UNDP Project No.:
SUD/87/111/A/01/12.

# ANIMAL TRACTION: KORDOFAN (FULA DISTRICT)

BY

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August, 1987

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## MAIN REPORT

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PART II

THE PROJECT.

(In a seperate volume consisting of 22 pages).

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# CHAPTER ONE

# INTRODUCTION

## 1.1. General

This document is titled: Formulation Mission Animal Traction (Kordofan). It is prepared under UNDP Preparatory Assistance Programme, with the Ministry of Agriculture and Natural Resources, Kordofan Region, as the implementing agency. The study on which the document is founded was carried out by a two-man team which tackled the issues outlined in the terms of reference. The document consists of two parts. Part I covers the mission's findings, based on the field surveys conducted at the proposed study sites, and on the literature consulted in relation to the subject matter of the assignment. Part II is a formulated project, according to UNDP format, proposed for implementation in the study area.

## 1.2. Purpose and Scope (based on the study terms of reference)

### 1.2.1. Background

The purpose and scope of the assistance programme under which the document is prepared may be summarised in: improving the farming efficiency of the

traditional small-holder in Kordofan Region through the design and application of a well proven intermediate technology suitable to the area. The need for promotion of this kind of technology is founded on the following considerations:

- Traditional crop production (dry farming) in Kordofan region is the dominant form of agriculture which accounts for the production of most of the food and cash crops,
- Fully utilizes family labour,
- Uses primitive, tedious and slow operating hand tools,
- Suffers from untimely application of cultural practices,
- Consequently farming efficiency in terms of productivity per unit area and total production is poor.

The strategy adopted by the traditional farmer to obtain higher yields under the current situation is horizontal expansion. Within this strategy, the Government of Kordofan is advocating the use of intermediate technology of animal traction that usually involves lower costs in comparison to tractorized farming. In response to this need, the preparatory Assistance

1.2.4. Scope of the Consultancy

The experts, within the time frame of the Preparatory Assistance should assess the following issues:

- The appropriate design of the project,
- Constraints and factors conducive to the failure or success of the implementation,
- The socio-economic and environmental impact of the project,
- Test the technical viability and financial feasibility of the project.

1.3. Study Methodology

1.3.1. Team Composition

The two-man team which conducted the study was composed of:

M.O. El Sammani, Socio-economist, main consultant, and

K.A. Shams , Agronomist (with experience in crop mechanization)

1.3.2. Field Visits

To cover the items specified in the terms of reference, the team made two visits to Kordofan region, in the periods June 3rd to 11th, and June 20th to July 10th. During the first period the team conducted field work in the proposed piloting area of Rigl El Fula, and those

- initially recommended by the local authorities, as highly crop producing areas,
- accessibility to Rigl El Fula in the range of 6 - 10 km.,
- ecological representation, lying south, west, north west and east of Rigl El Fula, and
- providing ethnic and economic variability.

As for places visited with animal traction activities, these included Wad El Hilew village close to En Nahud where the Agriculture Extension Department is running "En Nahud Intermediate Technology Project" (EITP) in a number of villages, and Es Sunut, Dabkar and Sunjikaya which come under the Nuba Mountains Rural Development Project (NMRDP).

While the NMRDP is an outcome of a throughly formulated programme, EITP is an attempted modelling of this programme. The project is presently facing some constraints such as: limited annual budgets, and a non-reliable source of supply of animal traction implements. From this angle studying the two experiences provided valuable findings that were drawn from the preparation of the present document.

1.3.3. Interviews

The team opted for the interview method as a main source of data collection. Interviews covered government agency officials met, pannels of farmers at various villages visited, and some of the resourceful persons recommended by the local authorities. The itinerary, Annex I, lists the names of those interviewed.

1.3.4. Pertinent Field Data

The team collected supporting data from government offices visited, extracted from documentary material and annual departmental reports. This covered fields such as:

- annual rainfall records
- demographic data
- ethnic composition
- services facilities
- participant farmers in animal traction programmes
- number and type of implements distributed
- acreage cultivated
- type and volume of crops produced
- crop yields
- crop prices
- costs of implements, etc.

1.3.5. Soil samples

To support soil accounts of villages visited, two to three samples of soils were taken from fields currently cultivated at each of the surveyed villages, as indicated by accompanied farmers. These were analysed with the resulted included in Annex III of the report.

1.3.6. Farmers' Acceptance

At the end of group meetings with farmers in the villages visited, farmers' perception of the use of animal traction was tested and assessed. At all places the chances of adoption of the technology were high, however, tied to certain conditions. These shall be explored and catered for in the project formulation.

1.3.7. Literature Review

Literature on the subject matter of the consultancy was reviewed including text material, scientific reports and documents and field manuals on animal power implements. Material referred to is included in the bibliography.

1.4. Report Organization

The following layout was adopted in organizing the report:

Part I: Made of 6 chapters

- An introduction: covering a general statement of the project, its purpose and scope, the terms of reference, the study methodology, and report organization.
- Background of the project area: location, ecological set-up and sccio-economic aspects.
- Forms of Livelihood: population activities, including major characteristics of crop and livestock raising, production of fuel wood, charcoal and building material and employment inside and outside the area as income generation activities.
- Experiences of Animal Traction: covering the two cases of the Nuba Mountains Rural Development Project (NMRDP) and En Nahud Intermediate Technology Project (EITP), with reference to objectives, main operational features, implements diffusion, supply and prices, draught animals, project management, etc.
- Farmers Preference Under (NMRDP) and (EITP) discussing performance under the two cases based on findings from sampled farmers in the two areas.
- Conclusion and recommendations: the essentials for formulating Rigl El Fula Project, with emphasis on prospects of animal traction, its management and organization, focussing the necessary revisions for enhancing animal traction experience and recommending a more complete package.

PART II: The Project, guided by the following formulation plan :

- Development objectives,
- Immediate objectives,
- Special considerations,
- Background and justification,
- Outputs,
- Activities,
- Inputs
- Preparation of work plan,
- Framework for effective participation of national and international staff,
- Development support communication,
- Institutional framework,
- Prior obligations and requisites
- Future UNDP assistance.

CHAPTER TWO

District from which the latter takes its name. It falls within its north part, centred on the town of Rigl El Fula, the headquarters of the district. Rigl El Fula too is a seat of a rural council named after it,(Fig.1). It is suggested that the proposed project may concentrate on this rural council as a pilotting area as a start.

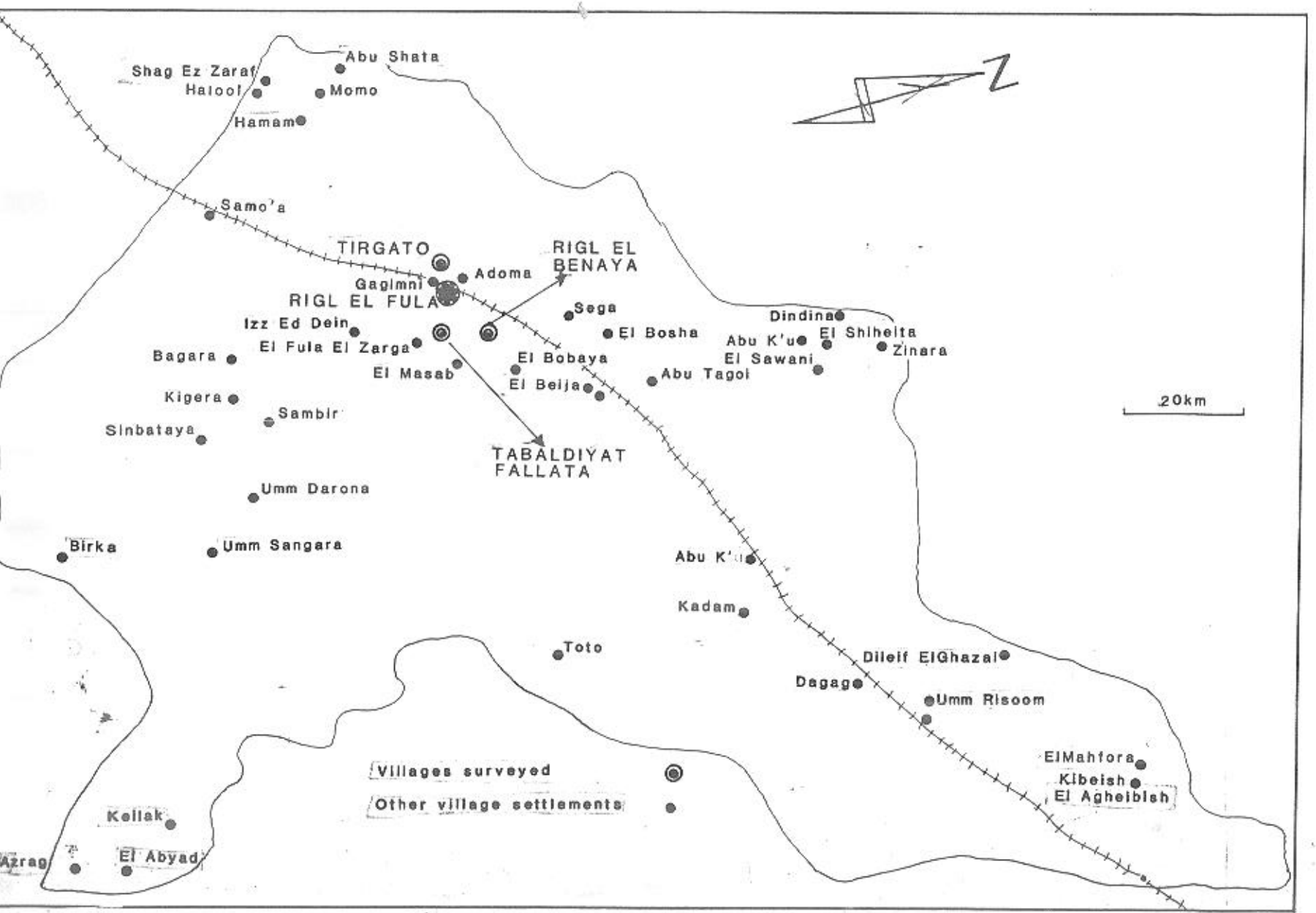
2.1.2. The sampled villages

The four surveyed settlements exhibit the following locational characteristics :-

i) Tabaldiyat Fallata:

It is a nomadic encampment, representative of a temporary settlement set during the rainy season for the purpose of establishing the crop fields. It is one of a complete set-up of a settlement pattern, evolved by the Messeriya in course of their seasonal migration to fulfill

G.(1) RIGL EL FULA RURAL COUNCIL:
Location of Villages Surveyed



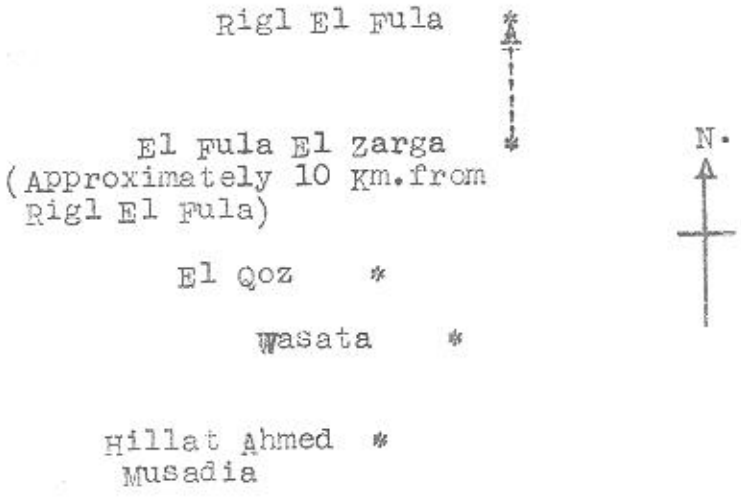

SOURCE: Rigl El Fula District Council, Office Map

cattle grazing requirements and raise crops for subsistence needs, as may be exhibited by (fig.2).

A main fact to be concluded from the Messeriya settlement pattern with regard to the prospects of introduction of animal traction in their farming activities is that crop production is well established in their economy. It is spatially and timely integrated in their migration system.

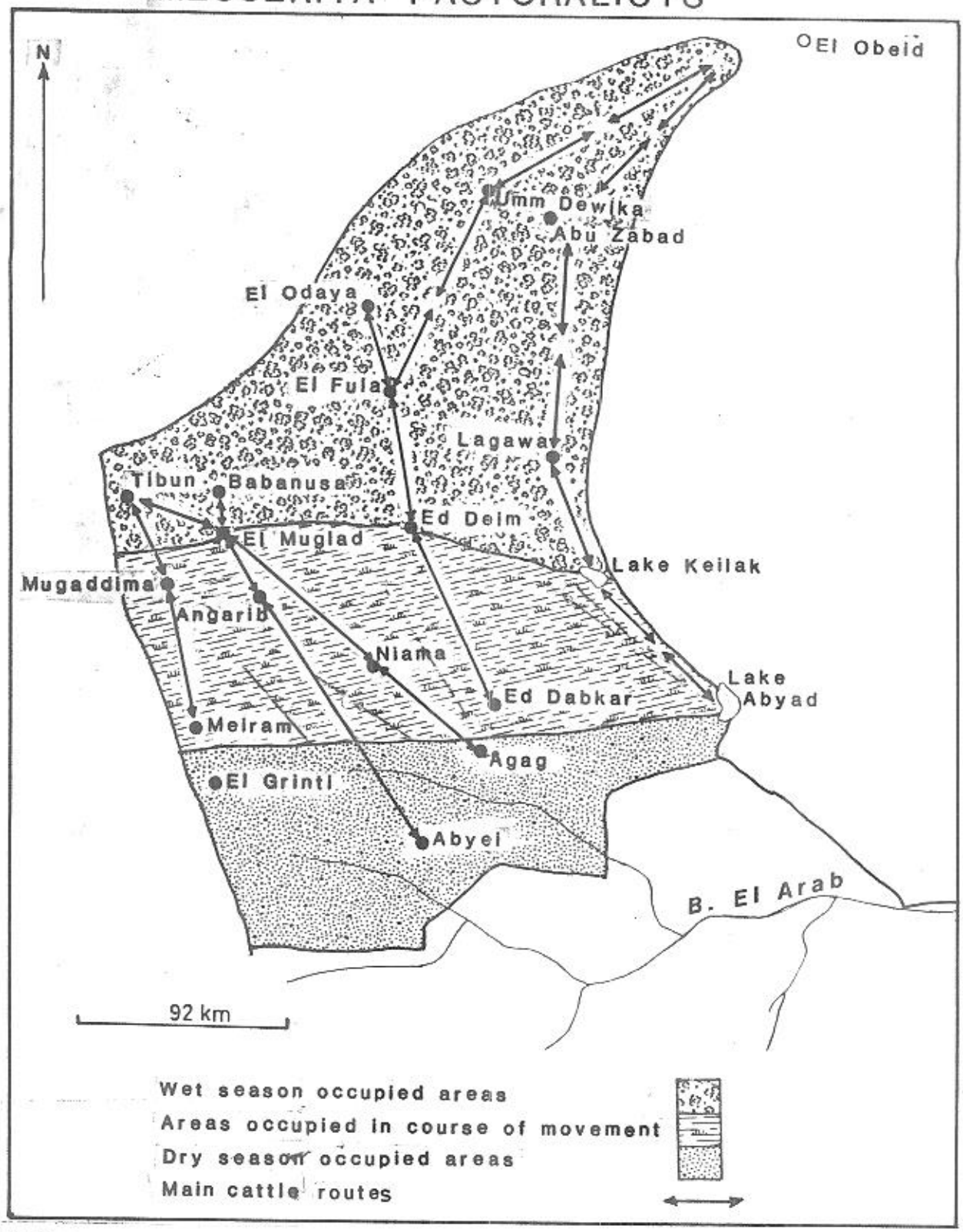
ii) El Fula El Zarga:

El Fula El Zarga is comprised of 4 villages, of which Wasata was the main one visited during the survey.




All other 3 villages are within a 3 Km. radius from Wasata.

