarcity, accounted for in part by the lack of water in the smaller canals which are no longer edged by grass. To make up for the shortage during this period most families reported that they store groundnuts straw following the harvest of this crop to be used as fodder. Others reported that they purchase oil seeds cake to make up for the shortage.

Survey findings substantiate the above picture. Of those questionned on the grazing situation around villages 58.8 per cent of the answers received indicate that no grazing scarcity is experienced. An evaluation of the degree of scarcity as reported by the remaining 41.2 per cent is traced through the following assessments:

- 33.3 per cent estimating that available grazing is short by 25 per cent of herd requirements of the village
- 41.7 per cent estimating that available grazing is short by 25-5o per cent of herd requirements of the village
- 25.o per cent estimating that available grazing is short by over 5o per cent of herd requirements of the village.

To assess whether scarcity in grazing has led to loss of animals during the last two years, though most of the answers received reported loss of animals, yet some respondents attributed that to disease attack rather than shortage of grazing:

47.2 per cent reported loss of animals, giving the following figures:

- cattle: 1o
- sheep: 41
- goats: 53.

It could be concluded from the above presentation that so far the Halfawyeen area does not suffer from grazing scarcity. Their family herds are smaller than those owned by the Nomads. They have the Amlak land that gives grazing areas additional to what is available in the fallow land in the tenancies and to the grass growing on the edges of the canals. The short period of scarcity reported by some tenants is made up for by the fodder stores from the groundnuts crop, and the purchase of oil-seeds cake.

3.1.4 Size of Herd

To start with, the survey investigated the preference of the Halfawyeens tenants as to the type of animal he suggested breeding. Of three animals, cattle is accorded first priority, sheep the second priority, with goats coming third. In fact the selection came in combinations of three animals in the following order:

- cattle/sheep: 33.3 per cent of all answers
- cattle/sheep/goats: 66.7 per cent of all answers.

As to the optimum size of herd that a Halfawyeen tenant can afford breeding, three ranges are given:

Type of animal	First range	% of respondents	Second range	% of respondents	Third range	% of respondents
	1-5		6-1o		Over 1o	
Cattle		63.9		16.7		19.4
Sheep		42.9		17.9		39.8
Goats		37.5		31.2		37.2

It is interesting to observe from the above figures that sizeable percentages of respondents suggest ranges of more than 1o heads of animals.

It could be gathered from the above disposition that the Halfawyeen tenant prefers to breed cattle as his first priority established from the computation of the results of the two combinations cattle/sheep, and cattle/sheep/goats (33.3 + 66.7 = 1oo) However, it should be taken into consideration that he pre-conditions this preference with the ability to own cattle in future since in many of the answers received the tenant makes the comment "If I can afford buying cattle"; otherwise the Halfawyeen tenant will go for sheep and goats.

Why the Halfawyeen tenant is keen on cattle breeding, is revealed in the following reasoning given by the tenant:

- It is claimed to be more profitable through the supply of milk for home consumption and cash earning, and the income it generates through the sale of heads produced.
- Cattle tolerate the environmental conditions of the area, especially the local breeds, not being open to disease hazards as compared to sheep and goats.
- It could be easily managed through the shepherd system where the cattle of many families from the same village could be entrusted to or put under one shepherd on monthly payment of LS o.75 per head.
- Being more controllable than sheep and goats, cattle could graze at long distances from villages making use of natural grazing inside and outside the Scheme.

3.1.5 Regulations and Tenant Attitude

The Halfawyeen tenant, believing strongly that his tenancy is continually open to attacks of livestocks owned by non-Halfawyeen elements who often intentionally drive their herds into his crops, and that as a tenant he comes from a peaceful society unprepared to attack back, is very much in favour of regulations that limit the numbers of livestock in the Scheme, and organize its movement. The majority of those interviewed emphasized that their tenancies were encroached upon by animals during the 1978/79 production season: 67.2 per cent of all respondents interviewed. For the remaining 22.8 per cent reasons given that tenancies were not attacked are: tenancy being close to village so more closely supervised, or tenancy in the middle of the Block, so not easily reached. As for the time during which tenancies are open to severe damages, the answers received point to the late period of cotton-picking. Many even claim that they never saw the produce of the fourth picking. Of the three crops it is reported that the ones that are highly susceptible to animal damage are cotton and wheat. Groundnuts is exceptionally the least mentioned to suffer from livestock encroachment.

Animals that cause damage are reported to be mainly cattle, being of limited walking distance, and at a time natural grazing and water sources outside the Scheme are depleted. Of all answers received those reporting cattle as the main animal causing damage make 46 per cent followed by sheep 24 per cent, camels 2o per cent and goats 1o per cent. Respondents identified the owners of these animals as being composed of three categories of population:

- livestock owning Nomad tenants from inside Scheme: Hadandwa, Beni Ameir, Shukriya, Lahawyeen, Zabaidiya, Fur, Zaghawa: 43.9 per cent

- livestock owning tribes from outside Scheme: Tribes of Eastern origin of Butana origin, and from river Atbara areas: 42.4 per cent

- livestock owning Halfawyeens tenants: 13.7 per cent.

Two main problems have been reported as resulting from encroachment of livestock on tenancies; namely, damage of crops and loss of produce; and personal assault which might lead to blood-shed and sometimes loss of life. To the above should be added the extra costs incurred to maintain the policing activity to guard tenancies and suppress conflicts.

Estimates given by tenant respondents in terms of cash values for crop damage caused by animals seem to show exaggeration; as the results from 37 cases reflect:

Ranges in LS	1-5o	51-1oo	1o1-2oo	2oo +	Total
Cases reporting damage in value of above range	7	7	4	8	26
Total value for cases	291	612	7oo	5,341	6,944

The last two figures give a reported average value of damage per tenant of LS 26o. As stated this average seems to be overestimated. However, the fact remains that crops are destroyed by animals year after year, more particularly in those years when animals owned by nomadic populations from outside the Scheme are forced to enter the Scheme because of scarcity of grazing and inflicting the highest loss on the cotton and the wheat crops.

Under the above conditions the Halfawyeen tenant is found to be most enthusiastic for ensuring that regulations for control of numbers of animals in the Scheme are devised and applied. In reaction to the following five proposals for regulation of livestock in the Scheme, as put in the questionnaire to the Halfawyeen tenant, the answers received by percentage of tenants supporting each are as follows:

- prohibit livestock from outside Scheme to graze inside Scheme: 44.3 per cent
- limit size to be bred by each tenant: 32.9 per cent
- take away tenancies from those who do not abide to regulations: 12.9 per cent
- specify areas for grazing inside Scheme if necessary: 7.2 per cent
- stop breeding completely inside Scheme: 2.7 per cent.

The first two proposals are the ones principally endorsed by the Halfawyeens. It could be gathered from these two answers that the animals presently owned and managed by the Halfawyeens are within the carrying capacity of the available grazing in the surrounding of villages. With the Amlak land at their disposal the present capacity could even absorb more. Actually these two answers indicate that the Halfawyeens are sure that their animals are not in excess of the available grazing, and that they do not take animals outside the vicinity of their villages to fear applying these regulations. In fact they are supporting these rules to guarantee banning the herds of foreign elements from entering their villages and tenancies lands.

3.2 The Nomad Area

3.2.1 General

Nomads tenants are livestock raisers by origin since they were drawn from the nomadic tribes that were the traditional beneficiaries from the Scheme area prior to the development of the latter under irrigated agriculture. In moving to the Scheme area they pursued two systems of agricultural production that, based on the tenancy; where cotton, groundnuts and wheat are raised under the Scheme management, and that based on livestock raising which is wholly managed by the tenant.

To keep the last type of economy running the Nomad tenant devised a grazing system that integrates natural pastures outside Scheme with the available grazing inside Scheme. Accordingly he has two herds (at least formally) one grazing inside Scheme comprising those animals allowed by Scheme Authorities, and the other outside Scheme for most of the year made of herds in excess to numbers permitted. It follows that he has a distinct system of division of labour, with most of the family permanently residing in villages inside the Scheme looking after the tenancy affairs and the herd allowed to graze internally; and with some of the male young members or hired shepherds taking the extra animals to natural pastures off the Scheme.

To the Nomad tenant the agricultural villages inside Scheme with the drinking water available in them, provide the permanent centres from which the emergent two production systems after resettlement operate. This dual feature of the economy with the lack of strict control of livestock numbers is behind the hazardous situation from which the New Halfa Scheme suffers at present, created by the fact that the tenant in the Nomad area is more absorbed in his livestock pursuits than in crop production.

The data on family involvement in farm operations presented in Chapter 1 of this study reveals the low contribution of the tenant an his family in crop production. The study on income elucidates this further; with livestock adding substantially to the earnings of the family as compared to agriculture. In what follows the many facets of livestock raising in the Nomad area will be dealth with emphasis on the attitude of the tenant towards breeding aspects at present and in future.