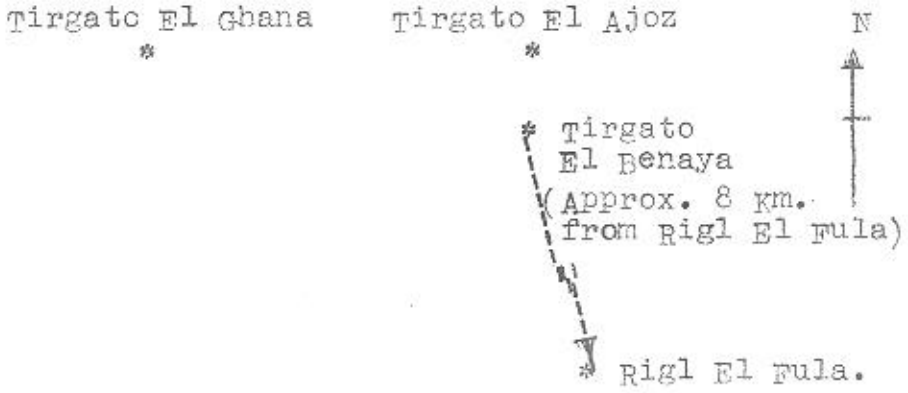
FIG.(2) SEASONAL GRAZING MOVEMENT OF MESSERIYA PASTORALISTS




SOURCE: Based on surveys carried out by M.O. El Samman1

iii) Tirgato:

Tirgato consists of 3 villages plus 3 "arareit".[1] The one visited was Tirgato El Ajoz.




The two other villages lie within 2 Km. from Tirgato El Ajoz.

iv) Rigl El Benaya:

Rigl El Benaya is comprised of one village located at a distance of 10 Km. to the east of Rigl El Fula.

2.1.3. Main characteristics

The project area reveals the following locational characteristics :

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1/ "Arareit": are settlement sites established close to fields, occupied during the cultivation season, to minimize walking distance to fields.

- Intermediately located within Kordofan Region, hence reflects features of the northern and southern parts of the region, and avail opportunity for extending results, both directions.
- Soil types are predominated by sandy pediplain soils, Gardud, with the presence of sandy, Qoz, soils, and alluvial pockets in wadis and depressions , hence soil diversity invites application of animal traction on three types of soils.
- Annual rainfall average is in the order of 450 mm., adequate for crop raising.
- Progressively peneterated by settlers of Darfurian and West African origin, who have many villages in the rural council.
- Crop raising for subsistence and cash generation is a basic activity of both sedentarists and nomads, and is highly integrated in the economy of the latter.
- Livestock raising and crop production are traditionally run, with least modern interventions.
- In terms of accessibility Rigl El Fula is reachable from El Obeid throughout the year, though rainy season road conditions may cause some motoring problems.
- Within the project area the villages targetted for application of animal traction fall within proximity to Rigl El Fula in the order of 6-10 Km., and are easily accessible in all seasons.

## 2.2. Ecological set-up

### 2.2.1. Climate

Rigl El Fula is situated in the western part of Southern Kordofan Province, in the savannah belt of the northern hemispheric tropics, i.e. the climate is hot and semi-arid. The cool dry season is associated with dry North Easterly trade winds between November and February.

The rainy season occurs between May and September, reaching its peak in August. The average maximum temperature varies between 30 to 35°C, with a peak of 40°C during March-May. Average minimum temperature is between 15 to 18°C, recorded between October and February.

The relative humidity reaches average of 80% during the rainy season, and drops to only 20% during the dry season. The average wind speed recorded is 3 to 4 M per second, with winds blowing constantly throughout the year.

The mean annual rainfall for El Fula Rural Council is 450 mm (according to the STD 40 year average),(Fig.3). See also monthly and annual rainfall totals, Babanusa Station, Annex II.

The main and critical factor affecting crop production in the area is rainfall distribution and intensity, with quantity ranking third in importance.

FIG.( 3 ) STANDARD 40 YEARS AVERAGE RAINFALL IN SOUTH KORDOFAN

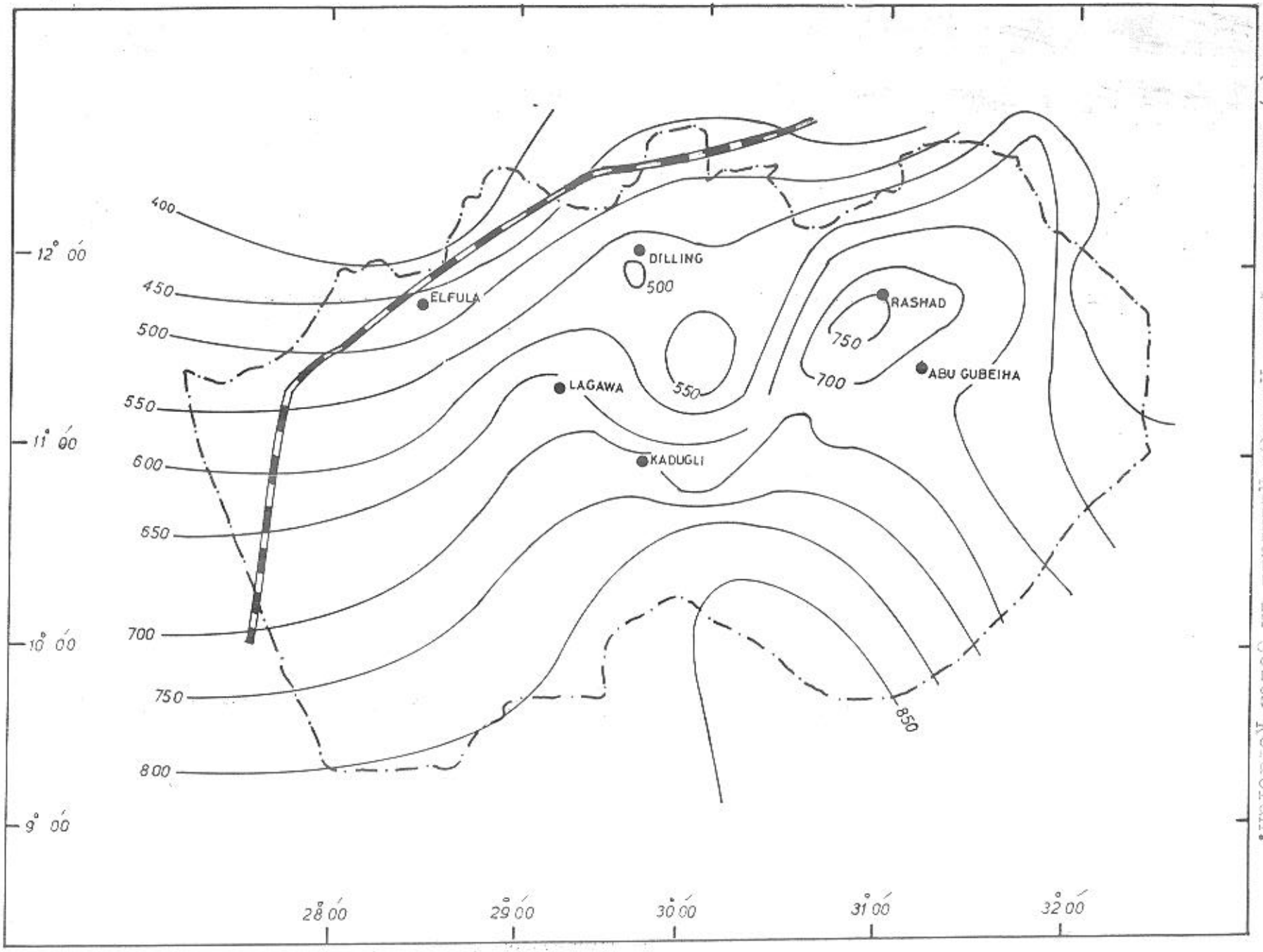


Fig.(3) standard 40 years Average rainfall in South Kordofan.

SOURCE: NMRDP Annual Report 1986

2.2.2. Soils

The topography of the project area is characteristic with its famous gently slope from the outcrops of the northern part of the district to the south. This coincides well with the drainage system, mostly through Rigl El Fula "Wadi" and other small tributaries, that enrich the light clays of the southern part of the district.

The rock outcrops of the eastern part of the district also constitute a good potential catchment area that is drained by Birdia "Wadi". There is also the famous Wadi El Gallah basin that drains water to the southern part of the district from quite a sizeable catchment area.

Through the entire district, 4 types of soils could be identified (Huntings, 1974), namely:-

2.2.2.1. Flat to gently undulating aeolian and locally reworked alluvial sand sheet:

These are deep coarse textured soils developed on aeolian sand. In some areas the sand has been reworked by alluvial processes. The soil texture, based on the mechanical analysis, is normally sand or loamy sand to a depth of more than two meters. The PH of these soils generally ranges from mildly acidic to neutral.

The flat alluvial sands, are used for the growing of millet which is the staple food crop in the area; whereas depressions provide a good potential for the limited cultivation of sorghum.

2.2.2.2. Flat Sand-plain to gently andulating interluver.

The soils are deep sandy soils in which the dominant process of formation is in situ weathering of Nubian Sandstone or Basement Complex rocks.

The profile normally comprises a variable thickness usually 50 to 75cm of dark red or reddish brown sand or loamy sand which overly yellowish red sandy loam or light sandy clay loam. The top 20cm often shows evidence of reworking by wind. Where both wind and sheet erosion effects are combined or any of them is very active, this ultimately ends into a truncation process. As a result of this process, the top sandy soil is eroded ending with a type of soil characteristic of the sandy pediplains. Sandy pediplains are generally hard, difficult to cultivate by the rudimentary hand tools, of low permeability and well favours surface run-off. In areas where the soils are trypical sandy pediplains, gully erosion is the main feature.

Generally, the PH ranges from 6.0 to 7 in the flat and the gentle sand plains respectively. The flat sand plain is normally used for the cultivation of little groundnuts and millet. Depressions in the undulating topography are used for the cultivation of dura and little sesame.

2.2.2.3. Flood plain complex

This constitutes the stratified recent alluvial soils of variable texture occupying relatively small areas (wadi bottoms). The occurrence of sandy material in the sub-soil is probably a fairly consistent feature of this type of soil. The top soil normally contains relatively high silt fraction with some clay content. The PH ranges from 6.8 to 7- especially at the southern location of this soil formation.

Since these soils are generally fertile, they are now extensively used for the growing of horticultural crops. Supplementary irrigation from surface wells at the wadi bottoms is becoming a normal practice in Rigl-El Fula Area.

2.2.2.4. Flat Light Clays:

These soils are characteristic of the southern part of the area. They normally range from light clays to limited cracking ones. The PH of these soils range from rentral to midly alkaline (7 - 7.5). They provide a good potential for sorghum cultivation in El Fula El Zarga area. The southern most part of these soils at "KARKARAYA" is reserved for nomadic pastoralism , normally known as the transitional area.

2.2.2.5. Suitability Classificiation

For a qualitative assessment of soils, through general characterization, 14 samples were collected where profiles' depths range from the surface (0-cm) to 30cm (working depth), as shown in Annex III. The following can be observed from the analysis of these samples :

( i ) Mechanical Analysis

The percent of fine sands in all samples collected is higher than both silt and clay contents. The percent of silt is remarkably low when compared to the fine sands and the clay fractions in all the samples collected. Normally the per cent of silt decreases with depth with the exception of samples 3, 7, and 9 which were collected from the vicinity of the Wadi bottoms.

The per cent of clay content at the working depth (5-30 cm), in all samples collected, is relatively reasonable and allows for the exchange of nutrients.

(ii) Chemical analysis

The soluble cations (Ca and Mg) vary from 0.5 to 1.0 meg/L and are more or less evenly distributed throughout the profile in all the samples collected. The cations of sodium vary from 0.6 - 1.8 meg/l and are variable with different depths in the entire samples.

The non-existence of the $CO_3$ in all samples collected indicates the suitability of the area for horticultural crops.

Generally the soils are suitable for the growth of millet, sorghum, sesame and groundnuts. It is to be noted that in areas where the soluble annionus in meg/l- is relatively high, the soil is not recommended for the production of legumes. It is also noted that in these soils the PH is found to be slightly acidic which interfers with the soil/plant/microbial complex.

Lastly it could be said that the soil class is of a rather poor quality, but nevertheless can be improved by proper cultural and tillage practices.

2.2.3. Vegetation

Rigl El Fula Rural Council falls within the major vegetation division of low rainfall woodland savannah on sand, which is divided into three sub-divisions,(Harrison and Jackson):

i) "The Combretum cordofanum - Delbergia - Albizzia sericocephalla savannah association. The dominant tree species are Combretum cordofanum, Albizzia sericocephala, Dalbergia melanoxylon and Guiera sengalensis.

ii) Terminallia sclerocaryes, Anogeissus prospopis association which dominates on deep sandy soils. The main tree species in this association are Terminallia brownii, Sclerocarya birrea, Anogeissus Schimperi, Prospis africana, Combretum cardofanum and Albizzia sericocephala.

iii) The Combretum cardofanum - Albizza - Dalbergia - Acacia senegal association which is found in alluvial soils occurring on the upslope of clay depressions. Acacia senegal and Lannea humilis are the main dominant species in this association (Hunting Technical Services 1976).

The dominant under storey in relation to these associations is comprised of the following grass species: Dactylocterium aegypticumi, Eragrostus emberbes, Hyparhenia pseudocymbana, Diphyllus spp. and Andropogon gayanus.

There is a close association between soil types and vegetation distribution. On those soils where land has been heavily used, e.g. sandy soils, the vegetation cover has witnessed noticeable changes, especially around settlements.

Bushes of Guiera senegalensis are spreading around villages taking the place of once valuable species. In addition, large scale destruction of trees has occurred because of expansion of cultivations particularly groundnut farming. Provision of water sources in the last decade or two has also added to the rate of devastation as a result of intensified human activity and overstocking of livestock around these sources. Another contributing factor to vegetation degradation is annual fires which reduce the grass cover.

2.2.4. Land Use

Two major forms of land use plus one subsidary type are practiced in the area. The major land use types are arable farming and livestock raising. The minor one is the tapping of forestry products through fuel wood and charcoal making, and limited gum production.

Crop raising is practiced through shifting cultivation and wholly depends on annual rainfall. The main crops produced are pearl millet (dukhun) and sorghum (marig) as staple food crops and groundnut as the main cash crop with kerkade attempted too. Vegetable crops such as Okra, cow pea (Lubia) tomatoes, pepper, cucumber (Tibish) and watermelon are produced in limited amounts for home consumption and the local market.

Livestock raising is an activity of both pastoralists and village settlers. For the former it involves large scale seasonal migrations between the northern and southern parts of the district, timed by rainy and dry season conditions. The main animals raised by the pastoralists are cattle, sheep and goats.

The settled population keeps animals too but in small numbers and mostly goats. The drought years of 1982-84 have drastically affected livestock numbers in

the area, particularly those owned by villagers. There is interaction and integration between the two types of economy i.e. crop farming and livestock raising among both pastoralists and sedentarists.

The subsidary form of land use which centres on forestry products is mainly practiced by the settled population, producing fuel wood, charcoal and construction material which are sold at Rigl El Fula.

A recently emerging form of land use is the development of small scale irrigated gardens for the production of fruits and vegetables. This is mainly attempted at places of shallow water aquifers and in the flood depressions of wadis. Production has not yet reached export level to other areas, and is mainly for the local market.

## 2.3. Socio-Economic Aspects

### 2.3.1. Population Size

According to 1983 Census Rigl El Fula District had a population of 390,975 persons, while Rigl El Fula Rural Council had 83,379 persons.

Regarding the 4 sampled settlements, their estimated population and household numbers are in the following order:

Table 1: Households and population of four sampled settlements.

| Settlement | Type: sedentary/ Nomadic | Number of: Population | Number of: Households | Average: Household size |
|---|---|---|---|---|
| El Fula El Zarga | Sedentary | 1,337 | 145 | 9.2 |
| Tirgato | " | 1,046 | 115 | 9.0 |
| Rigel El Benaya | " | 776 | 96 | 8.0 |
| Tabaldiyat Fallata | Nomadic | 550 | 65 | 8.5 |
| Total | | 3,709 | 421 | 8.8 |

Source: Sugar Rationing village estimates, and interview findings.