3.2.2 Livestock Ownership

Out of a total of 184 Nomads tenants surveyed in 25 villages, 173 respondents (94 per cent) reported owning animals (against 8o.3 per cent in the Halfawyeen sample). The remaining 6 per cent claimed that as poor families they either had no livestock or had lost what they previously owned due to various reasons. This high percentage of livestock ownership proves the previously constructed picture about Nomad tenant communities: that being livestock raisers by origin, they are still dominated by their cultural heritage, with animals assuming a leading role in the economy they pursue at present in the Scheme.

As for the time being they acquired animals, the overwhelming majority (94.7 per cent) stated that they owned animals prior to their resettlement in the Scheme. The contrast between the current deteriorating situation of agricultural production in the Scheme with resultant low farmer income, and the tenants' pre-Scheme reliance on livestock raising and dura cultivation generated an interesting discussion which deserves highlighting. Many tenants remarked that since their coming to the Scheme, they lost more of their animals either because they sold them completely to concentrate wholly on the tenancy, or because of neglect, not having adequate time to care for both the herd and the tenancy. Others denounce the idea of the Scheme altogether, as having occasioned the continuous sale of their animals to meet the expenses of agricultural production without any profits generated. Some claim that after losing hope in agriculture because of repeated failures they started re-building herds. Many in these categories even dream of the old days before the coming of the Scheme when they had large numbers of animals, ample dury supply, and an easy life not characterized by the many uncertainties of the present.

Numbers and types of animals owned by the 184 samples studies are detailed in Table 16.

As established in the classic studies of Nomad, the latter sharply understate the true figures of their herds for fear of taxation. A number of studies carried out in this country suggest an increase in the figures supplied by Nomads by up to five times. In the case of New Halfa Nomad tenants, the understatement of the situation may be aggravated by fear of being revealed to the Scheme Authorities as a livestock breeder. Hence the above figures should be taken as minimum estimates concealing the true picture.

ANNEX 4
Table 16

The Nomad Area: Number and Types of Animals Owned by the Population Studied

Livestock by type	Respondents owning					Total tenants owning	% of all tenants	Total numbers of livestock
	1-4	5-9	1o-49	5o-1oo	over 1oo			
Cattle	62	4o	16	1	-	119	64.5	1,197
Sheep	-	42	51	3	2	98	53.3	2,38o
Goat	69	34	36	1	-	14o	76.1	3,oo7
Camel	3o	1	6	-	-	37	2o.1	196
Donkey	1o3	-	-	-	-	1o3	56.o	342
Poultry	1o	8	1	-	-	19	1o.3	3o8

Period	% Respondents reporting grazing inside Scheme	% Respondents reporting grazing outside Scheme
Rainy season (July - Oct.)	63.1	36.9
Cool period (Nov. - Jan.)	68.4	31.6
Hot period (Feb. - June)	86.2	13.8

As to which of the above periods witnesses scarcity of grazing, and puts great pressure on the available fodder inside the Scheme, the answers received from respondents point to the hot and cool periods reported by 85 per cent and 1o.6 per cent respectively. Hence 95.6 per cent of all respondents emphasize that outside rainy season, fodder is not adequately available for livestock. Even during rainy season, the remaining 4.4 per cent of our respondents explain that the first rains rot the grass from last year on the edges of canals. Until new grasses sprout, they face scarcity of grazing during July.

The Nomad tenants refers the tightening situation of grazing with the progress of the dry months to the following:

- the large sizes of livestock progressively entering the Scheme
- the exhaustion of natural pastures outside the Scheme and the depletion of water sources formed after the rains, including hafirs
- the exhaustion of crop remains
- the removal and burning of cotton trees
- the decrease in amounts of irrigation water in canals
- the effect of early rains damaging the dry grass from last year
- the preparations for the new cotton crop which demand of the tenants to keep their herds out of tenancies, at a time another third part of the tenancy is under groundnuts.

When taking the question down to village level, Nomad tenants tend to give a better picture than at Scheme level, which might be due to their fear of implying that they own large herds of livestock. However, the general picture established for the whole Scheme applies to villages as well, since 57.6 per cent affirmed that their villages face scarcity of grazing during dry season. Apart from the declining condition of grazing with the advancement of the dry months, about 37.5 per cent refer the critical situation to the excess of animals over carrying capacities of villages, giving estimates in the following ranges:

- 1o.2 per cent estimating that available grazing is short by 25 per cent of herd requirements of the village.
- 36.2 per cent estimating that available grazing is short by 25 - 5o per cent of herd requirements of the village.
- 53.6 per cent estimating that available grazing is short by over 5o per cent of herd requirements of the village.

Regarding animals lost during the last two years, 6o per cent of the respondents confirmed losing animals, however, same as in Halfawyeens case, they referred the cause to diseases rather than to scarcity of grazing. The 184 samples surveyed reported losing 1o7 heads of cattle, 154 camels, 928 sheep, 437 goats and 7 donkeys.

How do the Nomads tenants go about scarcity of grazing, is one of the questions investigated in the survey. The solutions already adopted include:

- sending part of the herd to grazing lands outside the Scheme during rainy season
- supplementing the available grazing by purchased dura from the market.

Among the latter, the ones mentioned are:

- Dura, which is either taken from the amounts stored by the tenant for his family, or directly purchased from the market.
- Cotton seeds, which are bought from merchants in New Halfa Town. However, tenants complain that they grow cotton and do not receive their shares in the cotton seeds. Furthermore, why do they go through the process of obtaining the seeds for LS 7.5 to the sack, while merchants purchase it from NHAPC at the rate of LS 5 per sack.
- Dura straw, which is usually stored from tenants own production in case of eastern villages, and those tenants who cultivate in the Butana plain. However, for many they depend on amounts purchased from outside the Scheme, and transported to villages by lorries.
- Groundnuts residues, which are stored from the produce of the last season.

3.2.5 Regulations and Tenant Attitudes

As reviewed in the Halfawyeens case, problems arising from the presence of livestock inside the Scheme and within short distance to tenancies, shall be examined first as a background against which the need for regulations could be viewed; and the attitude of the tenant towards control measures could be as well evaluated. Attention should be drawn to the fact that many of the Nomads tenants interviewed give calculated replies to this issue, being aware of its implications on their dual role as tenants and livestock breeders at the same time. This has to be taken into consideration for a better understanding of how the Nomads tenants cautiously react to the whole issue, and in judging their attitude towards regulations.

Strange enough and compared to the Halfawyeen area, only 41 Nomads tenants (22.3 per cent of all respondents) admitted that their tenancies experienced livestock encroachment during the last year. Contrary to what is normally conceived of the Nomad area; as that part of the Scheme where agricultural production suffers seriously from livestock encroachment, the situation revealed by the above answers must have its reasons. First of these to remark is the deliberate intention of the Nomads to conceal part of the truth. Tenants might be aware enough of the adverse implications of respondents that admit the occurrence of livestock encroachment on large scale. On equal grounds, there might be some truth in the evaluation passed by those interviewed in rating animal encroachment very low, attributed to two factors:

- the physical presence of the tenant and his family in the tenancy as from the beginning of the picking season
- the keen interest of the tenant in preserving the left-over from the cotton crop as a vital source of fodder for his animals, which he cannot sacrifice for livestock owned by others, during a critical period of grazing.

Animals reported to cause crop destruction by order of importance are cattle: mentioned by 63.9 per cent of respondents reacting positively to the question, sheep: 16.4 per cent, camels: 13.1 per cent, and goats: 6.6 per cent. Except for camels and goats they come in the same order identified by the Halfawyeens. Cattle damage ranks high because it cannot easily fetch alternative grazing away from tenancies during the peak of scarcity.

The above animals are claimed to belong to the following populations given according to the weight of respondents reporting each group:

- Livestock owning Nomads tenants from inside Scheme: Hadandwa, Beni Ameir, Lahawyeen, Shukriya, and Zabaidiya.
- Livestock owning tribes from outside Scheme: Hadandwa, Beni Ameir, Lahawyeen, Shukriya, Zubaidiya, etc.
- Livestock owning Halfawyeens tenants.

The above rating is exactly the same as the one conveyed by the Halfawyeens. As for the problems arising from livestock encroachment these could be summarized as follows:

- damage of crops reported by 45.7 per cent of respondents
- disputes, personal assaults, court attendance and fines, reported by 3o.1 per cent of respondents
- others (like guarding tenancies at night) reported by 24.1 per cent of respondents.

Estimations of money value of crops destroyed by livestock per average tenant are given in the range of LS 48.7, in every cropping year. Compared to the figure furnished by the Halfawyeens LS 26o the former looks very low which could be attributed to one of three reasons. That the Nomad tenant deliberately disguises the true conditions, that the area cultivated per tenant in the Nomad part of the Scheme is smaller, or that the tenant there keeps a close watch on his tenancy; motivated in that by his interest to secure maximum benefits from cotton residues for his herd.