The above findings point out the following demographic aspects :-

- The target population of the project may include both sedentarists and nomadic groups, since the latter regularly set up their encampments every rainy season in the rural council area for grazing and farming activities. For this reason Tabaldiyyat Fallata was included in the sample as a representative case of the pastoral population.

- Average household size is in the order of 8.8 persons. The 421 households of the 4 sampled settlements present an adequate population to select from target farmers on implementing the project.

- The 83,379 population of Rigl El Fula Rural Council comprises 9,475 households, giving larger beneficiary groups, once expanding the project is seen feasible.

2.3.2. Ethnic composition

2.3.2.1. Messeriya

The dominant tribal group are Messeriya Ez Zurg, who are the owners of the land, judged on their size and historical occupation of the area. They are cattle raising nomads who carry timely migrations between the riparian land of Bahr El Arab, where they spend the dry months (November-May), and the northern half of Rigl El Fula District where they practice rainy season grazing (July-September) and raise crops.

There is an observed trend in the last two decades among many of the Messeriya to change into transhumant, prolonging their stay in the northern area beyond rainy season grazing requirements. This is partly attributed to the rise of many water sources, mainly tube-wells acting as nuclei for settlement, and partly due to the growing interest in farming.

Tabaldiyat Fallata, the nomadic settlement studied, was occupied by a Salamat sub-tribal group. The site is their farming locality, which they usually visit in June,

ahead of their cattle which is left about 40 km. south of the place. This early coming enables the household to prepare the fields and carry out the sowing and weeding operations, and at the same time manages the herd which grazes at proximity.

By the middle of the rainy season (August) the household and the herd unite and head to the sandy country lying to the north to escape flies and wet soils, leaving the cultivated fields under the supervision of a few group members. Crops are harvested on the return journey, again with some of the household members gaining time ahead of the herd, to carry out the harvest operation.

2.3.2.2. Other groups

The Messeriya country seems to have witnessed infilteration of many alien elements. This had its start with the collapse of the Mahdiya which induced groups to seek refuge in foreign lands. This trend continued, being maintained by various population migration factors. The three studied villages reflect a high ethnic heterogenity as may be judged from these results :

| Village | Ethnic group | Origin |
|---|---|---|
| El Fula El Zarga | Berti | Darfur |
| | Bargo | " |
| | Mataneen | " |
| Tirgato | Hamar | Kordofan |
| | Bederiya | " |
| | Mussabaat | " |
| | Berti | Darfur |
| Rigl El Benaya | Bargo | Darfur |
| | Salamat | Kordofan (Messeriya) |
| | Bederiya | Kordofan. |

Of all above groups only the Salamat and the Hamar could be traced to a nomadic origin. The rest originate from a sedentary population which practices agriculture as its major form of livelihood.

## 2.4. Organization and Leadership

In these traditional communities social organization is founded on blood relations and ethnic affiliation. In a group of the same origin like the Salamat there is evidenced homogenity of population element and social and political attitudes. In the other villages people differentiate themselves by their ethnic descent, hence tend to

cluster both physically within settlement, and socially and politically when confronted by situations resolved through group interests. Despite this ethnic identification village life is peaceful and people have managed to find a social harmony out of ethnic diversity.

In the 4 communities studied there is a dominating role of males over females. Among males the elders and heads of families organize village life, represent it to the outside world, and give it its leadership. The latter is vested in the hands of the village Sheikh. Villages occupied by more than one ethnic group, normally have more than one Sheikh, each representing his followers.

The Sheikh office is a heredity one, i.e. sons succeed fathers, except when the candidate is fallible for behavioural reasons. Qualities demanded in leadership may include: honesty, common sense, courage, and interest in community welfare.

The system of Sheikh leadership has its origin in tribal life where it was traditionally instituted. The native administration system, developed during the British period, was founded on this system. The British ratified it, and gave it taxation, security and judicial powers. Despite the many changes effected on the system during

May regime (1969-1984) it still proves to be the real people's administration in rural areas.

In the surveys conducted in the 4 settlements, it was the village Sheikhs who were first approached by the study team, and they were the ones who organized meetings with the pannel farmers interviewed. The acceptance of people of Sheikhs' leading role in village life was sensed in these meetings. This encourages one to see some role for traditional village leadership in implementing the project, as a source of contact between farmers and project management.

# CHAPTER THREE

# FORMS OF LIVELIHOOD

## 3.1. Population Activities

Two major and two subsidary forms of livelihood are practiced by the population of the project area. Regarding the former, crop production is the main activity of the sedentarist and the next important one of the nomads, while livestock raising reverses roles as of secondary importance to the sedentarist and of major importance to the nomads. As for the subsidary activities, these are: forestry products for the market namely fuel wood, charcoal and to a lesser degree building material, practiced by the sedentarists, and employment within and outside the area carried out by both categories of population.

## 3.2. Some Basic Statistics

To assess the role and contribution of the above forms of livelihood in the economy of the project area, 7 to 11 pannel farmers were selected at random, from each of the 4 settlements surveyed, and interviewed on their economic performance during 1986 production season. The results of this exercise present a factual

picture from the field, and give solid bases for analysing the economic and production situation and deriving conclusions. The forthcoming sets of tables shall be presented for this purpose.

3.3. Crop Raising

3.3.1. General

Table 2 gives information on some of the main parameters of crop raising in the 4 surveyed settlements. The general aspects of this form of production may be featured as follows:

- Full dependance on annual rainfall.
- Practiced as a traditional form of shifting cultivation, with plots alternated between fallow and production.
- Geared to household sustenance requirements, with emphasis on staple food crops among nomads and a mixing of food and cash crops among sedentarists.
- Applies practices intrinsically developed by the local farmer, without almost any innovated inputs.
- Uses rudimentary implements (ax for cleaning fields, 'Toriya' for casting seeds, Hoe for weeding, and Madgag for threshing) inherited by the farmer through the ages.

- Depends on family labour, which is of recent being distracted away from household farm, to raise income to meet family sustenance
- Lacks basic agricultural services, e.g. agriculture extension, plant protection, credit, marketing and storage infra-structure, etc.
- Fluctuating yields and unsecure harvest due to rainfall risks, poor inputs and the effects of pests and diseases.

3.3.2. Crops

Analysing crop raising status in the project area, from the data in Table 2, reveals that the main crops produced are millet, sorghum, and groundnut. Kerkade is of minor importance, being reported by only one case of the sample covered. Other crops came across in the survey were sesame, cowpea, watermelon, cucumber, okra and tomatoes, some of which are raised by the housewife in a small farm known locally as 'Jubraka'. Except for sesame, these last mentioned crops are produced in small quantities for generation of cash during the rainy season, with surpluses stored to meet household needs, throughout the year.

Table 2: Crop Raising Status in four surveyed settlements

Note: 0:Crop not cultivated 000:Crop cultivated but gave no yield.

| Name of Settlement | Case No. | Family size | CROP PRODUCTION STATUS 1986 Dukhun(Millet) Acreage | Dukhun(Millet) Total Production(Kg.) | Sorghum(Marig) Acreage | Sorghum(Marig) Total Production(Kg.) | Groundnut Acreage | Groundnut Total Production(Kg.) | Kerkade Acreage | Kerkade Total Production (Kg.) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Tabaldiyat Fallata | 1 | 7 | 12.0 | 380 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 9 | 6.5 | 190 | 0.5 | 380 | 0 | 0 | 0 | 0 |
| | 3 | 8 | 3.0 | 95 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 11 | 12.0 | 760 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5 | 10 | 10.0 | 380 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 8 | 8.0 | 235 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 7 | 7 | 8.0 | 380 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8 | 8 | 5.0 | 333 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 9 | 9 | 5.0 | 285 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 10 | 10 | 6.0 | 380 | 0 | 0 | 0 | 0 | 0 | 0 |
| Averages: | | 8.7 | 7.6 equivalent 11.5 feddan. | 30 Kg./ feddan | | | | | | |

Average household acreage 11.5 feddan.

cont../..

Table 2 (Cont.)

0: Crop not cultivated  000: Crop cultivated but gave no yield

| Name of settlement | Case No. | Family size | CROP PRODUCTION STATUS 1986 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dukhun(Millet) | | Sorghum(Marig) | | Groundnut | | Kerkade | |
| | | | Acreage | Total Production(Kg.) | Acreage | Total Production(Kg.) | Acreage | Total Production(Kg.) | Acreage | Total Production (Kg.) |
| 2.El Fula El Zarga | 11 | 11 | 1 | 000 | 1 | 143 | 2 | 1332 | 0 | 0 |
| | 12 | 4 | 1 | 143 | 0 | 0 | 2 | 440 | 0 | 0 |
| | 13 | 10 | 2 | 238 | 0.5 | 380 | 3 | 2220 | 0 | 0 |
| | 14 | 8 | 1.5 | 285 | 0 | 0 | 2 | 1465 | 0 | 0 |
| | 15 | 3 | 1.5 | 000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 16 | 11 | 1.5 | 143 | 0.5 | 143 | 1 | 533 | 0 | 0 |
| | 17 | 8 | 2.5 | 48 | 0 | 0 | 1 | 444 | 0 | 0 |
| Averages | | 7.9 | 1.6 Equivalent 2.4 feddan. | 81.6Kg. feddan. | 0.67 Equivalent 1 feddan. | 148Kg. feddan | 1.8 Equivalent 2.7 feddan | 390Kg. feddan | | |

Average household average under three crops equals 6.1 feddan.

cont../..

Table 2 (cont..)

0: crop not cultivated. OOO:crop cultivated but gave no yield.

| Name of Settlement | Case No. | Family size | CROP PRODUCTION STATUS 1986 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dukhun(Millet) | | Sorghum(Marig) | | Groundnut | | Kerkade | |
| | | | Acreage | Total Production(Kg.) | Acreage | Total Production(Kg.) | Acreage | Total Production(Kg.) | Acreage | Total Production (Kg.) |
| 3.Tirgato | 18 | 11 | 2 | 000 | 3 | 380 | 0 | 0 | 0 | 0 |
| | 19 | 8 | 3 | 190 | 3 | 285 | 0.5 | 44 | 0 | 0 |
| | 20 | 9 | 2 | 380 | 2 | 143 | 0 | 0 | 0 | 0 |
| | 21 | 7 | 5 | 570 | 0 | 0 | 1 | 222 | 0 | 0 |
| | 22 | 3 | 3 | 665 | 1 | 285 | 1 | 665 | 0 | 0 |
| | 23 | 8 | 1 | 48 | 3 | 380 | 0 | 0 | 0 | 0 |
| | 24 | 5 | 3 | 285 | 1 | 48 | 0 | 0 | 0 | 0 |
| | 25 | 6 | 1 | 48 | 2 | 285 | 1 | 444 | 0 | 0 |
| | 26 | 7 | 2 | 380 | 2 | 95 | 0 | 0 | 0 | 0 |
| Averages | | 7.1 | 2.4 Equivalent 3.6 feddan | 77.8Kg/ feddan | 0.47 Equivalent 0.70 feddan. | 167.7Kg/ feddan | 0.88 Equivalent 1.32 feddan | 262Kg./ feddan. | | |

Average household acreage under three crops equals 5.62 feddan.

cont../..

Table 2 (cont..)

0: Crop not cultivated  000: Crop cultivated but gave no yield

| Name of Settlement | Case No. | Family size | CROP PRODUCTION STATE 1986 Dukhun (Millet) Acreage | Dukhun (Millet) Total Production (Kg.) | Sorghum (Marig) Acreage | Sorghum (Marig) Total Production (Kg.) | Groundnut Acreage | Groundnut Total Production (Kg.) | Kerkade Acreage | Kerkade Total Production (Kg.) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4. Rigl El Benaya | 27 | 11 | 1 | 000 | 0.5 | 380 | 0 | 0 | 1.5 | 000 |
| | 28 | 7 | 8 | 190 | 1 | 475 | 1 | 266 | 0 | 0 |
| | 29 | 5 | 1 | 380 | 1 | 285 | 1 | 133 | 0 | 0 |
| | 30 | 3 | 2 | 475 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 31 | 5 | 4 | 285 | 1 | 143 | 0 | 0 | 0 | 0 |
| | 32 | 10 | 1.5 | 190 | 0.5 | 190 | 0.5 | 89 | 0 | 0 |
| | 33 | 7 | 2.5 | 285 | 0.5 | 95 | 0 | 0 | 0 | 0 |
| | 34 | 7 | 1.5 | 143 | 0.5 | 190 | 0 | 0 | 0 | 0 |
| | 35 | 7 | 3 | 190 | 1 | 475 | 0.5 | 222 | 0 | 0 |
| | 36 | 8 | 3 | 238 | 0.5 | 143 | 0.5 | 133 | 0 | 0 |
| | 37 | 10 | 3 | 380 | 1 | 48 | 1 | 133 | 0 | 0 |
| Averages | | 7.3 | 2.8 Equivalent 4.2 feddan | 69 Kg/ feddan | 0.7 Equivalent 1 feddan | 230Kg./ feddan | 0.75 Equivalent 1.1 feddan | 144Kg./ feddan. | 0 | 0 |

Average household acreage under three crops equals 6.3 feddan.

The two main staple grain crops raised are millet and sorghum, with the former assuming a leading role both in terms of acreage put to production and frequency of farmers producing it. Groundnuts is the main cash crop raised by the sedentarist, as judged from its frequency in the 4 surveyed settlements.

Farmers' strategy varies comparing nomads to sedentarists. While the former concentrate wholly on millet, the latter diversify their production incorporating sorghum and groundnuts. The main reasons behind this change in strategy of production may be explained by the fact that:

- Pastoralists' main drive is to secure an adequate grain supply, as they depend on the sales of their livestock for generation of cash.
- Sedentarists on the contrary have to depend on crop production for meeting both needs, hence are induced to raise cash crops.
- Pastoralists are on the move, not having amble time to attend to cultivations as it is true of sedentarists.

3.3.3. Acreage

There is a large variation in the acreage cultivated between the pastoralists and the settled

cultivators. The figure derived from the sample taken at Tabaldiyat Fallata is 11.5 feddan as compared to the mean of the three other villages being in the order of 6.3 feddans, almost half that of the former. This is attributed to:

- The financial ability of the pastoralists to hire labour as compared to the poverty of the sedentarist.
- Concentration of pastoralists on light sandy soils which are easy to work in comparison to 'gardud' and clay soils put under sorghum by the sedentarists.
- Cultivation of groundnuts by the sedentarists which is labour intensive in relation to millet, the main crop of the pastoralists.
- Selling of the sedentarists of part of their labour during the cultivation season to raise cash.

3.3.4. Land Tenure

Land in the project area is communally owned by village population. Every village knows the boundaries of its property, normally demarcated by natural land marks, which are recognized by neighbouring villages.

Within the village land each farmer owns fields. Due to the practice of shifting cultivation which entails rotating plots, all farmers usually possess more land than what they actually cultivate at any one season.

Land which is not used is put under the control of the village community, entrusted to the Sheikh of the village, who may dispose of it to village members in need of land, or to new comers who want to cultivate in the village area. In case of the later, land is leased for a certain period, at the end of which it goes back as village property.

Over cultivation of land occurs at places where there is increasing pressure of population on land, or as a result of development of commercial farming which expands the acreage cultivated. Both factors have not yet affected the use of land in the project area.

On surveying farmers' present property status, regarding acreage actually cultivated and land resting or unused, it was revealed by the 4 sites visited, that all farmers have access to large acreage in the range of 50 - 100 feddan. Hence, expanding household cultivation

under the proposed animal traction project shall not face a problem of land shortage.

3.3.5. Agricultural Operations

Agricultural operations are carried out in the same sequence by sedentarists and pastoralists in the following order:

i. Land clearance: Before the rainy season land is cleared from trees, bushes and previous year crop residues. All this material is piled and burned during April-May.

ii. Sowing: 'Rameil' sowing (sowing on dry soil) is practiced during June. The first crops sown are millet and sesame in case the latter is raised. This is followed by sorghum and okra after the first showers. Late in the season they grow cowpeas and watermelons.

iii. Weeding: Weeding starts from time of seed emergence and is continued for two to three weeks. The first weeding is highly decisive in the success of the crop, and unless it is completed within three weeks after seed emergence, the crop will be dominated by weeds. The second weeding is practiced in the period from the 7th to the 9th week after seed emergence. The second weeding is a less tedious job because the weeds are scattered and more easy to control.

iv. Harvest: Timing of crop harvesting depends on the type of crop grown and the time of its sowing. Generally, it starts from the first week of October and continues onwards. Millet and groundnut harvest is concluded first, followed by sorghum. Harvest of all crops is normally completed before the coming of nomads into the area.

3.3.6. Farm Inputs

i. Seeds: In an average year farmers always keep enough seeds from their previous harvest to grow in the next season. In years of bad rain, they normally run short of seeds because they need to resow the crop even two or three times. Farmers in the area are keen on growing good quality seeds, and they ask for that continuously.

ii. Labour: Crop raising in this area depends on household labour. On the average, a head of household is assisted by 2-3 members of his family in executing the various agricultural operations. To poor farmers, in terms of cash income earnings, household labour may not be timely available for undertaking operations in their fields, since such farmers, being needy of cash, sell their labour to rich farmers in the area. This has its direct effect on household production, as operations in poor farmers' field are not carried efficiently. In this

respect adoption of animal traction shall improve on labour utilization in the area, for both rich and poor farmer, by alleviating the labour bottleneck during the period of weeding.

iii. Agricultural Implements: Traditional and rudimentary as described before, resulting in low efficiency.

3.3.7. Pests and Diseases

i. Rats: It is the main pest in the area and causes great hazards to farmers. Rats affect all crop stages from sowing to the store. Field rats dig out the seeds before they germinate, cut the seedlings, feed on the heads, and destroy the crop when stored. To control rats a programme of baiting is essential. This could be arranged with the Department of Crop Protection of the Regional Ministry of Agriculture.

ii. Birds: Also birds are a source of menance to farmers, particularly at the time of crop harvest. The main type of bird attacking crops is Quelia Quelia which invade the area as from October. Control of birds could be effective by destroying nests at the egg-laying stage, which normally farmers in this area attempt. The other method of control is by spraying of pesticides using planes. Farmers could contribute their efforts to the first method, if a programme is organized by the Department of Crop Protection.

iii. Grass hopper: This is an indigenous pest of the area. It is most harmful at the seedling and milky stage. It could be controlled by attacking the pest at its breeding grounds.

iv. Striga: It is a famous noxious weed (Singa hermonthica), known locally as 'buda'. Striga normally dominates fields cultivated continuously with sorghum or millet. The farmer can control it by following proper crop rotation, which includes groundnut and sesame, since the weed does not survive in fields of crops other than those of the family graminaceae.

3.3.8. Yields

According to calculations based on figures furnished by Annual Agricultural Statistics Bulletin, the following production levels may be supplied for comparison of status of crop production in the project area.

Production in kg/Feddan

| Crop | L:Low | M:Medium | H:High | Sudan Average |
|---|---|---|---|---|
| Millet | 95 kg | 95-190 | 190 | 94.7 |
| Sorghum | 90 kg | 90-180 | 180 | 84.5 |
| Ground-nuts | 460 kg | 460-920 | 920 | 458 |

The data furnished by Table 2 points clearly to a drop in productivity below the national average (for 1986 production) for the two crops millet and groundnuts, since the figures from the table read:

- Tabaldiyat Fallata: 30 kg. of millet/feddan
- El Fula El Zarga : 81.6 kg. millet 148 kg. sorghum and 390 kg groundnut/feddan.
- Tirgats : 77.8 kg. millet, 167.7 kg. sorghum, and 262 kg. groundnut/feddan.
- Rigl El Benaya : 69 kg. millet, 229 kg. sorghum, and 144 kg. groundnut/feddan.

According to farmers reporting, 1986 was not a good production year as compared to 1985 for example, in which they achieved good production levels, and managed to raise a surplus in millet which carried them through the rainy season of 1986. Data furnished by 4 farmers picked randomly from the 10 farmers surveyed at Tabaldiyat Fallata signifies this fact:

| Case | acreage (makhams) | Production (millet) kg. |
|---|---|---|
| 1 | 10 | 5225 |
| 2 | 15 | 9500 |
| 3 | 8 | 3610 |
| 4 | 8 | 3230 |
| | 41 | 21565 |
| Average | 10.25 | 350.7/feddan |

This production rate is far beyond Sudan average and is almost double the highest level of production specified previously.

As mentioned before fluctuation of yields from one year to another is an established feature of this kind of farming. It is attributed to a number of factors:

- Rainfall amounts and distribution, e.g. 156.0 for 1984, 459 for 1985, and 280.5 for 1986, quoted from near-by Dabkar station (one of NMRDP sub-centres) distributed as follows:

| | 1984 | 1985 | 1986 |
|---|---|---|---|
| May | - | 38.0 | - |
| June | - | 68.0 | 33.5 |
| July | 32.5 | 74.0 | 47.5 |
| August | 57.0 | 82.0 | 92.5 |
| September | 66.5 | 195.0 | 87.0 |
| October | - | 2.0 | - |
| | 156.0 | 459 | 280.0 |

- Timely execution of agricultural operations, especially weeding, which requires to be optimumly carried out in the first 21 days after establishment of crops, approximately from 10th of July and onwards in an average

rainy year. It seems that family size is not indicative of a comfortable household labour situation, as this is not reflected in a substatial variation in acreage cultivated, judged on the figures furnished by Table 2. The head of the household is the major contributor of the labour effort, assisted by 2-3 of his family members. When forced to sell part of his labour, his performance is affected, leading to low productivity, as explained before.

- The other major factor behind low productivity are pests and noxious weeds, referred to previously.
- Of importance, but not applicable to all sites surveyed, is flooding of clay soils put under sorghum, reported by El Fula El Zarga farmers, which leads to a total loss of the crop, sometimes at a progressive stage of its establishment.

## 3.4. Livestock

### 3.4.1. The Pastoralists' Economy

Livestock raising is the major activity of the Messeriya pastoralists and the second important activity of the settled cultivators. The pastoralists fully depend on natural range, Fig.3, and reflect the following major features:

- Cattle is the main animal raised by the Messeriya, with sheep and goats coming next in importance, and camels recently acquired as transport animals.
- Household livestock ownership varies considerably and pastoralists are reluctant to supply information on ownership. However, for a household to pursue a migratory movement after livestock, it has to possess 35 head of cattle, about 20 sheep (not for all) 10 to 15 goats, 2 donkeys and/or one camel. Those owning less, turn into settlers.
- As portrayed by Fig.3 the dry period is spent in the riparian areas of the border lands of Kordofan, Upper Nile and Bahr El Ghazal regions, and the rainy period in the northern half of Rigl El Fula District and further north into En Nahud District. Crop raising is cleverly integrated in their grazing calender.
- Livestock is the main source of family cash needs, with crop raising practiced to provide for family grain supply, hence minimizing livestock sales to meet this basic necessity.
- Animals are normally sold during the rainy season, while the pastoralists are in contact with the market places located in northern grazing belt.

- The annual income generated by the average household from livestock sales is estimated at Ls 4000.

3.4.2. The Sedentarists' Economy

Livestock raising is second in importance to crop production in the settled cultivators economy, as a time occupying activity and as a source of food and cash for the household. This position might have shaken a little bit after the 1984 drought, since for many households, income generating activities, such as selling of fuel wood began to assume more importance as sources of cash.

Past and present status of livestock production system, and its contribution to household economy could be arrested from Tables 3 and 4. Table 3 featuring livestock ownership at drought time and presently could be used as a base to draw the following conclusions:

- Almost all farmers in the project area own one kind of livestock or another, particularly goats and donkeys. Average household ownership is in the order of 9.6 goats and 1.1 donkeys.

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Table 3: Livestock Ownership at Drought Time (1984/85) and presently

Note: 1=Number owned, 2=Number sold, 3=Number died } in this section
4=Number owned, 5=Number sold, 6=value } in this section

| Name of Settlement | Case No. | Livestock Owned 1984/85 | | | | | | | | | | | | Livestock presently owned and sales between November and April 1987. | | | | | | | | | | Total value Ls. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Goats | | | Sheep | | | Cattle | | | Donkeys | | | Goats | | | Sheep | | | Cattle | | | Donkeys | | | |
| | | 1: | 2: | 3: | 1: | 2: | 3: | 1: | 2: | 3: | 1: | 2: | 3: | 4: | 5: | 6: | 4: | 5: | 6: | 4: | 5: | 6: | 4: | 5: | 6: | |
| 1.El Fula | 11 | 15 | 3 | 0 | 0 | 0 | 0 | 20 | 5 | 8 | 1 | 0 | 0 | 10 | 3 | 185 | 0 | 0 | 0 | 6 | 2 | 550 | 1 | 0 | 0 | 735 |
| El Zarga | 12 | 20 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 10 | 2 | 215 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 215 |
| | 13 | 15 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 14 | 30 | 10 | 5 | 0 | 0 | 0 | 3 | 2 | 1 | 1 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 15 | 10 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 16 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 2 | 180 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 180 |
| | 17 | 16 | 7 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 2.Tirgato | 18 | 20 | 5 | 5 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 15 | 5 | 350 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 350 |
| | 19 | 10 | 2 | 0 | 5 | 3 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 7 | 2 | 160 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 150 | 310 |
| | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 9 | 25 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 21 | 20 | 10 | 0 | 0 | 0 | 0 | 8 | 3 | 5 | 2 | 0 | 0 | 15 | 3 | 225 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 225 |
| | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 3 | 16 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 24 | 4 | 4 | 0 | 0 | 0 | 0 | 5 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 25 | 13 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 10 | 2 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 150 |
| | 26 | 9 | 7 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 3.Rigl | 27 | 72 | 30 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 31 | 20 | 850 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 850 |
| El Benaya | 28 | 30 | 10 | 2 | 0 | 0 | 0 | 12 | 10 | 0 | 4 | 2 | 0 | 25 | 5 | 275 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 275 |
| | 29 | 25 | 5 | 0 | 0 | 0 | 0 | 12 | 5 | 0 | 1 | 0 | 0 | 18 | 6 | 300 | 0 | 0 | 0 | 6 | 0 | 0 | 1 | 0 | 0 | 300 |
| | 30 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 31 | 20 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 17 | 4 | 420 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 420 |
| | 32 | 10 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 11 | 6 | 280 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 280 |
| | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 34 | 10 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 2 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 105 |
| | 35 | 18 | 6 | 2 | 0 | 0 | 0 | 9 | 6 | 3 | 1 | 0 | 0 | 15 | 8 | 500 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 500 |
| | 36 | 12 | 4 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 5 | 5 | 250 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 250 |
| | 37 | 15 | 3 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | | 15.0 | | | .19 | | | 5.7 | | | 1.2 | | | 9.6 | | | 0 | | | .63 | | | 1.1 | | | 190 |

- Not like the Messeriya pastoralists, sheep are not raised neither before or after the drought, due to two facts: the animal is delicate to raise, plus the fact that the terrain of the area is not suitable for sheep, especially during the rainy season.
- Cattle was raised by many households up the drought time, with an average household ownership of 5-7 heads. This presently dwindled to 0.63 heads, as a result of selling and mortality. Hence, cattle as draught animals for the purposed animal traction project are not available as household property.
- Of the three animals, goats and donoys were the least reduced by drought conditions as compared to cattle, and if years of good rains and grazing persist, the goat population of the area shall probably increase.
- There is a continuous feed back between the livestock owned and the production attained from crop raising. In good crop years, cash surpluses made from farming are tied back in livestock, and the reverse occurs at times of bad harvest, with animals sold to supply the cash needs of the family.

- The average household income derived from the sales of livestock mainly goats is in the order of Ls. 190.

Table 4 traces the relationship between livestock raising, crop farming, and the other economic activities practiced by the population. The following salient points may be depicted from the table.

- Out of 25 households (92.5% of the three villages sample) owning livestock, 15 households (60%) resorted to livestock selling after 1986 harvest.
- Livestock selling is tuned by the dura supply available to the family and the other income generating activities practiced by the household.
- The main other sources of cash as it appears from Table 4 are: selling of fuel wood and charcoal, selling of labour inside and outside the area, and running of other businesses inside the area.

3.5. Fuel Wood, Charcoal and Building Material

Farmers, especially the poor segment among them, with limited returns from crop farming, and who are poor in livestock, resort to the selling of forestry products to generate cash. The presence of

Table 4: Livestock Raising as related to other economic activities.

x: Activity practiced  O: Activity not practiced, attained,

| Name of settlement | Case No. | Crop production status 1985-1986: Amount reserved July 1986 from 1985 production (Sacks) | (Kg.) | Amount attained from 1986 harvest (Sacks) | (Kg.) | Amount at home June 1987 (Sacks) | (Kg.) | Earnings from sales of 1985 cash crops | Other sources of cash to purchase dura and meet other family needs: Selling of livestock | Selling of fuel wood/ charcoal outside area | Selling labour inside area | Selling labour outside area | Receives remittances | Running other business inside area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1.El Fula El Zarga | 11 | 10.0 | 950.0 | 1.5 | 143.0 | 6.0 | 570.0* | 1500.0 | x | O | O | O | O | x** |
| | 12 | 14.0 | 1330.0 | 1.5 | 143.0 | 3.0 | 285.0 | 500.0 | x | x | O | O | O | O |
| | 13 | 4.0 | 380.0 | 6.5 | 618.0 | 3.0 | 285.0* | 2500.0 | O | O | O | O | O | x** |
| | 14 | 6.0 | 570.0 | 3.0 | 285.0 | 7.5 | 713.0* | 1664.0 | O | O | O | O | x | O |
| | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | O | x | x | O | O | O |
| | 16 | 4.0 | 380.0 | 3.0 | 285.0 | 3.0 | 285.0* | 600.0 | x | x | O | O | O | O |
| | 17 | 8.0 | 760.0 | 0.5 | 48.0 | 1.5 | 143.0 | 500.0 | O | x | O | O | O | O |
| 2.Tirgato | 18 | 0 | 0 | 4.0 | 380.0 | 0 | 0 | 0 | x | O | O | O | O | O |
| | 19 | 5.0 | 475.0 | 5.0 | 475.0 | 1.5 | 143.0 | 50 | x | O | O | O | O | O |
| | 20 | 9.0 | 855.0 | 5.5 | 523.0 | 1.5 | 143.0 | 0 | O | O | O | x | O | O |
| | 21 | 9.0 | 855.0 | 6.0 | 570.0 | 2.0 | 190.0 | 250.0 | x | O | x | O | O | O |
| | 22 | 5.0 | 475.0 | 10.0 | 950.0 | 4.0 | 380.0 | 749.0 | O | O | x | O | O | O |
| | 23 | 0 | 0 | 4.5 | 428.0 | 0 | 0 | 0 | O | O | x | x | O | O |
| | 24 | 2 | 190.0 | 3.5 | 333.0 | 0 | 0 | 0 | O | O | x | O | O | O |
| | 25 | 3 | 285.0 | 3.5 | 333.0 | 0 | 0 | 500.0 | x | O | O | x | O | O |
| | 26 | 2 | 190.0 | 5.0 | 475.0 | 3 | 285 | 0 | O | O | O | O | O | x 1/ |

cont../..