The reaction of the Nomad tenant, to the five proposed regulations that came in the questionnaire, is very much shaped by those conditions governing his situation in the Scheme, as a livestock breeder by culture, who still depends on the herd for part of his income, and to whom the Scheme provides an indespensable grazing and watering ground. The following computed summaries of his attitude towards regulations, reflect clearly that he is keen on continuity of breeding of livestock in the Scheme, and on limiting the sizes of other's herds; but not equally supporting the prohibition of livestock owned by populations from outside the Scheme to enter for grazing, compared to the Halfawyeens.

- limit size to be bred by each tenant: 56.2 per cent
- prohibit livestock from outside the Scheme to graze inside the Scheme: 21.7 per cent
- take away tenancies from those who do not abide to regulations: 11.6 per cent
- specify areas for grazing inside the Scheme if necessary: 8.9 per cent
- stop breeding completely inside the Scheme: 1.6 per cent.

His reluctance in not supporting prohibition of livestock from outside the Scheme, is mainly due to the fact that, many of the Nomads tenants actually own a sizeable number of the livestock entering the Scheme in March every year for seasonal grazing. Though not all Nomads tenants have surplus livestock outside the Scheme, yet since their communities are strongly connected by kinship and social obligations, mutual relations are the rule governing the interests of the different members within the same group: those who do not own animals are entrusted with some heads to look after and utilize their milk, during the period when livestock enters the Scheme to graze in the cotton tenancies. Hence, for both the rich and the poor, prohibition of livestock from outside the Scheme to enter during late dry season shall undermine vested interests of most tenants.

3.2.6 Introduction of Areas under Fodder

The Nomad tenant being a livestock breeder by origin, still giving importance to his animals as a means of living and a source of cash, reacted more positively to the proposition of putting part of the tenancy under fodder. Out of the 184 tenants interviewed 117 supported the proposal, making 63.6 per cent as compared to 54.6 per cent among the Halfawyeens. In almost all villages surveyed the majority of tenants warmly welcomed the idea of growing fodder in the tenancy. Many suggested that fodder should be introduced instead of wheat, while some proposed it to substitute cotton.

As for the 36.4 per cent rejecting the idea of introduction of fodder crops in the tenancy, those fall into two categories. The first is comprised of poor tenants in terms of livestock, who do not see means to acquire livestock and hence sceptical of losing part of their tenancies to others, if they accept the proposal. The second group consists of those who believe that the remains of groundnuts and cotton are adequate for meeting the fodder requirements of the few animals they have during the period grazing is scarce in the Scheme. Many among these two categories favour putting part of the tenancy under dura instead of fodder, since the former can serve both purposes.

The area proposed for fodder growing varies from one tenant to the other, however the majority has given a figure that ranges from one fourth to one third of the tenancy as revealed by the following percentages:

	% Respondents
- all of the tenancy	2 per cent
- half of the tenancy	6 per cent
- one third of the tenancy	27 per cent
- one fourth of the tenancy	65 per cent.

3.2.7 Payment for Grazing within Tenancy

Similar to the Halfawyeen mentality the Nomads were reluctant at the beginning to pay for fodder grown in the tenancy. They want to grow it, but not to pay any rates for that. They speak of their poverty and their debts due to the failure of the cotton crop. After being explained to them that the fodder grown shall wholly go to their animals, and that they have to pay to secure this supply of fodder, the majority of them, 85.8 per cent agreed to the idea of paying rates for growing fodder.

The remaining 14.2 per cent opposing to pay raised the following arguments:

- unable to pay because they are poor
- do not trust the Corporation because of cotton experience
- bring new complications same as the ones of the cotton joint account
- rates might be high so no profits raised at the end.

As to whether tenants would agree to limit the size of their herds to match the area put under fodder in the tenancy once that is secured for every family, 82.3 per cent of all answers received confirm that the size of the herd will be limited. Those opposing seem to be the rich owning families who give reasons such as:

- livestock is profitable, it generates cash, offers security to the family, and helps in financing the tenancy
- not to limit livestock numbers but punish offenders
- do not like to be instructed.

3.2.8 Reaction to Milk and Fattening Project Proposal

This issue was put finally to respondents, to judge their attitude towards the introduction of enterprises of this nature in the Scheme. The majority of tenants 80.5 per cent received the idea warmly, with many of them emphasizing that this is what they are really looking for. The few who reacted negatively argued that the Project might turn to be:

- not profitable and open to losses
- difficult to run, with animals destroying crops
- they prefer rates system instead of a joint venture with the government.

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- not profitable and open to losses
- difficult to run, with animals destroying crops
- they prefer rates system instead of a joint venture with the government.

4.2.2 Social Services

The list of priorities given by tenant in the Nomad area indicates of their deficiencies and ambitions. These are: clean water supply piped to the village, health facilities, more schools, police-posts, planned market areas, farm machinery co-operatives, consumers' co-operatives; and flour mill co-operatives.

The management of NHAPC accepted their shortcomings in the fields of production and social development, but noted that because of this, those of the tenant are disguised. Assuming that the planned inputs for New Halfa Scheme cater technically for the shortages in agricultural production and social services, the shortcomings of the tenant remain to be considered. The findings from the five areas covered in this report point to the following under each area.

4.2.3 Population Characteristics, Demographic Trends, Migrant Labour Situation, Income and Expenditure

- The tenant is aging in the Halfawyeen area, with some absent from the Scheme. In the Nomad area the tenants' time is divided between agriculture and livestock raising.
- The tenants involvement in agricultural production is limited to the supervision of the tenancy.
- The family labour contribution is not effective in production as females contribute very little in the two areas. Childrens' priority in the Halfawyeen area is for education, and in the Nomad area for herding livestock.
- The tenant is depending more and more on migrant labour whether on direct recruitment, or share-cropping or tenancy rental basis, at a time when the costs of labour are escalating, and the tenants' supply of labour of subject to competition from elsewhere.
- The status of migrant labour is unrecognized, being socially and culturally viewed as alien elements of the population. Their duration of stay in the Scheme is apt to change, depending on economic and social prosperity.
- Tenancy size at present is beyond the working capabilities of the tenant and his family.
- Income from agricultural production from the tenancy is the lowest of all sources of revenue received by the tenant in both the Halfawyeen and the Nomad areas.

4.2.4 Needs of Nomad Settlements

- Tenants are reluctant to change the sites of their settlements in order to be close to their tenancies, particularly in the case of the eastern villages along river Atbara.
- There is a wide cultural gap between the Halfawyeens elements and the Nomads, widened still further by the planned settlements provided to the Halfawyeens. The Nomads wish to be given equal treatment and status.
- The Nomads' background and their livestock heritage have given their settlements a dispersed form. The preference of most tenants, at this stage of development is for the continuity of the present pattern of settlement layout.
- The needs of Nomad settlements are limited, at present, to basic services namely: water supply, health facilities, schools, police-posts, and planned market places.

4.2.5 Tenant Attitude Towards Livestock

- While the Nomads entered the Scheme with an established cultural heritage of livestock production, the Halfawyeens have gradually taken up this enterprise, discovering that it is more remunerative than agriculture.
- The Halfawyeen tenant approves of livestock raising in his own villages, but views livestock owned by the Nomads as a threat to his own existence.
- The Nomads tenants keep more livestock than permitted inside the Scheme. To him the Scheme is an important grazing ground during the critical grazing periods; this results in the overstocking of the Scheme during late dry season.
- Nomads, since livestock constitutes the main source of their livelihood, view with contempt the fact that its role is not recognized by the Corporation.

4.2.6 Co-operative Movement

- There is a big gap separating the Halfawyeen and the Nomad areas in relation to co-operative development, due to historical factors that accompanied the progress of the two populations.

welcomed the proposal to enter with the NHAPC in a joint project for livestock in the Scheme area. This proposal should be adopted as a strategy of development to complement crop production with livestock. Its implementation should be carefully approached as a pilot experiment, spread between the Halfawyeen and the Nomad area. For geographical reasons, and based on livestock potential, Villages 21, 4 and 8 are suggested as trial centres for the introduction of livestock, together with villages Umm Aranib, El Bresi, Rataga East, El Sabaat, El Sufia, Umm Gargour, and El Sedeira in the Nomad area.

- Despite some of the shortcomings of the co-operative movement in the Halfawyeen area, its overall performance is satisfactory. It is in a position to receive new inputs of farm-machinery and utilize them efficiently. The situation is the reverse in the Nomad area, where the infrastructure of farm-machinery co-operatives is lacking. With all the drawbacks that hamper co-operation in the Nomad area, the progress of the movement very much depends on the initiation of social action programmes. The latter should be geared towards the enlightment of the tenant in co-operatives benefits, the training of co-operative leadership and the skilled manpower required, and the provision of adequate credit and subsidies to support whatever investment the tenant makes available. Unless these steps are taken the present gap between the Halfawyeens and the Nomads will widen further. Guided by the above strategy, farm-machinery co-operatives supported by the NHAPC should be initiated in the following Nomads villages: Umm Aranib, El Bresi, Gamaloon, Rataga East, Abu Harira, El Sabaat, El Sufia, Umm Gargour, El Sedeira, and El Gafala, chosen on the basis of location and potential for development.

- Finally, to enhance the role of the Tenants Union, its effectiveness at grassroots level should be strengthened. This entails initiating a training programme for committees at village, block and section levels, plus the building of the two Union sub-centres at El Sabaat and Debaira.

The issue at hand is to what degree should the tenant contribute to his own economic and social prosperity, through aligning his own interests with those of the Corporation, and ultimately those of the Nation. The attainment of this goal is definitely linked to the provision of many inputs: technological as well as socio-economic ones. The point to be highlighted is that the technological inputs when catered for, as required, are not a guarantee of success unless positively received by the tenant, and adequately supported by the latters' own exertion and organizational capabilities.

This last aspect leads us to the area of social action, so as to marry the technical inputs with the socio-cultural forces that will tap the tenants' potentials for improved production and better social life. Social action implies opening a dialogue with the tenant at grassroots level through effective models of participation. Fortunately these models exist as institutions of which the tenant is well aware i.e. the co-operative movement and the Tenants Union. It remains that future programmes of development in New Halfa Scheme should devote substantial efforts to increase the viability of those two institutions.

Social Survey Methods

The Social Investigation methods adopted in this survey include the following:

- the questionnaire
- the guided interview method (at the level of the individual and the group)
- general meetings and discussions
- participant observation.

Besides the above methods of investigation, other required data have been collected through consultation with the staff of the formal bodies and institutions at all geographical levels, such as the NHAPC, the Co-operative Department, the Co-operative Union, the Tenants Union, etc. A third source of information utilized is the office files in all these institutions wherever considered necessary.
To elaborate more on the methods applied we review first the areas covered in the survey. These are:

1. Demographic characteristics and future trends, including sections on Migrant Labour, and income and expenditure.
2. Needs of Human Settlements.
3. Tenants' attitude towards livestock.
4. Co-operative movement.
5. Tenants Unions.

A combination of the previously mentioned survey methods was thought essential to cover each of the above topics, and to meet the spefific data collection requirements, so as to tackle the topic satisfactorily.

For the collection of primary data on demography, needs of human settlements, tenants' attitude towards livestock, migrant labour and the Tenants Union, the questionnaire method was applied effectively for a full coverage at the Scheme level. Coupled with the questionnaire, group interviews were conducted, plus general meetings, so as to fill any gaps in the data collected; i.e. with informal gatherings of tenants, section and block staff, co-operative committees, Tenants Union grassroots committees, etc.

The guided interview method at the level of the individual was used intensively in one field of study, that of: income and expenditure, since the questionnaire method has been found from previous experience elsewhere, to yield less reliable information.

Questionnaire and Guided Interview Design

Based on the knowledge of the team leader of the Study Area, who also conducted Phase I of the Sociological Study, questionnaires were designed to cover the various topics listed previously. Similarly topics to be researched through the guided interview methods were outlined and detailed.

Six graduates in the following fields were involved in the data collection process for a field survey period of one month:

- one rural Social Development Expert
- two Geographers .
- one Statistician
- one Sociologist
- one Agricultural Economist.

Sampling Technique

The Scheme Area is inhabited by two main population groups, namely: the Halfawyeens and the Nomads. Each of the two groups has specific characteristics that make of it an identifiable category both culturally and geographically. Again they are different in terms of population weight. To achieve an appropriate sampling technique, proportionally stratified random sampling was adopted.

Firstly the totality was divided proportionally according to the weight of the population in the two areas, taking into consideration the homogeneity of the Halfawyeens, and that Phase I of the Sociological Study had concentrated more on their area. Hence, an approximate ratio of 1 : 4 (Halfawyeens/Nomads respectively) was applied in the distribution of the sample. Thus 6 Halfawyeens villages were surveyed, as against 25 Nomads villages for the demographic coverage, needs of Nomads settlement, tenants attitude towards livestock, and co-operative movement. Furthermore, in the case of the latter the general questionnaire was supported by data collected through interviewing co-operatives committees, selected in the ratio of 7 farm-machinery co-operative societies out of 22 in the Halfawyeen area, and 6 co-operative societies out of 19 in the Nomad area. For the Tenants Union survey 4 villages were selected in the Halfawyeen area against 8 in the Nomad area.

The sample distribution between the two areas also took into consideration the geographical location of villages, where the latter were sampled into localities, from which the appropriate numbers were picked.

THE DEMOCRATIC REPUBLIC OF THE SUDAN

MINISTRY OF NATIONAL PLANNING

(Project Preparation Unit)

NEW HALFA IRRIGATION PROJECT

REHABILITATION STUDIES

PHASE II

Support Measures

ANNEX 5

Farmers Union Survey

August 1980

AGRAR- UND HYDROTECHNIK GMBH

ESSEN - W. GERMANY

S U D A N

New Halfa Irrigation Rehabilitation Project

Phase II

Support Measures

Farmers Union Survey

SUMMARY

Historically the Tenants Union has passed through two stages of development. It initially had its start as a purely Halfawyeen institution, known as the "Village Committees" to cater for the rights of the Halfawyeens during the resettlement phases. In 1968 the second stage in its development commenced, with the Tenants Union established, representing both the Halfawyeens and the Nomads.

According to its constitution the Union should serve the interest of the tenant inside and outside the Scheme, in the two areas of agricultural production and social prosperity. Of the two, the Union has comparatively achieved more success in the area of agricultural production.

The membership of the Union is mandatory, hence every tenant is a member of the Union.

Structurally the Union has a well-developed hierarchy of bodies and committees ranging from the grassroots upwards: the Village Committees, the Block Committees, the Section Committees, the General Assembly, the Central Committee, and the Executive Office. All of these bodies are elected once every four years.

The Executive Office of the Union is accountable to the General Assembly and the Central Committee on a four-year basis. At the end of each period the performance of the previous Executive Office is reviewed by the General Assembly; the new Central Committee and Executive Office are elected, and the budget for the coming period is passed.

The Executive Office runs its activities through a specialized secretariat, plus ad hoc groups formed whenever necessary.

Judged from its past performance, the Union is more effective on issues tackled at the Executive Office and the Central Committee levels i.e. production relations, representation in the Directing Board, utilization of the Tenants Reserve Fund,

managerial aspects, contribution to national issues, etc., taken up by its Executive Office and Central Committee with the NHAPC, the Ministry of Agriculture, Food and Natural Resources, and with the Provincial Authorities.

The financial resources of the Union are made up of the subscriptions deducted from the tenant, the fixed rate on sales of groundnuts, and the subsidy received from the social services fund established by the NHAPC. Subscriptions are collected at a fixed rate of LS 1.20 per tenant paid in the past from the cotton revenue. With the latter not regularly received by the tenant during the last four years, subscriptions are deducted at present by the Corporation from the cotton loans to the tenant and handed over to the Union.

The last four-year budget of the Union was in the order of LS 71,000. Actual expenditure over the period 1975-1978 was in the order of LS 57,000. Judged from the items of expenditure, most of this sum was spent on running Union activities at New Halfa level, with very limited funds spent at the tenants' level.

The Union has limited physical assets comprised of its premises at New Halfa Town plus three landrovers used for transportation.

The Union has not undertaken so far big investment projects. However, and being motivated by the achievements of the Co-operative Union, it has taken steps to enter into a partnership with an Italian firm to establish a textile factory, tapping the Tenants Reserve Fund to achieve this.

Except for the agricultural operations that occasionally bring committee members at village, block and section levels together with the NHAPC staff operating at the same levels, the Union has no other activities directly concerned with the tenant. As such the tenant has expressed his dissatisfaction with the present performance of the Union.

The tenant considers that the Union would be more effective if it undertook other roles in the area of agricultural production, and social development; listing many fields to which the Union might contribute.

Finally and to enhance the performance of the Union at grassroots level, it is recommended that two branch-offices of the Union be established: one at El Sabaat and the other at Debaira to bring the Union leadership close to the tenant. It is also suggested that the perception of the tenant of the role of the Union has to be improved through training programmes for the Union Committees at village, block, and section levels.

For specific proposals, see Annex 7, Chapter 4.2.6.6. No Project costs would be associated with these proposals which would be self-financed.

1. Historical Background

1.1 Initiation

Tracing back the historical development of the Tenants Union, the initial idea of forming an institution to guard the interests of the tenants came with the proposal to resettle the Halfawyeens in New Halfa Area. With the decision taken to move the Halfawyeens from Old Halfa Area to a planned resettlement Scheme the affected population found itself faced with many issues to resolve, most important among which was the participation in the decision to select the new site for resettlement out of many proposals put before them; besides of course all the complications accompanying the resettlement process itself.

The need for community action to face up to the above issues instigated the Halfawyeens to form in the early 1960's a Resettlement Committee as a representative body of the resettlers looking after their affairs and defending their rights before the Government and the Resettlement Authorities. The Committee participated in the selection of the resettlement site on behalf of the Halfawyeens, discussed the issues arising from the compensation given on property at that time, and voiced the opinion and the interests of the tenant in all of the questions associated with the resettlement process.