Table 4 (cont..)

| Name of settlement | Case No. | Crop Production Status 1985-1986 | | | | | | Earnings from sales of 1985 cash crops | Selling of livestock | Selling of fuel wood/charcoal | Selling labour inside area. | Selling labour outside area | Receives remittances | Running other business inside area. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Amount Reserved July 1986 from 1985 Production | | Amount attained from 1986 harvest | | Amount at home June 1987 | | | | | | | | |
| | | Sacks | Kg. | Sacks | Kg. | Sacks | Kg. | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 3.Rigl El-Benaya | 27 | 6 | 570 | 4.0 | 380 | 0 | 0 | 0 | x | 0 | 0 | 0 | 0 | 0 |
| | 28 | 8 | 760 | 7.0 | 665 | 2 | 190 | 300.0 | x | 0 | 0 | x | 0 | 0 |
| | 29 | 5 | 475 | 7.0 | 665 | 1 | 95 | 150.0 | x | 0 | 0 | 0 | 0 | 0 |
| | 30 | 1 | 95 | 5.0 | 475 | 0 | 0 | 0 | 0 | x | 0 | 0 | 0 | 0 |
| | 31 | 4 | 380 | 4.5 | 418 | 1 | 95 | 0 | x | x | 0 | 0 | 0 | 0 |
| | 32 | 3 | 285 | 4.0 | 380 | 0 | 0 | 100.0 | x | 0 | 0 | x | 0 | 0 |
| | 33 | 2 | 190 | 4.0 | 380 | 2 | 190 | 0 | 0 | 0 | 0 | x | 0 | 0 |
| | 34 | 1 | 95 | 3.5 | 333 | 2 | 190 | 0 | x | 0 | 0 | x | 0 | 0 |
| | 35 | 3 | 285 | 7.0 | 665 | 3 | 285 | 250.0 | x | 0 | 0 | 0 | 0 | 0 |
| | 36 | 0 | 0 | 4.0 | 381 | 1 | 95 | 150.0 | x | 0 | 0 | x | 0 | 0 |
| | 37 | 4 | 380 | 4.5 | 418 | 2 | 180 | 150.0 | 0 | 0 | 0 | x | 0 | 0 |

Notes on columns 6 and 15

* : Purchased dura after 1986 harvest.

** : Runs a horse cart.

1/ : petty trader.

an administrative centre like Rigl El Fula at proximity, and the loss of livestock by many households as a result of the last drought, have increased the dependancy of needy households on this source of income generation.

It is worth mentioning in this connection, that prior to the last drought, increase in livestock numbers was taken as a major factor behind devastation of the vegetation cover, through grazing and browsing activties. Though this is to some degree true, livestock has proved to have a counter balancing effect on the vegetation resource base as compared to activities resorted to as a result of loss of livestock. With the depleation of household livestock numbers, many farmers went directly to trees, turning them into fuel wood and charcoal resulting into higher devastation rates. Hence in this regard maximizing farmers' opportunity in other activities of production, such as increasing the acreage annually cropped by adopting animal traction, may reduce dependency on existing woods, and thus enhance ecosystem conservation needs.

The above mentioned three forestry products are practiced in the off-farming season period, November to June. Farmers producing them have to have a means of transport to carry the product to Rigl El Fula. Hence, nearly all households own donkeys which are used for this activity and also as a means of transport to the farm during the cultivation period. The average income generated by those practicing this form of economy is in the order of Ls. 400 per annum.

3.6. Employment Inside and Outside Area

3.6.1. Employment Inside Area

The major source of employment inside the area, other than wood products is agricultural wage labour, with peak times at farm preparation (May-June) and the weeding operation (July-August). It is mostly practiced within village, near-by villages and Rigl El Fula town, where labour is sold to financially able farmers. Selling ones' labour is determined by factors such as household dura and cash situation, the size of labour available to the household, and the prospects of economic returns from the household farm, assessed on crop performance.

Farmers who resort to wage labour in agricultural operations are forced into this undertaking because of their income limitations. They are estimated as making about 20% of the households in each of the surveyed villages.

Alternative sources of credit which farmers may bank on seem to be non-existent. Even the sheil system, which was to some degree practiced in this area, has haulted to function after the drought of 1984, as creditors, namely local merchants, began to question farmer's liability to pay back. Furthermore many merchants lost repeatedly on crediting on the groundnuts crop during the last 5 years, because of the fluctuating prices of the commodity.

Selling ones' labour means dividing his time between his own field and those of others' who employ him. The needy farmers' strategy is to conclude operations in his own farm and after that engage himself in others' fields. Very often this strategy does not work, as being induced by his immediate cash needs, many a farmer finds himself deferring operations in his own field to work for

others. The result is that he attains a poor harvest, as signified by a number of farmers in the sample surveyed relating their crop failure to late weeding due to their labour engagement in others' fields.

Labour prices are rising from year to another, and shall most probably continue so in the coming years. A major cause behind this is the haulting of the inflow of Abyei Dinka wage labour into this area (which almost assumed a regular trend in the last decade) due to the civil strife in the South. Prices of labour for 1985-87 show the following trend, Table 5.

The estimated income a farmer employing himself as wage labour raises in a farming season is in the order of Ls. 300.

Other sources of labour employment inside the area are individualized. In the sample surveyed, we came across respondents who run businesses such as horse carts and petty trade. Annual per capita income generated from such activities is in the order of Ls.300.

3.6.2. Employment Outside Area

There is migration to the other parts of the country for employment purposes. Emigration for the

Table 5: Prices of Agricultural Operations, 1985-87.

| Year | Operation | Unit | Price LS. |
|---|---|---|---|
| 1985 | Sowing "Saloka" | Dahawa | 5.00 |
| | Sowing "Dafan" | " | 2.50 |
| | Weeding "Mur" | Makhamas | 20.00 |
| | Weeding "Jankab" | " | 10.00 |
| 1986 | Sowing "Saloka" | Dahawa | 10.00 |
| | Sowing "Dafan" | " | 5.00 |
| | Weeding "Mur" | Makhamas | 50.00 |
| | Weeding "Jankab" | " | 20.00 |
| 1987 | Sowing "Saloka" | Dahawa | 15.00 |
| | Sowing "Dafan" | " | 7.50 |
| | Weeding "Mur" | Makhamas | 80.00 |
| | Weeding "Jankab" | " | 40.00 |

Source: Field Survey Data.

Notes : Saloka : Labourer who prepares seed holes.
Dafan : Labourer who cast seeds.
Mur : Is first weeding.
Jankab : Is second weeding.
Dahawa : Is days' work from 7 a.m. to 12 noon.
Makhamas: Is 1.5 feddans.

same purpose from this area to near-by countries is practiced on a very limited scale, being only reported by the first sample of pastoralists surveyed at Tabaldiyat Fallata.

Migrants head to urban centres, namely: Khartoum and Wad Medani, the irrigated agricultural schemes of Gezira, Rahad and White Nile area, and the sorghum mechanized farming schemes namely Gadaref area. They normally head to these places after they harvest their crops in December. However, some depart as early as October, only participating in the establishment of crops and not awaiting the harvest. They mostly return by June. The income generated from the activity is in the order of Ls. 800. A major item of expenditure on this income is buying clothes, and it is reported that a migrant would spend about Ls. 500 on clothes, coming back with Ls. 300 cash.

3.7. An Estimate of Income

In such traditional economies, and in absence of records and survey material, it is cumbersome to furnish an accurate picture of income. However, this is seen as an essential parameter for assessing the financial ability of the farmer and his prospects of

contribution to the realization of the proposed animal traction project. Thus an attempt at constructing a picture of farmers' income from the samples' findings is made in Table 6. The following points may be highlighted from the table

- Average annual income is in the order of Ls. 1367 including grains value, and Ls. 904 when excluding the latter, since grains are produced for family consumption and not for the market.
- Cash income earnings are in the range of 350 to Ls. 1646, with the majority falling close to the average, Ls. 904.
- High cash earnings are not indicative of cash surpluses, as amounts earned have to be balanced against household dura supply.
- Since for an average household of 8 persons, 10 sacks of dura are required annually, and at current market prices (averaging prices of millet and sorghum Ls.75) this has a value of Ls.750 which has to be met from family production or agumented from the market, almost all households are on the deficit side of an average amount of Ls.320.

Table 6: Respondents Income Levels Computed from Production Performance, Tables: 2, 3 & 4

Crop values worked out on following 1987 prices:
- a sack of dunkun Ls.85
- a sack of marig Ls.65
- a sack of groundnut Ls.50.

| Name of Settlement | Case No. | Crop value (Ls.) | | | Livestock Sales value LS: | | | | Income from inside and outside employment Ls. | | | | Income Level | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Millet | sorghum | groundnut | Goats | Cattle | Donkeys | Forestry products value Ls. | As wage labour inside area | From other activities inside area | As wage labour outside area | | Total income | Minus value of food crops Millet+Sorghum | value of food crops Ls. | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | 13 | 14 | 15 | |
| 1.El Fula | 11 | 0.0 | 98.0 | 1500 | 185 | 550.0 | 0.0 | 0.0 | 0.0 | 3000.0 | 0.0 | | 5333.0 | 5235.0* | 98 | |
| El Zarga | 12 | 0.0 | 128.0 | 500 | 215 | 0.0 | 0.0 | 4000 | 0.0 | 0.0 | 0.0 | | 1243.0 | 1115.0 | 128 | |
| | 13 | 213.0 | 260.0 | 2500 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3000.0 | 0.0 | | 5973 | 5500.0* | 473 | |
| | 14 | 255.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 1901 | 1646.0 | 255 | |
| | 15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 400.0 | 300.0 | 0.0 | 0.0 | | 700.0 | 700.0 | 0.0 | |
| | 16 | 128.0 | 98.0 | 600.0 | 180.0 | 0.0 | 0.0 | 4000 | 0.0 | 0.0 | 0.0 | | 1406 | 1180.0 | 226 | |
| | 17 | 43.0 | 0 | 500 | 0.0 | 0.0 | 0.0 | 4000 | 0.0 | 0.0 | 0.0 | | 943 | 900.0 | 43 | |
| 2.Tirgato | 18 | 0.0 | 260.0 | 0.0 | 350.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 610.0 | 350.0 | 260 | |
| | 19 | 170.0 | 195.0 | 50.0 | 160.0 | 0.0 | 150.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 725.0 | 365.0 | 360 | |
| | 20 | 340.0 | 98.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 800.0 | | 1238 | 800.0 | 438 | |
| | 21 | 510.0 | 0.0 | 250.0 | 225.0 | 0.0 | 0.0 | 0.0 | 300 | 0.0 | 0.0 | | 1285 | 775 | 510 | |
| | 22 | 595.0 | 195.0 | 749.0 | 0.0 | 0.0 | 0.0 | 0.0 | 300 | 0.0 | 0.0 | | 1839 | 1049 | 790 | |
| | 23 | 43.0 | 340.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 300 | 0.0 | 800.0 | | 1483 | 1100 | 383 | |
| | 24 | 255.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 300 | 0.0 | 0.0 | | 588 | 588 | 0.0 | |
| | 25 | 43.0 | 195.0 | 500.0 | 150.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 800.0 | | 1688.0 | 1450.0 | 238 | |
| | 26 | 340.0 | 65.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3000.0 | 0.0 | | 3405.0 | 3000.0* | 405 | |

cont../..

Table 6 (cont..)

| Name of Settlement | Case No. | Crop value Ls. | | | Livestock sales value Ls. | | | | Forestry Products value Ls. | Income from inside and outside employment (Ls.) | | | Income Level Ls. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Millet | Sorghum | Groundnut | Goats | Cattle | Donkeys | | | Average labour inside area. | From other activities inside area. | As wage labour outside area. | total income | Minus value of food crops Millet + Sorghum | Value of food crops Ls. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| El Benaya | 27 | 0.0 | 26.0 | 0.0 | 850.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 876.0 | 850.0 | 26 |
| | 28 | 170.0 | 325.0 | 300.0 | 275.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1870.0 | 1375.0 | 495 |
| | 29 | 340.0 | 195.0 | 150.0 | 300.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 985.0 | 450.0 | 535 |
| | 30 | 425 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 400.0 | 0.0 | 0.0 | 0.0 | 825.0 | 400.0 | 425 |
| | 31 | 434.0 | 98.0 | 0.0 | 420.0 | 0.0 | 0.0 | | 400.0 | 0.0 | 0.0 | 0.0 | 1352.0 | 820.0 | 532 |
| | 32 | 170.0 | 130.0 | 100.0 | 280.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1480.0 | 1180.0 | 300 |
| | 33 | 255.0 | 65.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1120.0 | 800.0 | 320 |
| | 34 | 128.0 | 130.0 | 0.0 | 105.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1163 | 905.0 | 258 |
| | 35 | 170.0 | 325.0 | 250.0 | 500.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 1145 | 750.0 | 485 |
| | 36 | 212.0 | 98.0 | 150.0 | 250.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1510 | 1200.0 | 310 |
| | 37 | 340.0 | 33.0 | 150.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 800.0 | 1323 | 950.0 | 363 |
| | | | | | | | | | | | | | 1367.0 | 904.0 | 320 |

Source: Field survey data.

Note: For columns 13 and 14 averages were computed for 24 cases excluding case 11, 13 and 26, being out of pattern.

- This leaves the household with an average cash earning of Ls.584 to meet all other family necessities.

3.8. Conclusion

It is apparent from the above disposition that the economy of the project area centres on four activities: crop production, livestock raising, forestry products and casual employment. Though crop raising is the major economic activity, it does not fully maintain household needs, and is supplemented by earnings from one or the other of the three forms of production. The depressed state of crop raising is a result of many factors including rainfall variability, small acreage cultivated, poor seeds, rudimentary implements, havocs caused by pests and diseases, unsteady labour input by farmer, lack of credit and agricultural services, and poor marketing and transport infra-structure.

These inadequacies lead to persistent defficiencies in farmer's performance, resulting in poor harvests. There is an evidenced shortage in food crop production and a narrow return from cash crop earnings. In years

of bad rains such as duri g the drought time of 1984, farmers may need to be su ported by dura from outside the area. Rigl El Fula C uncil records show that El Fula El Zarga, Tirgato and Rigl El Benaya received 1410, 1814 and 1253 sacks of dura consecutively during 1984/85 drought period.

Incomes generated fr om crop raising and the other economic activitie , limited as they are, are drained by expending on dura.

It is evident that t the present stage of the economy there are limted cash surpluses in household earnings that may be cha neled away from the basic family needs into invest ent, such as animal traction. Accordingly the feasibil ty implementing this project shall very much depend o applying a system of easy loans to enable the farm r to purchase implements and acquire draft animals.

# CHAPTER FOUR

# EXPERIENCES OF ANIMAL TRACTION

## 4.1. Introduction

Within the frame of reference of the assignment, the study team visited four sites where animal traction projects are currently implemented. In order of visitation these were Wad El Hilew in En Nahud area, Es Sunut in Abu Zabad area and Dabkar and El Sunjukaya in Dilling area, The purpose of the visits was to evaluate these experiments and draw ideas that may give insights in formulating Rigl El Fula proposed project.

In what follows a discussion of the two experiences shall be made, with successes and failures highlighted.

## 4.2. The Nuba Mountains Rural Development Project(NMRDP)

### 4.2.1. General

The project had its start in 1978, as a trial experiment of animal drawn implements, financed by the E.E.C. on the European Development Fund (E.D.F). The implementing agency was Societe Agricol Technique et de Co-operation (SATEC), a French technical consultancy.

The activity continued thr ugh 1979 on two types of soil: clay soils in Kadugl. area, and loamy and sandy soils in Dilling area. The concentration was on three operations: land preparati n, sowing and weeding. Based on this experimental work certain types of implements were concluded as suitable for the conditions of the two areas.

In 1979 a project for introduction of animal traction was recommended on the results of a feasibility study conducted in the two areas by the aforementioned consultant. In 1980 an agreement was signed by Government of Sudan (GoS) and E.E.C to execute the project and SATEC was chosen as the implementing agency.

4.2.2. Project Objectives

- Stablizing the food base in the project area by increasing productio of the two main staple food crops of sorghum and millet.
- The production of cash crops is considered a second strategy of the main objectives of the project to raise the standard of living of the project farmers, and to add to the foreign exchange earnings of the regional and the national economy.

- To investigate the terms and conditions of the future co-operative formation by establishing farmers groups from the small holders to participate in their own future development' (Abu Sin, 1987).

The above objectives were seen to be realized through:

- Introduction of the intermediate technology of animal traction.
- Increase of production of small holder.
- Assist the traditional farmer through provision of improved inputs, e.g. seeds, credit.
- Assist in veterinary services.
- Improve community services in fields of rural water supplies, health and education.
- Enhance environmental conservation.