With the resettlers moving into New Halfa the roles served by the same Committee changed. Coming to an environment completely new to them, the general atmosphere at that time was characterized by many uncertainities, to which the Halfawyeens reacted with more solidarity that fostered the role of their representative body. The latter found itself preoccupied with continually emerging problems of: building the confidence of the resettlers that the new situation will work, the accomodation of the new-comers in the built settlements, the distribution of tenancies, the operation of services facilities, and all that related to the acceptance of living in the new environment and coping with its problems.

In reaction to the above problems, and on entering the New Halfa Area the Resettlement Committee was reorganized and named as the Villages Committee. Tenants in each of the new settlements selected from among themselves 3 persons to represent their village. New Halfa Town was represented as well, but by 6 members instead of 3. The final result of this procedure was the "Villages Committees" assembly of 81 members representing the Halfawyeen settlers. This general assembly elected a representative body of 15 members as its Executive Committee.

1.2 Transitional Development

The Villages Committees continued representing the Halfawyeens and their interest up to early 1966. By this time the phase of settlement of populations of nomadic origin had started. This generated new conditions that entailed reconsideration of the question of tenants representation. The Halfawyeen Villages Committees by virtue of their formation and role, represented the Halfawyeen faction of the population only, with no representation for the Nomads. Furthermore the Villages Committees as a representing body had no legal status since they were not registered as a formal institution; and being so, were not recognized by the government as standing for a Farmers' Union.

In a meeting with the Minister of Agriculture, at that time, the question of establishing a Tenants Union was discussed, and the conclusion reached was to form a preparatory Committee representing the Halfawyeens and the Nomads, to undertake the necessary steps that lead to the emergence of the Union. Among the latter were the working out of a constitution, the preparations for the general elections that shall bring a permanent committee, and the registration of the Union.

To draft the constitution, the preparatory committee approached some of the established trade unions at that time i.e. The Gezira and Managil Farmers' Union, Sudan Workers' Union, Bank of Sudan Workers' Union, etc.; for consultation and to benefit from their experiences. In 1968 the temporary Committee succeeded in registering the Union, and in 1969 elections were held, and the New Halfa Tenants Union became a reality.

1.3 Geographical Spread and Membership Size

During the first phases of the Halfawyeen resettlement the membership of the Villages Committees was geographically limited to the 25 Halfawyeens Villages. Their membership at that time was estimated to be 6,000 members.

Membership began to expand during the preparatory stage that preceded the registration of the Union, following the successive resettlement phases of the Nomad population; incorporating the 15 Nomad Villages settled first, and later the other villages that followed. With the registration of the Union and the recognition of its status, its membership reached the maximum i.e. 22 thousand tenants, covering all the Scheme Area; and from 1969 to the present this has remained fixed.

1.4 Past Activities

As stated previously the Villages Committees arose to look after the tenants' interest and to present his problems before the Government and the management. The temporary Committee, besides the roles assigned to it as mentioned earlier, became involved with the Scheme authorities in solving the urgent issues related to agricultural production, resettlement and the general welfare of the tenant.

The period of the Villages Committees and the temporary Committee could be considered as a transitional one, that preceded the rise of the Union. The main achievement of this period could be briefly summarized as follows:

In the area of production relations, one of the major achievement was the approval by the authorities to give the tenant free water for wheat irrigation. The initial plan was to charge water rates on wheat. The tenants opposed the rates and their representatives succeeded in suppressing the rates proposition, securing thus for the tenants the right to free watering.

The Villages Committees struggled for the establishment of ginning factories within the New Halfa Scheme Area. In the earlier stages of the Scheme the cotton produced there was taken for ginning at the ginneries at Hasaheisa and Wad El Huri. The struggle of the Villages Committees materialized in the rise of the ginneries presently functioning at New Halfa Town.

Another field in which the Villages Committees showed activities is that of wheat marketing and processing. The Committees organized and supervised the marketing of wheat, and the idea of the co-operative union flour-mill had its roots during that period.

The Villages Committees contributed also to the advancement of the co-operative movement substantially, through encouragement and enlightment. Meetings were held to stimulate tenants and motivate them to form co-operatives.

The activities of the Villages Committees also extended to the field of education. As a result of their negotiations with the Government, a general secondary school, and a high secondary school were opened at New Halfa Town.

One of the major achievements of the temporary Committee was in the area of the Scheme management, where they succeeded to introduce the "Directing Board" with the tenants represented for the first time.

2. The Tenants Union Constitution as a Frame of Reference

2.1 General

The Tenants Union Constitution as a document stands as a comprehensive frame of reference of the objectives and targets to be served by the Union. In this respect it is thought necessary to review the concepts, principles, and aims, embraced by the constitution as a background against which the present activities, and performance of the Union could be judged; and the gap between targets set and actual achievements could be measured. The overall philosophy on which the constitution rests points to the following targets.

With the growing awareness that agriculture is the hope for the nations' security against poverty and hunger, it becomes evident that the Tenants Union has a big role to play in the realization of this target, through the mobilization of tenant forces to this end.

Playing this role is vital because under the slogans of socialism that guide the development of the country the Tenants Union is one of the basic social, economic and political institutions that has to work continually towards the achievement of self-sufficiency and equity in the society. By so doing, it fosters national unity, abolishes tribalism and regional disparities; and aligns all the potential forces and capabilities of the tenant for the maximum utilization of resources to increase production.

At the level of the tenant, the Tenants Union shall work towards the improvement of the production relations so as to stimulate the tenant through monetary and other rewards to increase productivity. It shall also seek all possible alternatives to better the standard of living of the tenant.

2.2 Objectives and Means

The above is the general philosophy that guides the activities of the Union. In what follows, a detailed review of the set-objectives to be served by the Union as specified in the constitution shall be presented:

i. The ultimate goals of the Union are to improve the level of the tenant economically, socially and culturally, and work towards national prosperity, through:

   a. Ensuring the participation and contribution of the tenant at a wider level in the management of the Scheme through effective representation in the Directing Board, and the Section and Block Committees.

(iv) Fostering relationship between tenant and management.	a. Maintained through current relationship between the two.
(v) Maximization of production and cutting down of costs.	a. Not very much is done in this respect because of the degraded economic situation of the Scheme, and the steadily rising cost of operations, partly due to the high rate of inflation.
(vi) Promotion and Support of the co-operative movement.	a. Some meetings held at village level to encourage tenants, especially in the Nomad area, to form co-operatives. b. Proposal for the establishment of a large multi-purpose co-operative complex to serve all tenants in the Scheme area, put before management and other concerned authorities. c. The proposal of the textile industry mentioned earlier, to be developed jointly by the Tenants Union, and an Italian funding firm; some initial steps taken in this direction.
(vii) Adoption of policies to increase returns to the tenant from crop marketing especially cotton, and general improvement of production relations to the benefit of the tenant.	a. Free irrigation water for wheat, exercised since the early years of the introduction of the crop. b. Tenants' share in cotton net revenue changed from 44 to 50 per cent.

c. The cost of cotton picking transfered from the individual tenant account to the General Joint Account.

d. Proposal for quick settlement of Cotton Joint Account with the tenants' share to be paid in June, August and May adopted, however this was only applied in 1975/76 production year. For 1976/77 the tenants' share was paid in 1979, while for the following years no payments have been made till now.

e. For loans to the tenant to finance agricultural operations the Union already forwarded a proposal that loans be deposited in a commercial bank so as to avoid delays occurring from requests for approvals by Sudan Bank.

(viii) Improvement of livestock situation in the Scheme and control of numbers.

a. Proposal to integrate livestock in the Scheme and accordingly reconsider crop/animal rotation.

b. Proposal to provide water sources in the form of hafirs on the Butana plain outside the Scheme area, to keep non-tenant-owned livestock on

		natural pastures away from tenancies.
(ix) & (x)	Improvement of existing services; including education facilities.	a. Construction of a general secondary school at El Sabaat.
		b. Construction of a boarding- house from local material for students studying at New Halfa Town.
		c. Payment of one third of the costs of feeding of the students living in the boarding- house.
		d. Donations to Khalwas (Koranic Schools) at the rate of LS 30 per Khalwa.
		e. Assisted in the establishment of 111 mosques.
		f. Payment of small incentives to the "Imams" and other religious helpers in mosques.
		g. Contributed funds to the improvement of the water supply situation at village level.
		h. Contributed funds to the improvement of New Halfa hospital.
xi.	Expansion of the agro-industrial base	a. Decision to partially finance the proposed textile factory at New Halfa.

These are the major achievements of the Union as documented in its formal records, and as revealed in the discussions held with its leadership.

As for the current activities of the Union these involve the following areas:

- Administration: Tenants through their representative are participating at all levels (Directing Board, Section and Block) in Scheme affairs. This participation is evaluated below. Regular meetings are held between NHAPC staff and Tenants Union Committees at the three levels to run the agricultural and other activities, and solve problems.

- Supply of Labour: The Union participates in the collection and transportation of labour from Kassala/ Gedaref areas to the Scheme, usually organized through contractors. There are Committees to receive and distribute the labourers, in which the Union is represented.