The project was implemented in 1981 at two chosen nucleus development centres (NUDC) at Umm Serdebba and Sunjikaya. Umm Serdebba is located at 35 km. east of Kadugli, selected to implement the project on the clay soils of Umm Dorein Rural Council as a targetted area, with a potential of 140,000 feddans of arable land and an estimated population of 30,000 persons. The traditional crops grown there are sorghum, cotton,

sesame, groundnut, millet and maize, with the former as the leading crop occupying about 65% of the cropped area.

Sunjikaya, located 20 km. north-east of Dilling, was selected to work on sandy and loamy soils to cover Ed Dibeibat Rural Council with a land area of 120,000 feddan, and an estimated population of 25,000 persons. The crops grown are millet, sorghum and groundnut, sesame, kerakde, maize, with millet as the leading crop occupying about 60% of the cultivated area.

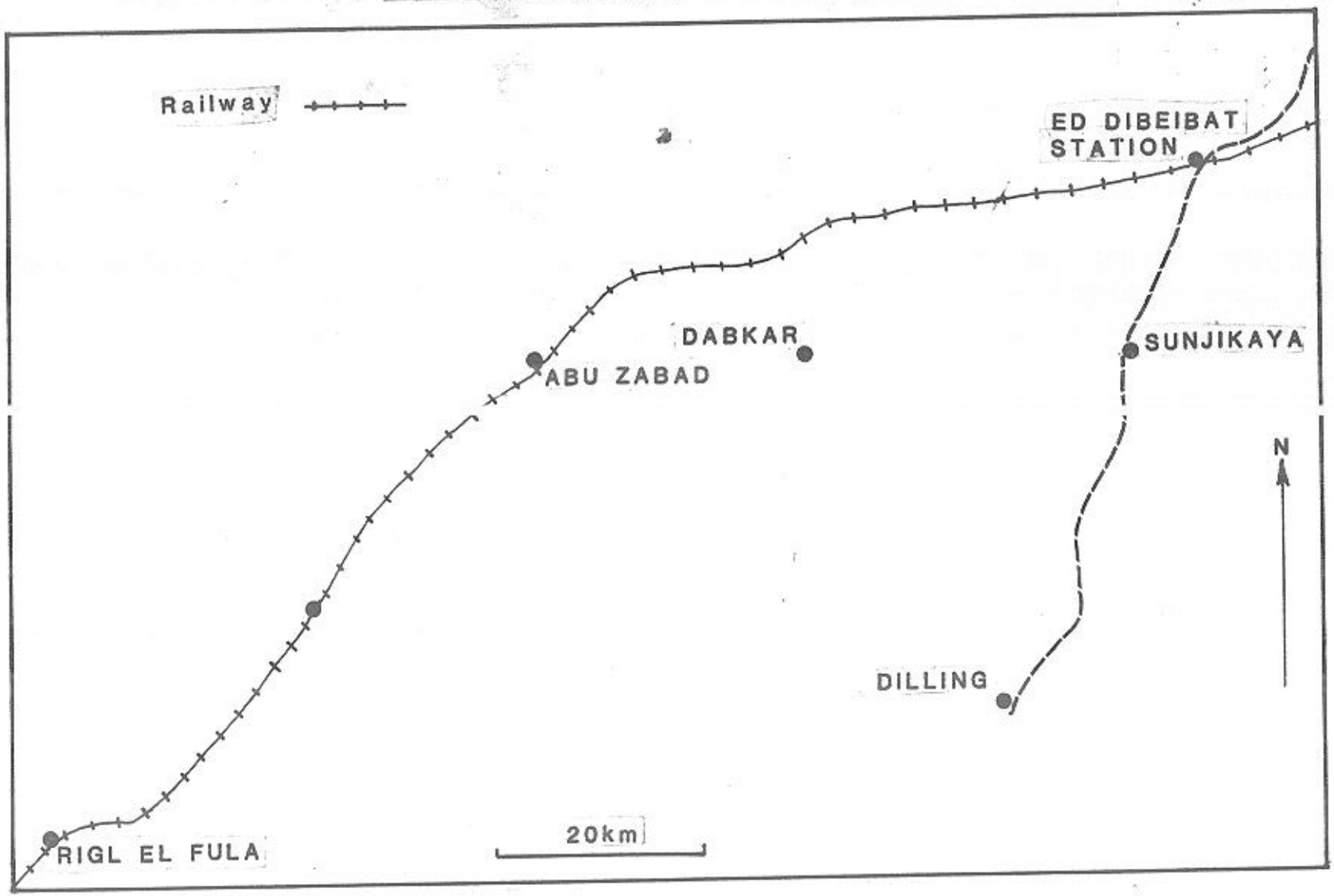
Of the two (NUDC) we were directed as consultants to investigate Sunjikaya experiment which presents conditions similar to Rigl El Fula.

4.2.3. Location

The Sunjikaya NUDC came in existence in 1982, with one branch station at Dabkar established in 1983. Fig.4. Each of the two centres commands a group of villages from which the project is operated named as training centres. The ones linked to Sunjikaya are:

| | |
|---|---|
| Sunjikaya | Kurkara Baggara |
| Umm Saada | El Hajiz |
| Ed Dibeibat | Manago |
| El Farshaya | El Neila |
| El Tukma | El Shoshaya |
| | Abu Iseibai |

# FIG.(4) LOCATION OF SUNJIKAYA-DABKAR CENTRES IN RELATION TO RIGL EL FULA




SOURCE: Dabkar Centre Office Map

Those of Dabkar are:

Es Sunut  Abu Zabad  Abu Galib

Gusa  Kadamat

4.2.4. Main Operational Features

- Each centre is run by a resident staff including: intermediate level agriculturists, aided by auxillary personnel of clerks, accountants, cashiers, store-keepers, credit officers, enumerators, a veterinary assistant, a forester, a social worker and village workers.
- The package of implements diffused include: Nuba Hoe, Seeder, Ridger, groundnut lifter and ox cart.
- Messages about availability of implements are diffused to centres through village workers.
- Patches of farmers are selected from applicants to receive the implements.
- Implements are credited on three installments following an immediate down payment of 30% of cost on delivery.
- Of the criteria of selection in the programme is the provision by the farmer of draught animals - at the beginning 2 oxen-presently relaxed to include a horse or a camel.

- Participant farmers are put to 21 days training, at the training centres, where they bring their animals to be trained on implements.
- Farmers performance is monitored through surveys carried out by enumerators, and by village workers who reside at villages.
- The programme concentrated in its first years on the diffusion of agricultural implements. Recently it began to give attention to new areas of development e.g. credit for groundnut seeds, development of nurseries for afforestation activities, and assistance in maintenance of village infrastructure of services.

4.2.5. Implements diffusion

Table 7 gives the number and type of implements distributed by the two centres (see also Annex IV, Fig. 1,2 and 3 for designs).

Table 7: Implements distributed by the two centres

| Centre | Nuba Hoc | Seeder | Ridger | Ground-nut Lifter | Ox-cart |
|---|---|---|---|---|---|
| Sunjikaya (for period 1982/86) | 499 | 333 | 168 | 124 | 350 |
| Dabkar (for period 1983/86) | 544 | 161 | 141 | 55 | 190 |
| | 1043 | 494 | 309 | 179 | 540 |

Source: Office data collected from Sunjikaya and Dabkar centres.

The above figures indicate that the most two diffused implements are the Nuba Hoe and the ox-cart. From reporting by the project management at the two sites, and interviews with participant farmers at Es Sunut, Dabkar and Sunjitaya, these two implements are the ones most desired by the farmer, and ranked as the top 2 in the package of the 5 implements. The process of diffusion seems to be influenced by the following conditions:

- Availability of implements, their prices, and the preparedness and financial ability of the farmer to participate in the project.
- It is assumed that a farmer shall acquire all the set in time.
- Acquiring the Nuba hoe is a condition for being accepted as a new farmer, while old farmers are expected to complete their set.
- No implement is provided, except to a participating farmer. Implements are registered in the name of the project until all costs are paid by the farmer.

4.2.6. Supply and Prices of Implements

The set of implements used by the project is a French make, imported for the purpose of the project. Attempts at local manufacturing of some of the units of

the set, namely the ox-car; were made by the project, and the purchases were included in the distribution.

The delivery price of implements to the farmer is on continuous rise as could be judged from Table 8.

Table 8: Price of implements (Ls) 1983-1987

| Year | Nuba Hoe | Seeder | Ridger | Ox-cart | Groundnut Lifter |
|---|---|---|---|---|---|
| 1983 | 115.000 | 168.000 | 18.000 | 260.000 | 14.000 |
| 1984 | 157.000 | 265.000 | 28.498 | 626.909 | 19.380 |
| 1985 | 220.000 | 428.000 | 33.620 | 634.500 | 30.000 |
| 1986 | 240.000 | 615.375 | 44.500 | 657.230 | 34.000 |
| 1987 | 427.000 | * | 100.125 | 984.500** | 52.875 |
| | | | | 1310.000*** | |

Remarks:

* Not yet fixed

** Locally made

*** Imported

Source: Dakar office files

The main factor behind the rise in prices is the charging of custom duty by the Ministry of Finance on the imported implements.

4.2.7. Payment System

Initially to receive project implements, a newly accepted farmer was to meet a down payment of 30% of the cost of implements issued. The balance was divided in three equal installments to be paid in three years. As of 1985, and on considerations of the drought impact on the farmer, the down payment has been reduced to 10%. Normally collections of installments are made by village workers immediately after harvest.

The rate of pay-back of installment reflects a relaxed attitude from the side of farmer, equally true of the two centres visited. Tables 9 and 10 reflect the situation of Dabkar case.

Table 9: Farmers performance regarding payment of installments, 1986.

| Year | Total number of farmers with due installments | Number who paid | % | Laggards | % |
|---|---|---|---|---|---|
| 1984 | 250 | 75 | 30.0 | 175 | 70.0 |
| 1985 | 320 | 0* | 0 | 320 | 100.0 |
| 1986 | 150 | 65 | 43.0 | 85 | 57.0 |

Remark: * All farmers exempted because of drought situation.

Source: Dabkar office files.

Table 10: Amounts paid and arrears, (Ls) 1983-86

| Year | Amounts due | Amounts paid | % | Arrears | % |
|---|---|---|---|---|---|
| 1983 | 11,514.742 | 8,639.182 | 75.0 | 2,875.560 | 25.0 |
| 1984 | 9,976.750 | 9,560.750 | 95.8 | 416.000 | 4.2 |
| 1985 | 58,300.380 | 4,348.664 | 7.5 | 53,951.716 | 92.5 |
| 1986 | 73,210.800 | 11,698.900 | 16.0 | 61,511.900 | 84.0 |

Source: Dabkar office file:

The following points may be derived from the two tables.

- There was a high rate of pay back (70-98.5%) in the first years (1983-84) of establishment of the project at Dabkar.
- The exemption of 1985 brought the payment down to a percentage of 7.5.
- The low rate of payment continued through 1986, 16%.

The project management attributes the drop in payment to:

- Management and supervision problem related to shortage of staff and transport vehicles.
- Absence of farmers from villages at time of collection of instalments. Few farmers have self initiative to visit the project office to pay. The majority need to be chased.

- Some farmers are incapable of paying back because of bad harvest and are induced to migrate outside the area looking for work.
- Others are crooks and deliberately escape paying.

Presently the project offices at Sunjikaya and Dabkar are becoming more stiff on the pay-back issue, by applying measures on laggards such as: chasing them to pay, deny them credited seeds and ABS credit, not to be given pesticides, and not to be supplied with spare-parts for their implements.

4.2.8. Draught Animals

At the start of the project, oxen were the prefered draught animals, and implements were initially designed to be drawn by oxen. Cattle was also available in the project area, either raised by the farmer or within his financial capabilities to acquire. In the first three years of the project, it was a condition of acceptance that a farmer comes to the training centre with two oxen to be trained on implements.

The 1984/85 drought reduced the cattle population in the project area, as a result of sales and the high mortality of the animal. In the preceding years cattle

prices have risen tremendo ısly to Ls 4,000 for a pair of oxen, as compared to Ls 1,600 in 1982. This induced the project manage ıent to look for alternative solutions, by adopting mea sures including loans to farmers to purchase oxen, ınd permitting the use of camels and horses, as may ɔe depicted from Table 11.

Table 11: Draught animals ısed by type and number- Dabkar training :entres, 1983-1986.

| Name of Training Centre | Number of Farmers | Number of Oxen Credited | Oxen Non Credited | Number of Camels | Number of Horses |
|---|---|---|---|---|---|
| Dabkar | 57 | 5 | 44 | 1 | 7 |
| Abu Zabad | 135 | 3 | 5 | 14 | 113 |
| Abu Galib | 85 | 9 | 3 | 35 | 38 |
| Gussa | 34 | 2 | 12 | 14 | 6 |
| Kadamat | 18 | - | 18 | - | - |
| Sunut | 215 | 1 | 31 | 141 | 42 |
| Total | 544 | 20 | 113 | 205 | 206 |

Source: Dabkar office fil s.

The following discus ion with the project leaders, veterinary assis ant and beneficiary farmers reveals the advantages an disadvantages of the three animals:

a. On the advantage side

i. Oxen

- A pair of oxen is more strong in drafting implements than a horse or a camel.
- An ox earns good money to owner after working age, about 5 years.
- An ox is more acclamatized to the conditions of the area.
- In this area farmers are traditionally cattle raisers, hence acquainted with the animal.
- Less vulnerable to diseases.
- Utilized in drawing carts

ii. Camels

- Gives about same input in field operations compared to two oxen (weeding capacity 30 feddan in one season)
- Less costly to acquire.
- Cheaper to feed and keep.
- Can be utilized as transport animal by itself.
- May be utilized in operating traditional oil pressers, as some farmers do.

iii. Horses

- Gives about same input in field operations compared to two oxen (weeding capacity 25 feddan in one season)

- Less costly to acquire.
- Utilized in drawing carts.

b. On the disadvantage side

i. Oxen

- Costly to acquire
- Open to theft
- Expensive to feed and requires more care to maintain.

ii. Camels

- Vulnerable to diseases
- Imported from outside the area

iii. Horses

- Vulnerable to diseases.

4.2.9. Project Management

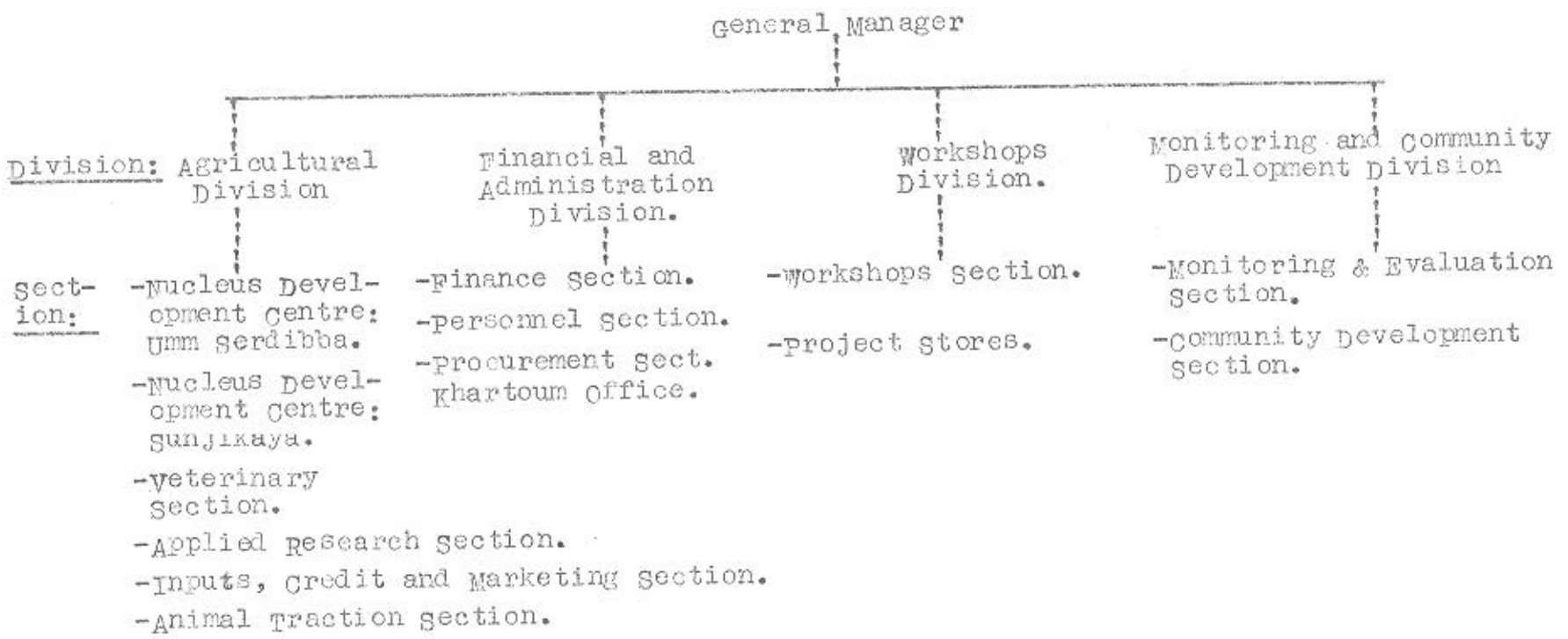
Fig. 5 gives the organizational chart of NMRDP. The project is organized around 4 divisions, two nucleus centres and 12 sections.