- Marketing: Joint meetings between the Tenants Union representatives and the representatives of the Co-operative Union are regularly held to organize and supervise the marketing of wheat. Meetings are also held between the Tenants Union, the NHAPC, the Co-operative Union, and representatives of the owners of commercial harvestors, before the wheat harvest to determine the costs of the harvesting operation and to distribute the harvestors in the Scheme area.

  Also for the marketing of groundnuts joint meetings between the local government authorities and the Union are held to organize the marketing operation. The Union has permanent representatives in the auction place to guard the interest of the tenant. Finally the Union assists Block inspectors through its local representatives in the collection and delivery of cotton to the collection centres.

- Animal Control: The Union representatives at Block level co-operate with the Block inspectors and the local police force to control the coming of animals to the Scheme area. These three bodies tour the areas encroached upon when necessary, to take actions against offenders. Recently a decision has been taken that the regional security Committee (operating at the level of Kassala Province) is to pass an act, with the help of the Tenants Union, to control livestock numbers and movement, so as to protect the Scheme against the encroachment of animals.

- Social Services: The Union is represented in the Social Services Committee of NHAPC which decides on the annual budget allocations for the projects falling under this activity, aimed at the improvement of services in the Scheme area.

3.2 The Physical and Financial Resources of the Union

3.2.1 Physical Resources

Union premises exist only at New Halfa Town, without any sub-centres in the rest of the Scheme area.

The Union premises at New Halfa consist of:

- a large meeting hall
- two offices: one for the secretary general, and the other for the chairman
- two offices for the assistants of the two above personnel
- a rest house for use of tenants representatives when they come to meetings
- two store-rooms, used at present by secondary school students as a boarding house.

The other assets owned by the Union are limited to transportation facilities, namely:

- two Landrovers (pick-ups)
- one Landrover (station).

3.2.2 Financial Resources

The financial resources of the Union consist solely of the annual budget which comes from three main sources: the subscriptions contributed by the tenant members, the rates levied per groundnuts sack when the crop is marketed, and the allocation received from the Social Services Fund. The former amounts to LS 1.20 deducted by the Corporation from all tenants (since the Union membership is mandatory) and credited to the Union Central Committee. The rate on groundnuts is LS 0.02 per sack, collected at the groundnuts auction shed by the local Government and again handed over to the Committee. The allocation from the Social Services Fund amounts to LS 8,000 annually.

A third source of finance available to the Union, but so far existing only as a potential, is the Tenants Reserve Fund. By virtue of the initiation of this fund, and as explained by the Executive Committee of the Union, the fund is built to help support the tenant in case of abnormal occurrences such as complete crop failure, or a natural catastrophe like flooding that affects the tenants' position in any particular year.

However, and as stated in the constitution of the Union, tenants intend to invest the reserve fund resources in development activities under the management of the Union. A recent development in this line is the steps taken by the Union to raise LS 900,000 as the Union specified share to enter the joint venture with the Italian firm to establish the proposed textile factory.

To raise this money, the Union requested utilizing part of the Reserve Fund for this purpose. As indicated by the Executive Committee, the Union already obtained approval to use LS 270.000 from the Reserves Fund held by the Corporation to meet its obligations towards the Project. The total value of the Fund is estimated to be LS 400,000.

3.2.3 Financial Performance

A better way of presenting the financial resources of the Union is through analysing its performance in a budgetary form, relating the income and the expenditure of the Union. Normally the Union operates financially through a cyclic budget covering a period of four years, where the budget for the whole cycle is allocated and approved at the beginning of the first year. To illustrate the financial performance of the Union, the last cycle spanning the period 1975-1978 is given.

During the period the Union had, in principle, available finance of approximately LS 71,000, detailed as follows:

	LS
- carried forward from the previous cycle ending 1975	1,555.831
- accumulated at the NHAPC as subscriptions deducted from tenants up to July 1977	36,333.376
- profits from cooking oil distributed by the Union	376.540
- profits from cement distributed by the Union	173.600

	LS
- revenues collected by the Union from the groundnuts auction place	2,894.400
- subscriptions collected from village 24, Amlak land and other villages (1)	61.450
Total	55,397.197

To the above are added the following fixed allocations (LS 8,000 per annum) from the Social Services Fund:

- allocations for 1976/77	8,000.000
- allocations for 1977/78	8,000.000
Grand total	71,397.197

Out of this sum of money, the Union's total expenditure was LS 57,058.130. The balance is detailed as follows:

- allocation from Social Services Fund uncontrolled from NHAPC for 1977/78	8,000.000
- balance outstanding from NHAPC	2,075.939
- balance in the Tenants Union cash department	2,741.347
Total	14,339.067

Itemised expenditure is set out below (information provided by the Executive Committee):

- printed material	425.980
- correspondence (telephone calls and cables)	797.166
- travel expenses of delegations	2,454.780
- transportation	5,391.789
- rent of Union premises prior to completion of present building	550.000

1) These subscriptions are collected from tenants in those Halfawyeen villages who do not have access to a cotton tenancy.

	LS
- allowances for the Central Committee and the Executive Office (travel expenses for meetings)	5,209.100
- salaries of executive secretaries	3,150.000
- salaries of driver, guard and messenger	1,840.545
- celebrations and parties	861.900
- incentives to supervisors representing the Tenants Union at the groundnuts auction place, plus others as required	2,032.000
- office furniture	767.300
- donations to: schools, boarding house construction costs, dispensary construction, poor students, etc.	10,066.000
- cost of construction of Tenants Union present premises	22,904.415
- miscellaneous	607.155
Total	57,058.130

3.2.4 Assessment of Diffusion of Activities to Tenant Level

One basic fact emerges from the above presentation of the financial performance of the Union: the Union tends to operate more at its leadership level than at the tenants' level, judged from the viewpoint of the major activities pursued, and the percentage of total expenditure actually spent on these activities. An exercise in computing what part of the total expenditure goes directly in running activities at leadership level, and what part is spent at tenants' level, might help in elucidating this point. Out of the total expenditure, all that goes into the following items might be considered as spent at leadership level:

Printed material; correspondence, allowances for the Central Committee, part of the expenditure on transportation; rent of Union premises, part of the allowances for Central Committee and Executive Office to meet travel expenses; salaries of Executive Secretaries; salaries of driver, guard and messenger; celebrations and parties, part of the incentives; and office furniture.

It could be concluded from the above discussion that the Tenants Union according to its constitution has to perform at two levels: that of the tenant, and that of the institutions which come in contact with the tenant such as Government, the NHAPC, the Provincial Authorities, etc. So far the Union has succeeded in playing the latter role more effectively than the former one, and hence the diffusion of its activities to the grassroots level of the tenancy is still extremely limited. Even its formal representation at Section and Block to cater for the tenants' interest and coordinate activities with the management in specific tasks e.g. the running of agricultural production Committees, is reported by tenants to be defective. This is attributed to many factors.

Among these factors there is the apparent lack of involvement of the Tenant Union Committee members at Section and Block level. This is partly attributed to the non-awareness of the Committee members of their rights and roles in these joint Committees. Survey findings indicate that about 28.97 per cent of the representatives at Section and Block levels are illiterate; with the figure even higher (43.75 per cent) in the Nomad area.

Besides, there is an observed lack of interest from the side of tenants' representatives in the Section and Block Committees, because of lack of harmony between the representatives and the NHAPC staff in the Sections and Blocks, reported by 31.43 per cent of respondents as the reason behind the disinterest of the representatives in the Committees deliberations.

Furthermore the relationship between the tenants' representatives and the inspectors at Block and Section levels is often strained. Some feel that there is a superiority/inferiority gap which hinders co-operation between the two groups. On the other hand many tenants claim that some of the tenants' representatives have developed personal relations with Block and Section staff that create private interest to the exclusion of benefit to all tenants. Whether the relation developed with the Block and Section Headquarters is negative or positive, in line with the above analysis, the outcome is the same, i.e. representatives become reluctant to participate effectively in the activities of these Committees. This is clear from the attendance of tenants representatives at the meetings of the Committees. The average number of absentees in 12 successive meetings of a number of Block Committees, taken at random, is two members out of six representatives.

The need for the improvement of the present performance of the Tenants Union at tenant level emerges also from questions relative to potential fields of action which the Union should take up in the interest of the tenant. The list of the proposals put by the tenant to improve performance is a long one and will be taken in more detail when the effectiveness of the Union is considered.

4. The Organizational Set Up of the Union

4.1 General

The organizational set up of the Union consists of different bodies and committees, represented and built up in a hierarchical order. This hierarchical structure of the Tenants Union Bodies and Committees is designed to ensure, at least theoretically, efficient performance at all levels, and to maintain two way communication between the grassroots bodies and the leadership of the Union at the apex of the hierarchy. The summary overleaf explains the various Bodies and Committees and how they integrate.

In reference to this summary, the six units comprising the Tenants Union organizational set up, are considered in turn.