In terms of staff size and specialization at the nucleus centre level, Dablar furnishes the following picture:

- Extensionist (centre leader) graduate of Abu Haraz College (Secondary level)

Fig. 5.

NMRD Project Organization Chart.




Source: Financial Agreement, Interim Period, 1985.

- A/Extensionist - Abu Laraz College
- Veterinary assistant - Ranker
- Lady social worker - Secondary level
- 6 enumerators - Secondary level
- Accountant
- Cashier
- A/credit
- 3 Clerks

  } Secondary level

- 12 village workers including trainers on implements
- 12 labourers
- 1 driver
- ox-trainer

The capacity of the above staff may be judged on the grounds that it has succeeded in organizing 544 farmers in the period 1983-86 under the project.

4.2.10. Other Project Activities

The project has embarked on the following supporting activities:

- Groundnut seed credit to farmers, distributed at cost price and collected after harvest. There are indications that the turn back is not satisfactory. Farmers are banking on the crop damage caused by rats in 1986.

- Credit for agricultural operations organized by Agricultural Bank of Sudan.
- Pesticides, namely seed dressing chemicals.
- Spare-parts for implements.
- Extension services to farmers.
- Running of experimental farms for the purpose of improving productivity.
- Establishment of nurseries to avail seedlings for the afforestation programme.
- Contribution to maintenance and construction of community services by providing some construction material.
- Improvement of community water supply.

4.3. Wad El Hilew Experiment: (En Nahud Intermediate Technology Project - EITP)

4.3.1. General

The project was started in 1983. The initiation came from an official who worked for some time as a staff member of NMRDP. Hence, the beginning was on personal basis and almost independent. The idea found recognition from Kordofan Region Ministry of Agriculture, and a project was founded under the Department of Agriculture Extension. The budgetary situation is as follows:

Table 12: Project approved and expended budget (Ls)

| Year | Approved budgeted | Actually expended |
|---|---|---|
| 1983/84 | 90,000 | 76,000 |
| 1984/85 | 85,000 | 50,000 |
| 1985/86 | 150,000 | 85,000 |
| 1986/87 | 200,000 | 50,000 (June 1987) |

Source: En Nahud Agriculture Extension Dept. Files.

4.3.2. Project Objectives

Almost the same objectives of the NMRDP are adopted for En Nahud one, including:

- Stablizing the food base,
- Increase cash crop production and farmers income,
- Enhancing beneficiaries organizational capabilities for co-operative and social development, plus promotion of environmental conservation.

As explained by the staff of the Extension Department at En Nahud, these objectives shall be realized through:

- Provision and maintenance of animal drawn implements.
- Upgrading the knowledge of farmer about crops produced.
- Implementation of timely operations and improvement of practices.

- Promotion of use of fertilizers.
- Improvement of rotations and introduction of hashab.
- Initiation of co-operatives, animal health and forestry programmes.
- Support of community services.
- Provision of credit to farmer.

4.3.3. Location

Wad El Hilew was chosen as the NUDC of the project on considerations of:

- Proximity to En Nahud Town,
- Permanent water supply,
- Central to many villages, hence possibility of diffusion, and
- Availability of traction animals.

Six villages other than Wad El Hilew were selected, based on volunteer acceptance and geographic location to Wad El Hilew. These are:

- El Shamamiya (1983)
- Girewid (1987)
- El Kiram (1987)
- Umm Giteis (1987) and
- El Nagi (1987)

4.3.4. Main Operational Features

- Project founded on philosophy of NMRDP.
- The initial plan was to supply implements by the project and distribute them on installment basis.
- Since implements received were a small number of units, project preferred to keep them and loan them to farmers.
- Hence project may still be considered in its initial stage of development judged on size of implements project owns and the number of farmers involved.
- Farmers so far involved are 9 in number, with 19 trained this year, who may possibly receive implements.
- Project received few units of implements from NMRDP for trial and resorted to local market to manufacture prototypes of the French make implements.
- Project is taken at its present phase as an extension activity to convince farmers in the area of adopting animal traction.
- All implements and draught animals are owned by the project and loaned to participant farmers free of cost to use in farming operations, to be returned to project at end of cultivation season.

- Participant farmers are trained in the use of implements at Wad EL Bilow centre.
- The main crop supported under the programme is groundnut.
- Groundnut seeds are credited to farmers.
- Pesticides mainly seed dressing chemicals are distributed to farmers.
- The project is run by the agriculture extension department.
- No other services are offered to farmers.

4.3.5. Implements Under Project

Official correspondence was exchanged between EITP and NMRDP managements for supply of implements by the latter. EITP staff claim that NMRDP agreed to supply 25 - 50 complete sets for which (EITP) allocated funds in its budget. However, the number received by EITP was:

7 Nuba Hoe

5 Ebra $MS_2$ Seeder

5 Groundnut Lifter

The main reason for this discrepancy as stated by EITP staff was that, NMRDP later on sticked to its terms of reference, interpretted as the imported implements

are for a specific operational area i.e. Nuba Mountains project, and that the financiers would not agree to supplying implements outside project area of reference.

Finding itself in this situation, EITP resorted to a local manufacturer at Khartoum by the name Munawar, who is in the business of producing some implements too for NMRDP. They managed to obtain in 1986 20 Nuba hoes from this manufacturers' make. Other attempts were made to produce locally at El Obeid and En Nahud, but the products received were not to specifications, and proved to be of low efficiency.

4.3.6. Prices of Implements

The prices of units received from NMRDP were the fixed prices of 1983 charged by the project to its participant farmers, of the following order:

| | Ls |
|---|---|
| Nuba hoe | 138 |
| Ebra $MS_2$ Seeder | 194 |
| Groundnut lifter | 37 |
| Chain | 12 |

Yoke was manufactured locally at Ls 12 per unit.

The 20 Nuba hoes delivered by the local manufacturer were at Ls 769 per unit, 1986 price.

4.3.7. Payment Situation

No farmer pays for the services of the implements and the draught animals loaned by the project. The project credits groundnut seeds at no interest. Last year it distributed 60 Qantar of seeds to 7 out of the 9 farmers. Only 3 fully paid back and the remaining 4 partially paid. The total amount collected was 38 Qantars. Arguments put by farmers included, low production, or sold the crop because of need for cash.

4.3.8. Draught Animal:

The project owns 12 trained pairs of oxen obtained as follows:

1983/84: 5 pairs at an average price of Ls 600 per head.

1986/87: 7 pairs at an average price of Ls 1600 per head.

In a normal year oxen with implements are distributed to farmers in July and received back by the project in October. During these months farmers undertake the feeding of the animals. In case of feed

shortage, as it occurred in 1984/85, the project takes full responsibility of the animals.

The future plans of the project consider supplying the farmer with implements namely the Nuba hoe plus a pair of oxen on credit basis.

4.3.9. Project Management

As mentioned previously the project is lodged under the Agriculture Extension Department, En Nahud. It is run by:

- An agriculture inspector: University Graduate
- An agriculture officer : Shambat Institute
- 4 local extensionist : Secondary level
- 4 workers
- 1 ox trainer
- 1 guard.

4.3.10. Other Project Activities

No other activities were being reported, except for distribution of hashab seeds and seedlings,

# CHAPTER FIVE

## FARMERS PERFORMANCE UNDER NMRDP AND EITP

### 5.1. NMRDP Case

#### 5.1.1. Es Sunut As Sampled Area

It is seen as most practical to judge farmers' performance by investigating a sample of farmers under the project. Es Sunut, one of the sub-centres of Dabkar, was chosen for this purpose. The selection was made on grounds that it shows similarities in farming conditions to Rigl El Fula area, in terms of location within same ecological belt, soil types and range of crops raised.

The sample studied covered 20 out of the 57 participant farmers at Es Sunut, selected at random. Two aspects were focussed upon in investigating farmers performance namely: diffusion and use of implements, and production and income levels attained by farmers from crop raising. Tables 13,14 and 15 furnish information on these aspects.

#### 5.1.2. Implements Diffusion and Use

In discussing this aspect the following points may be highlighted based on the data in Table 13:

Table 15: Value (Ls.) of staple food and cash crops produced by Es sunut Sample of farmers, 1986/87.

Crop values worked out on following 1987 prices:-
- A sack of Dukhun : Ls.85. -A sack of Marig Ls.65. -A sack of groundnut Ls.50.
-A sack of sesame Ls. 100.

| Case No. | Millet equivalent Ls. | Sorghum equivalent Ls. | Groundnut equivalent Ls. | Kerkade equivalent Ls. | Sesame equivalent Ls. | Total Ls. |
|---|---|---|---|---|---|---|
| 1 | 850.00 | 325.00 | 6250.00 | 303.75 | 500.00 | 8228.75 |
| 2 | 0.00 | 0.00 | 750.00 | 459.00 | 0.00 | 1209.00 |
| 3 | 0.00 | 195.00 | 300.00 | 0.00 | 0.00 | 495.00 |
| 4 | 0.00 | 65.00 | 450.00 | 0.00 | 0.00 | 515.00 |
| 5 | 340.00 | 0.00 | 330.00 | 0.00 | 0.00 | 670.00 |
| 6 | 170.00 | 390.00 | 425.00 | 101.25 | 0.00 | 1086.25 |
| 7 | 0.00 | 32.50 | 400.00 | 0.00 | 0.00 | 400.00 |
| 8 | 127.00 | 0.00 | 500.00 | 0.00 | 0.00 | 627.50 |
| 9 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 10 | 127.50 | 0.00 | 800.00 | 0.00 | 0.00 | 927.50 |
| 11 | 127.50 | 260.00 | 450.00 | 0.00 | 0.00 | 837.50 |
| 12 | 340.00 | 130.00 | 2250.00 | 303.75 | 0.00 | 3023.75 |
| 13 | 170.00 | 0.00 | 200.00 | 0.00 | 0.00 | 370.00 |
| 14 | 340.00 | 0.00 | 700.00 | 0.00 | 0.00 | 1040.00 |
| 15 | 60.00 | 0.00 | 1000.00 | 0.00 | 0.00 | 1060.00 |
| 16 | 425.00 | 0.00 | 600.00 | 0.00 | 0.00 | 1025.00 |
| 17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 18 | 0.00 | 97.50 | 2500.00 | 0.00 | 0.00 | 2597.50 |
| 19 | 0.00 | 650.00 | 750.00 | 0.00 | 200.00 | 1600.00 |
| 20 | 340.00 | 0.00 | 150.00 | 0.00 | 0.00 | 490.00 |
| Averages | 186.58 | 112.89 | 1010.79 | 77.44 | 40.33 | 1426.36 |

Remark : Average worked on 19 cultivating farmers.

Source : Field survey data.

- Of the set of implements offered by the project, the Nuba hoe ranks highest in adoption (19 units) a fact already established, followed by the seeder and ox-cart. The latter is preferred to the seeder since it can be hired for generating income.
- Ridger and groundnut lifter feature very low in adoption.
- The value of the initial payment confirms a previous finding on the rise in cost of implements.
- To some farmers, owning the implements has become a matter of social prestige among fellow villagers, though not operating them, they refuse to sell them even if offered high prices.
- Some farmers entered the programme, attended the training phase, and acquired the implements in anticipation that they would obtain a loan to purchase oxen, a promise that has not materialized, resulting in that implements are not operated.
- Of the three draught animals used, camels rank highest (12) as compared to 2 oxen and 2 horses, mainly because of the rise in the cost of oxen which confirms an earlier finding.

- Though camel is cheaper to obtain it shows many cases of deaths.
- Those preferring horses utilize the animal too in drawing carts.
- A major modification has been brought on the French imported ox-drawn cart, to suit horse application by almost all farmers who acquired the implements. The one pole designed for drafting by two oxen was changed to two poles to suit horse use. While the iron sheet plate was replaced by a wood blanks plate, turning it into the familiar 'Sudanese' two wheel horse cart.

5.1.3. Production Levels

Tables 13 and 14 give the crop acreage cultivated and the yields attained. Discussion of the two aspects reveals the following points:

- Crops raised are more diverse as compared to Rigl El Fula area, adding sesame, however the three crops dukhun, marig and groundnut remain the dominant ones.
- There is a tendency for putting more area under groundnut (7.34 feddan) as compared to food crops (5.46 feddan), being a successful crop in this area, and probably to earn cash to pay back installments on implements.

- The average acreage cultivated by a household is in the order of 14.0 feddan which is almost double the acreage cultivated by the Rigl El Fula sample (6.3 feddan). This may be partially attributed to the introduction of animal traction, since increasing acreage is not only a function of application of animal drawn implements.
- The 14.0 feddan is far less than the targetted acreage of 30 feddan to be fulfilled by a complete set of implements. This demonstrates that for this goal to be attained, it is not only animal traction that will bring the change, but how to realize the full package of all other improvements on this type of rain-fed farming.
- Table 14 furnishing information on crops, acreage and yields of participant farmers of Dabkar centre and Es Sunut sample depicts low productivity (with reference to Sudan averages cited earlier pp.37-38) for all crops during 1983/84 and 1984/85 production season, a medium productivity in 1986/87 and a high productivity in 1985/86.
- This emphatically proves that rainfall is the major determinant factor of levels of production, allowing some room for the effect of crop pests.

- To complete the picture, Table 15 gives the cash value of the crops raised by the sampled farmers, which comes to Ls.1426.36. This compared to the figure reached from (Rigl El Fula lying south of Es Sunut) level of soil fertility (land at Es Sunut heavily cropped) and the attack of pest (effect of rats 1986/87 on groundnut crop and birds on millet and sorghum, Es Sunut area) may be part of the reason.

5.2. EITP

Farmers' performance under Wad El Hilew project may be assessed from Table 16.

Table 16 furnishes information on crops, acreage and yields of 6 sampled farmers out of the 11 participant ones. The table shows that:

- Two main crops raised are, dukhun and groundnut, with more acreage put under the former.

Table 16: Crops, Acreage and Yields 1986/87 - EITP

| Name of Farmer | Year of participation | Crops, acreage and yields 1986/87 | | | | Acreage Planned for Cultivation 1987/88 | |
|---|---|---|---|---|---|---|---|
| | | Dukhun | | Groundnut | | Dukhun Feddan | Groundnut Feddan |
| | | Acreage Feddan | Yield/feddan Kg. | Acreage Feddan | Yield/feddan Kg. | | |
| 1. Adam El Daw | 1986 | 7.5 | 0.00 | 6.0 | 125.8 | 10 | 15 |
| 2. El Agab.....? | 1986 | 15.0 | 0.00 | 4.5 | 217.1 | 25 | 15 |
| 3. Hamad El Nil | 1986 | 22.5 | 21.1 | 6.0 | 222.0 | 15 | 15 |
| 4. Dafalla Mohd. Dafalla | 1986 | 9.0 | 0.0 | 6.0 | 81.0 | 15 | 18 |
| 5. El Amin El Agab(*) | 1987 | 22.5 | 0.0 | 5.25 | 0.0 | 22.5 | 15 |
| 6. Ibrahim Mohd. Ahmed (*) | 1987 | 18.0 | 0.0 | 0.00 | 0.00 | 15 | 15 |
| Averages. | | 94.5 / 15.75 | 21.1 / 0.24 | 27.75 / 4.62 | 645.9 / 107.65 | 102.5 / 17.08 | 93 / 15.5 |

Remarks :
- Farmers Number 5 & 6 did not use project implements.
- Average acreage cultivated is 20.37 feddan.
- Average acreage planned to be cultivated is 32.58.