4.2 The Village Committee

The Village Committee is the basic unit from which the organizational structure of the Union builds up. It is the nucleus of the whole Union body. Every village is considered as a constituency if it has 100 tenant farmers, who are represented by a Committee of five representatives elected by the tenants in the village. Since many villages have more than 100 tenants, every additional 100 to the basic one is represented by three. It follows that, and as a result of the variation in the size of village tenants population, that Village Committee members range between 5 and 11. The Village Committee, as a representative body of the tenants at village level, presently has the main task of linking the village to the Block NHAPC staff, in all issues related to agricultural production i.e. agricultural operations, loans, and livestock control.

Organizational Summary

1. Tenants at Village Level
   a. Village Committee: Every 100 tenants are represented by 5, making the Village Committee; maximum Village Committee size is 11.
   b. Members to General Assembly: Every 100 tenants are represented by one in the General Assembly.

2. The Block Committee
   Each village is represented in the Block Committee by elected member(s) from among the Village Committee. The number varies from one village to the other.

According to the Constitution the Central Committee represents the Tenants Union in all spheres that fall under its responsibilities. It has the right to form any task-group or a specialized Committee to look into any issue that is deemed necessary. It supervises the properties of the Union, its financial resources, and the accounts which are normally checked by an auditor from outside the Union.

The Committee decides on the donations and the contributions by the Union in the different spheres of public interest. It is in a position to pass decisions on the utilization of the Tenants Reserve Fund in the interest of the tenant.

It meets once every month and decisions are taken by absolute majority.

4.7 The Executive Office

It is the executive organ of the Union, which executes and supervises the plan of work set by the Central Committee. It is also responsible for the scheduling of the Central Committee activities, the calling of meetings, and the keeping of the records and accounts of the Union.

According to internal articles of organization the Executive Office apart from the Chairman has to run its activities through a specialized secretariat. Among the 21 members who make up the Executive Office there are the following offices:

- the Chairman and his deputy
- the Secretary General and his deputy
- the Treasurer and his deputy
- the Assistant secretaries for:
  - agricultural affairs
  - information
  - external affairs
  - Debaira Section
  - Sasraib Section
  - Sedaira Section
  - Demyat Section
  - Reira Section
  - Sheikh Omer Section.

The Executive Office holds meetings twice every month, but in necessity meetings can be held at any time. Decisions are taken by absolute majority.

4.8 Level of Education of Committee Members

The Tenants Union movement in New Halfa Scheme has very much been influenced and motivated especially at its leadership level by two groups: energetic traditional leaders irrespective of level of education; and the educated elite, especially more recently. The role of the former group is often denigrated in the belief that effective leadership is more linked with education. Whilst the influence of the latter factor is not denied, there are other qualities that count as well: experience, organizational skill, zeal, and concern about community affairs - traits and aptitudes, which might not be readily available in the educated elite.

The members of the Executive Office of New Halfa Tenant Union reflect leadership qualities acquired through both traditional status and education as can be judged from Table 1.

From Table 1 it emerges that 2 of the 21 members constituting the Executive Office are university graduates (including the Chairman); 4 are senior secondary school graduates; 1 is a junior secondary school graduate; 12 completed primary school and 2 received Khalwa (Koranic school) or illiteracy education. Thus 66.66 per cent of all members of the Executive Office have received only primary education, which emphasises the earlier point about the role of forces other than education in leadership.

At the level of Village Committees, the educational attainment of the members of Nomad Committees is clearly lower than in the Halfawyeen area. From the findings of the survey of four villages in the Halfawyeen area, and eight villages in the Nomad area, only 2 per cent of the members of the Committees in the former area are illiterate, as against 41.38 per cent in the latter area, and with the remaining percentages in the two areas receiving education ranging from primary level to high secondary.

True education has its reflection in widening the horizons of the leadership and evidently on the performance of the Union. So far this performance has been comparatively satisfactory at leadership level, in issues resolved at the level of NHAPC, the Government, Kassala Province Authorities, or similar higher order institutions. The comparison does not hold true at the grassroots level in the villages.

ANNEX 5
Table 1

Education Level of TFU Executive Officers

Members of executive office in serial order	Age	Khalwa	Adult literacy	Primary	General Secondary	Senior Secondary	University	Occupation other than tenant	Ethnic origin
1	34						x	Government official	Shukriya
2	46					x		-	Hadandwa
3	60			x				merchant	Halfawyeen
4	52			x				agent	Halfawyeen
5	70			x				merchant	Halfawyeen
6	50	x						-	Shukriya
7	47			x				owns book-shop	Shukriya
8	45			x				-	Halfawyeen
9	48					x		-	Shukriya
10	47					x		teacher	Shukriya
11	52						x	advocate	Halfawyeen
12	29			x				-	Shukriya
13	32			x				-	Shukriya
14	37			x				-	Shukriya
15	40			x				-	Shukriya
16	36					x		school director	Shukriya
17	58			x				-	Hadandwa
18	42			x				-	Hadandwa
19	42		x					-	Shukriya
20	28			x				-	Halfawyeen
21	34				x			Government official	Halfawyeen
Total		1	1	12	1	4	2		

Here, apart from financial limitations, and the superiority/inferiority relationships between tenants and inspectors at Block and Section level, there is evidently an apparent lack of conceptualization at all levels of what could actually be offered to the tenant in the two areas of agricultural production and community welfare. From the side of the tenant this lack of conceptualization could be attributed in part to limited education and enlightment particularly in the Nomad area, which might otherwise have assisted in creating an active leadership that would align the interest of the tenant with those of the management for the improvement of conditions in the Scheme.

5. The Effectiveness of the Union

5.1 General

To examine the effectiveness of the Union the following areas have been investigated in this connection:

- effectiveness at membership level
- acquaintance of members with representatives
- tenants attitudes towards the Union
- leadership attitude towards the Union
- NHAPC attitude towards the Union.

In what follows each of the above areas is considered in more detail, drawing from the findings of the attitude survey conducted for 100 samples in the Halfawyeen and the Nomad areas, and from the results of the interviews held with the Executive Office of the Union, and the staff of the NHAPC,

5.2 Effectiveness at Membership Level

Though all tenants know that they are members of the Tenants Union, few are found who recall the exact year they joined the Union. The majority of the Halfawyeens (74.3 per cent) consider their earlier membership in the Villages Committees institution as the date in which they joined the Union. Of the remaining 25.7 per cent, 16.1 per cent actually do not know when they joined the Union, with the other 9.6 per cent referring rightly to 1969 when the Union was formally registered. Among the Nomads three answers are received. About 34.9 per cent mentioned that they became members in 1972. Reference to this year is very much tied to the date the presidency of the Union shifted to the Nomads. Of the rest 33.3 per cent related their membership to the date they obtained a tenancy, while the remaining 29 per cent really do not know when they become members.

- lack of machinery	6.60
- reallocation of tenancies	3.30
- eviction from tenancies	1.70
Total	100.00

Of the above, the reallocation of tenancies plus the introduction of dura are two issues raised mostly by the Nomad tenant; while encroachment of livestock is mostly mentioned by the Halfawyeen tenant. The other issues are shared commonly by tenants from the two areas.

The above reactions indicate that the relationship so far existing between the tenant and his Committees at Block and Section level is limited to the field of agricultural production, as repeatedly mentioned earlier; a relationship necessitated by the declining situation of inputs.

The outcome of the approach by the tenant to his representatives in solving the above problems is an indication of the effectiveness of the Union in this respect. The tenants followed their replies that they have approached the Union on the above issues by comments such as: "But the Union is not in a position to solve our problems"; that "We lost confidence in the Union"; or finally, "What can the Union do if all the powers are in the hands of the inspector, who has the final say in giving orders and instructions".

The data from the situation during the preceding year validates the above picture. In reply to the question: "Whom have you met of the Tenants Union leadership at all levels during this past year", the answers received reveal the following picture.

Of all respondents interviewed in the Halfawyeen area 53.8 per cent mentioned that they met the General Secretary of the Union, who is a Halfawyeen by origin. Of the same respondents only 7.7 per cent reported contacting their representative at village level. As for the Nomad area, 28.9 per cent stated that they met the President of the Union who is a Nomad by origin. Compared to the Halfawyeen area, the majority of the respondents in the Nomad area (90 per cent) reported seeing their representatives at Village level: which is a reflection of the magnitude of the agricultural problems in the latter area.

5.4 Tenants Attitude Towards the Union

It is clear from the above analysis that tenants are not satisfied with the performance of their Union. They pointed out many areas of deficiencies. To reach a definite opinion on this issue, tenants were asked to state whether they were satisfied or not with the performance of the Union.

From all respondents interviewed in the Halfawyeen area, 90.32 per cent report that they are not satisfied with the Union's performance. The figure drops to 55.07 per cent in the Nomad area. The average rating for all tenants in the Scheme area is 66 per cent. One interpretation for more satisfaction in the Nomad area as compared to the Halfawyeen one, is that the president of the Union comes from the former area; hence giving the tenant population there more pride and the feeling of a secured right to the Union leaderships despite the declining agricultural situation from which the Nomad area suffers.

Apart from the ineffectiveness of the Union in solving many of the tenants' problems at tenancy level (mentioned by the majority of tenants as the basic reason behind their dissatisfaction), most tenants mention the social and cultural gap that separates the two communities of tenants (the Halfawyeens versus the Nomads) as one of the factors that contribute to the ineffectiveness of the Union. Of the Halfawyeen tenants interviewed 77.42 per cent believe that the Scheme is made of many heterogeneous communities; and a similar attitude is reported by 76.81 per cent in the Nomad area.

This lack of homogeneity leads to opposing rights and interest. The Halfawyeens cite the effects of uncontrolled livestock on their economic and personal well-being as an area in which their interest comes into sharp opposition with the Nomads. The latter from their side point to the prosperity enjoyed by the Halfawyeens reflected in their possession of enterprises such as the "amlak" land and the Co-operative Union. These are seen as creating a wide gap between the two communities, which the Nomads do not visualize they will be in a position to close in the near future. Both communities believe that such conflicts of interest have a direct effect on the performance of the Union.

To increase the efficiency of the Union, tenants were asked to propose what they consider essential to upgrade its performance. The proposals put forward centre on three areas: agricultural production, community welfare, and co-operative development. The results from this exercise are given in Tables 2, 3, and 4. In what follows the basic proposals are highlighted according to the importance attached to them by the two communities.

In the area of agricultural production, the Halfawyeen tenants think that the Union should address itself to the following issues as judged from the proportion of responses received from the tenant in relation to each: pricing of crops: 17.39 per cent; irrigation water: 15.94 per cent; loans: 11.60 per cent; livestock control: 11.58 per cent; and land preparation: 8.70 per cent.

In the Nomad area the main proposals accorded priority in the field of agricultural production are: land preparation: 20 per

cent; loans: 18 per cent; irrigation water: 15.30 per cent; cotton Joint Account: 8.67 per cent; and pricing of crops: 8.0 per cent. For the rating of the rest of the proposals see Table 2.

In the area of community welfare the Halfawyeen tenant priorities are: improvement of health services: 20.0 per cent; improvement of education facilities: 13.34 per cent; improvement of water supply: 8.89 per cent. The Nomads on the other hand highlight the following areas as their priorities: improvement of water supply: 30.65 per cent; health services: 21.77 per cent; education 16.13 per cent. For a more complete picture see Table 3.

Finally there is the area of co-operative development. Of those tenants interviewed in the Halfawyeen area 40 per cent consider that the Union has no role to play in this respect. Those holding the same belief in the Nomad area amount to 32.91 per cent.

Of those considering that the Union could play a role in the advancement of co-operatives in the Halfawyeen area, 20 per cent see this role in the provision of finance, 17 per cent in making more farm-machinery available, and 14.29 per cent in contributing effectively in giving advice and enlightment to the tenant. The Nomads on the other hand believe that the Union could assist in providing farm-machinery: 15.19 per cent; in financing co-operatives: 8.86 per cent; in the establishment of consumers' co-operatives: 8.86 per cent; and in flour-mill co-operatives: 8.86. For more details see Table 4.

5.5 Leadership Attitude Towards Union Performance

The efficiency of the Union is very much allied to the effectiveness of its organization and the devotion of its leadership and members, in achieving its goals. The Leadership of the Union (the Executive Office) supports the above statement and believes that the Union will not attain real effectiveness until representatives at leadership and grassroots levels show more activeness, and work in harmony, co-ordinating their activities with the tenant.

The Tenants Union leaders are not fully satisfied with the present performance of the Union, and admit that what has been so far achieved is below their expectations. They attribute the shortcomings of the Union performance to the weak participation of the Committees at village, block and section levels.

ANNEX 5
Table 2

Tenants Proposals for the Improvement of Tenants Union Performance in Agriculture

Proposed area of improvement	Halfawyeen area		Nomad area	
	No. of answers proposing it	% of total	No. of answers proposing it	% of total
1. Land preparation	6	8.70	30	20.00
2. Loans	8	11.60	27	18.00
3. Irrigation	11	15.94	23	15.33
4. Pricing of crops	12	17.39	12	8.00
5. Cotton Joint Account	5	7.24	13	8.67
6. Farm machinery	4	5.80	11	7.33
7. Livestock control	8	11.58	1	0.67
8. Supervision of agricultural operations	4	5.80	5	3.33
9. Improved seeds and in time	4	5.80	3	2.00
10. Supervise weeding operation	2	2.90	3	2.00
11. Raise our problems to the Corporation	1	1.45	3	2.00
12. Rehabilitation	00	0.00	4	2.67
13. Introduction of dura	0	0.00	3	2.00
14. Solve labour problems	2	2.90	1	0.67
15. Others	2	2.90	5	3.33
16. Don't know	0	0.00	6	4.00
Total	69	100.00	150	100.00

ANNEX 5
Table 3

Tenants Proposal for the Improvement of Tenants Union Performance in Community Life

Proposed area of improvement	Halfawyeen area		Nomad area	
	No. of answers proposing it	% of total	No. of answers proposing it	% of total
1. Water-supply	4	8.89	38	30.65
2. Health services	9	20.00	27	21.77
3. Education	6	13.34	20	16.13
4. Construction of bridges on canals	2	4.44	5	4.03
5. Enlightment	2	4.44	3	2.42
6. Mosques	0	0.00	4	3.23
7. Electricity	2	4.44	1	0.81
8. Police	0	0.00	3	2.42
9. Tenants Union office	2	4.44	1	0.81
10. Social club	2	4.44	0	0.00
11. Veterinary service	0	0.00	2	1.60
12. Don't know	0	0.00	4	3.23
13. Others	4	8.89	4	3.23
14. No role to play in this field	12	26.68	12	9.67
Total	45	100.00	124	100.00

ANNEX 5
Table 4

Tenants Proposals for the Improvement of Tenants Union Performance in the Area of Co-operatives

Proposed area of improvement	Halfawyeen area		Nomad area	
	No. of Answers proposing it	% of total	No. of answers proposing it	% of total
1. No role to play in this field	14	40.00	26	32.91
2. Provision of farm-machinery	6	17.14	12	15.19
3. Finance co-operatives	7	20.00	7	8.86
4. Encouragement & enlightment	5	14.29	3	3.80
5. Assist in establishment of co-operatives	0	0.00	5	6.32
6. Provision of flour-mill co-operatives	0	0.00	7	8.86
7. Provision of consumers co-operatives	1	2.86	7	8.86
8. Don't know	0	0.00	6	7.60
9. Others	2	5.71	6	7.60
Total	35	100.00	79	100.00

The issue at hand therefore is how to improve the operational capabilities of the Tenant Union, through activating its organizational set-up to meet its objectives, especially at grassroots levels, and hence prepare the Union for a more progressive role. With the anticipated technical inputs coming to the Scheme, more involvement of the Union Committees at the Village, the Block, and the Section level is not only desired, but is a prerequisite, realized by both the Union leadership and the NHAPC staff. This involvement needs to be upgraded to the level of joint responsibility.

How to effect this will very much depend on improved understanding by the lower level Committees of their roles at Village, Block, and Section; on a viable two-way communication between the leadership and the grassroots; and between the Union and NHAPC bodies at all levels. In essence this is an educative process which entails a new outlook from all three parties concerned i.e. the leadership, the grassroots and the NHAPC.

Of the means to achieve this, one is to extend the physical presence of the leadership so that it is felt in both the Halfawyeen and the Nomad areas. The construction of two branch offices, one at Debaira in the former area, and the other at El Sabaat in the latter, is therefore proposed. From these two offices, the six secretaries of the six Sections in the Executive Office, who presently operate from New Halfa Town could operate more effectively within the Halfawyeen and the Nomad areas, thereby maintaining a close link between the leadership and the Village, the Block and the Section Committees.

To perform their role effectively, the two sub-offices would require the appointment of some auxiliary staff, to help with the office and accounts tasks. Furthermore, maintaining the link between the branch offices and the tenant on one hand, and the leadership at New Halfa on the other, will require the provision of an adequate number of vehicles.

The next important input following the establishment of the office infra-structure is a training component for Section, Block, and Village Committees to be sponsored, supported and supervised by the Tenants Union Executive Office. This training should concentrate on guiding Committee members to think in practical terms about the role of the Union as laid down in its set objectives and targets. To administer this would require the support of local expertise in specializations such as Community Development, Social Work, Administration and Management, Co-operative Development, etc. This expertise would be provided on a secondment basis to the Tenants Union to design programmes for short-term workshops to be attended by the Section, the Block, and the Village Committees.

It is recommended that this training should start immediately (together with the planning of the building of the two branch offices), possibly at the Tenants Union premises at New Halfa. It is envisaged that it could be organized on the basis of batches of 30 trainees to be selected in succession by the Executive Office, on condition of favourable response from the side of Committees to the idea. Initial success would diffuse the message to the other areas, and further Committee members would follow.

Supporting the programme of training will require funds to be made available for the payment of the remunerations of participating personnel (presumably their salaries would be borne by their departments), and travel expenses and feeding for the Committees members while they are attending the workshops at New Halfa.