- Yields attained in 1986/87 were very low because of rain shortage, rat and birds attack.
- Acreage cultivated by household is comparatively large (20.37 feddan actually cultivated and 32.58 feddan planned for 1987/88) in relation to Rigl El Fula and Es Sunut sample.
- This is not a direct result of application of animal traction. Farmers indicated cultivating same area prior to entering the project. Reasons given are easy working of sandy soils and use of hired labour.

A critical examination of ELTP and farmers performance reveals some shortcomings which have to be avoided in formulating Rigl El Fula project. These may be summarized in the following:

- Initiation came as an ad hoc idea which was not put to proper planning.
- No permanent source of implements supply was secured from the beginning.
- The present source is still unreliable, because of the conflict between the French supplier and the local manufacturer on brand right as the latter only copied the French models.

- Implements and draft animals are owned by project and their services are given free to farmers, hence no real test of conditioning variables such as economics of operation and real farmers interest and adoption.
- Most farmers were not randomly selected. Though labelled as progressive ones there seems to be a bias to those who are well connected.
- In addition to free access to implements, farmers are motivated to participate by the groundnut seeds credit, which the majority are failing to pay back.
- Annual budgets allocated for the project are inadequate and unsteady as judged from the amounts approved and the amounts actually received and expended.
- The project is poorly monitored and farmers' performance is not well assessed.

# CHAPTER SIX

# CONCLUSIONS AND RECOMMENDATIONS: THE ESSENTIALS FOR FORMULATING RIGEL FUL PROJECT

## 6.1. General

This chapter aims at pulling together the main findings of the study, which shall be used as a basis for drawing conclusions and making recommendations, seen as essential guidelines in project formulation. The aspects treated shall be discussed under the following headings:

## 6.2. Status of Crop Raising

- A major activity practiced by both pastoralists and sedentarists
- Well integrated time and economy wise in the other household pursuits, i.e. livestock raising, forestry products and migration for income generation.
- Climatic and soil conditions can favourably support the activity.
- Land is available for increasing household acreage.
- Population possesses traditional farming skills which provide a base for improvement.

- The activity is practiced through household labour whose input may be enhanced by introduction of animal traction.
- There is a built-in awareness among farmers about the need to improve farming efficiency in the area. Animal traction may provide prospects in this respect.

6.3. Prospects of Animal Traction

- Presently stands as an assimilated technology by farmers under NMRDP.
- Increases household acreage under traditional rainfed farming conditions.
- Application of the technology provides access to well tested implements designs which may be transferred to other areas.
- Through increased acreage cultivated, animal traction has not yet demonstrated a substantial increase in productivity per unit area, which may be attributed to the low priority given to the other components of the package particularly crop protection and improved seeds.
- Well received by participant farmers, judged on high rate of application for enrollment under NMRIP and the size of implements so far distributed.

- Within economic means of traditional farmer provided that more support is secured for him and is better organized.

6.4. Management and Organisation of Animal Traction activity

- Succeeded under a well formulated and monitored project, NMRDP as compared to EITP.
- There is by now the national expertise in NMRDP which may be drawn from in replicating the activity in other areas.
- Drawing from NMRDP organizational set-up, the centre concept run by a core of intermediate level agriculturists assisted, by some aids, and a few workers proves to be adequate in running project activities.
- The experience of NMRDP shows some weakness at grass root level of application, which may be rectified by strengthening avenues of social action with the farmer.
- Phased monitoring of project through timely evaluation of progress is essential for achieving objectives.

## 6.5. Necessary Revisions for Enhancing Animal Traction Experience

### 6.5.1. Implements

- To transfer animal traction into a 'local' technology, it looks more appropriate to produce the implements locally. Importing carts from France, while they were years back produced in local workshops is unjustifable
- To secure a local and a steady supply of implements, capable agricultural engineers in research positions should be encouraged through financially supported programmes, to design implements instead of haphazard approaching of workshops in towns.
- It is essential too, to work on the present arrangement of contracting local manufacturers of the French designed models through securing legal arrangements with the owner of the designs.

### 6.5.2. Draught Animals

- Oxen as draft animals are proving to be beyond the financial capability of the farmer, (excepting Tabaldiyat Fallata pastoralists owning cattle who may use ox if they prefer so). Enlisting under the NMRDP of farmers using camels and

horses is a recognition by the project of this difficulty. Freedom to the farmer in choosing the type of animal he can afford should be accorded.

- It is even more preferred if plough designs could be reached that enable the farmer to use his donkey as a draft animal. The survey team visited a farmer at khor Taggat (El donki) village who manufactured his own plough in 1978, and since then has been using it, applying his donkey and cultivating up to 30 feddan annually. Under western savannah project donkeys are used too as draft animals.
- Due to the low and fluctuating income of the farmer, the payment scheme for implements and draught animals needs to be revised, allowing longer period of pay-back of installments costs.

6.5.3. A More Complete Package

- Animal traction by itself has limited impact on increasing farming efficiency and improving rural incomes. Efforts should aim at applying a more concerted package of improvements.

- The beginnings of such a package: supply of credit, pesticides, environmental conservation, improved practices (through results derived from centres research stations), provision of agricultural services, and support to community facilities, as presently attempted by NMRDP, should be strengthened.
- As put by farmers at Es Sunut, for a farmer to be an efficient producer he has to have:
  - a regular supply of spare-parts for implements,
  - Loans or credit to buy implements and draught animals,
  - adequate and good seeds at the beginning of the sowing season
  - credit to raise his crops and support his family,
  - protection against pests and diseases,
  - vaccination and veterinary treatment of his animals,
  - adequate water supply, and
  - health services with emphasis on protection against Malaria.

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ANNEX (I):

ITINERARY, AND PERSONS MET

Field visits, June 1987:

i) El Obeid 4-5 June:

- M.O. El Sammani meeting other member of team K. Shams, consulting on assignment.
- Sayed/Ali Gamaa, Secretary General, Kordofan Regional Government, informing him about assignment.
- Meeting, Director of Kordofan Regional Ministry of Agriculture, Sayed/Abu El Gasim Ali Abu El Gasim, to brief him on assignment.
- Sayed/Hamad Mohamed Baklayi, Senior Executive Officer, Rigl El Fula District, consulting with him on site selection.

ii) En Nahud, 6, June:

- Meetings with Agriculture Extension Department staff :
  Sayed/Ibrahim Omer, Inspector Agriculture Extension.
  Sayed/Mahgoub Ali Bagdool, Assistant Inspector, EITP.
- Visit to Wad El Hilew centre.
- Meeting with EITP farmers.

iii) El Odayia, 6 June (Spent night there)

- Meeting Sayed/Saddig Badawi, Director El Odayia Project.

iv) Rigl El Fula 7-8 June

- visit Rigl El Fula District Office, meeting: Sayed/Gabba Ahmed Mohamed, Executive Officer, Rigl El Fula Rural Council for further consultation on sites to be selected and for collection of data from office files.
- Survey of El Fula El Zarga village.
- Survey of Tabaldiya Fallata settlement.
- Survey of Tirgato village.
- Survey of Rigl El Benaya village.
- Met farmers from Gagimini village.

v) Dabkar-Es Sunut 9-10 June

- Meetings at Dabkar with NMRDP Centre staff :
  Sayed/Suliman Obeid Suliman, Agricultural Inspector.
  Sayed/Mohamed Mekki El yas, Accountant/Cashier.
  Sayed/Suliman El Thelib, Assistant Credit.
- Survey of Es Sunut village.

vi) Sunjikaya 11-12 June

Meeting with Centre staff including :

- Agricultural Officer.
- Chief Accountant: Sayed/Ali Mohamed El Rayah.
- Veterinary Assistant.

20 June-10 July spent by Team members at El Obeid for Report write-up.

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ANNEX (II)

## Monthly and Annual Rainfall Totals Babanusa Station.

Station: Babanusa

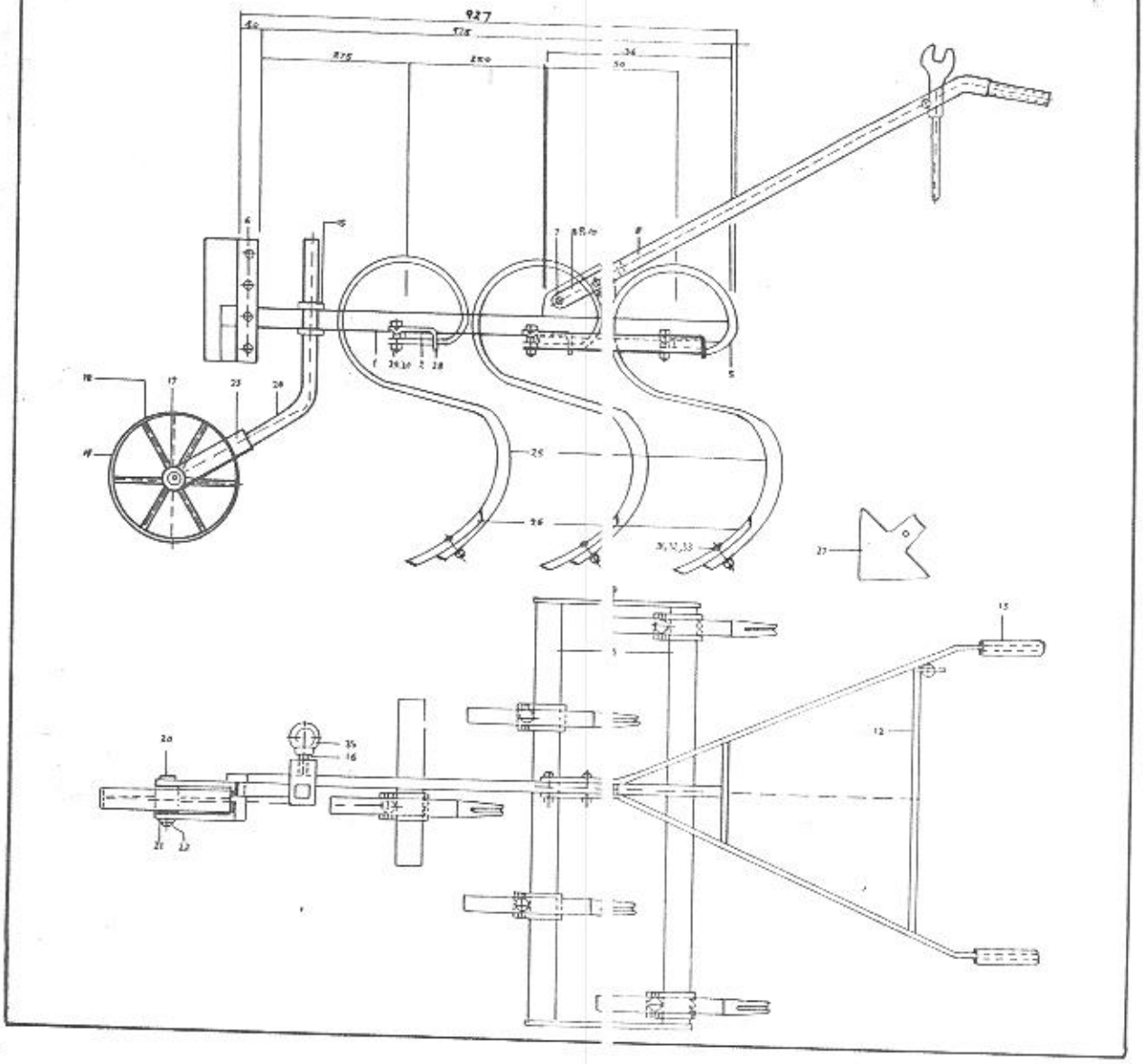
Lat: 11 20 Long: 27 49 Alt: 453 Ref.No.:0964 Index No. 11273801

Station stated on June 1974.

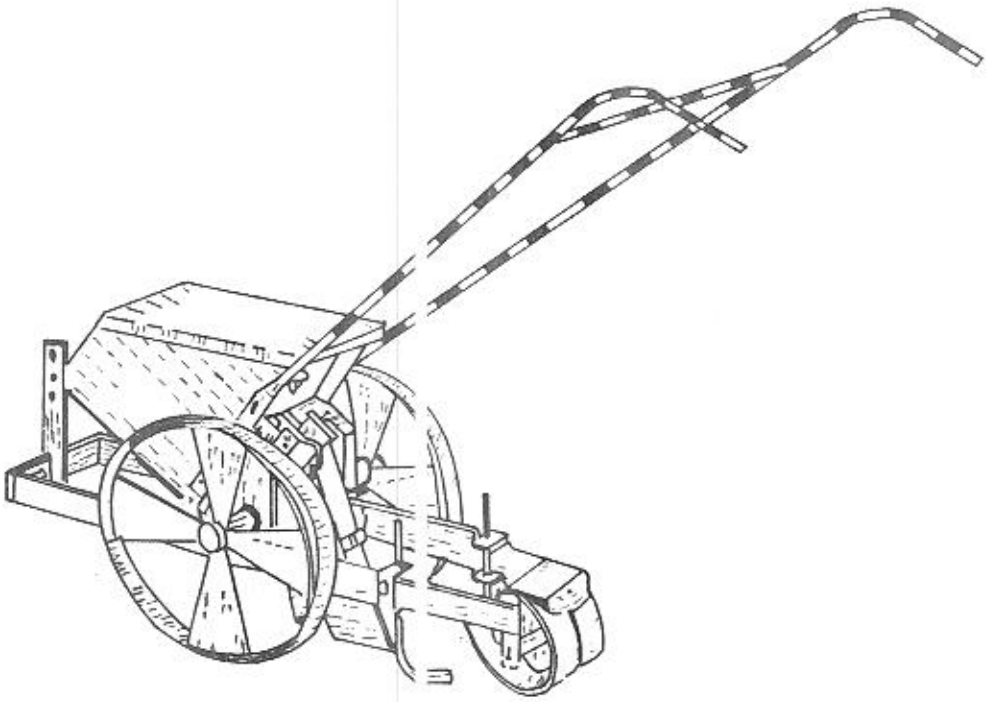
| Month / Year | Jan. | Feb. | March | April | May | June | July | August | Sept. | Oct. | Nov. | Dec. | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | x | x | x | x | x | 118.7 | 132.4 | 123.5 | 102.7 | 0.9 | 0 | 0 | (478.2) |
| 1975 | Tr. | 0 | 0 | 0 | 18.7 | 64.2 | 79.7 | 196.9 | 62.7 | 38.3 | 0 | 0 | 460.5 |
| 1976 | 0 | 0 | Tr. | 6.9 | Tr. | 35.7 | 209.1 | 128.5 | 94.6 | 16.8 | 0 | 0 | 491.6 |
| 1977 | 0 | 0 | Tr. | 0 | 57.7 | 61.0 | 79.7 | 162.1 | 74.1 | 10.5 | 0 | 0 | 445.1 |
| 1978 | 0 | 0 | Tr. | 11.3 | 47.3 | 43.2 | 242.9 | 56.0 | 71.6 | 70.4 | 0 | 0 | 542.7 |
| 1979 | 0 | 0 | 0 | 59.2 | 10.6 | 39.2 | 116.6 | 79.9 | 83.7 | 6.6 | 0.1 | 0 | 395.9 |
| 1980 | 0 | 0 | 12.2 | 6.3 | 11.1 | 241.7 | 89.5 | 121.3 | 129.1 | 22.9 | 2.3 | 0 | 636.4 |
| 1981 | 0 | 0 | 0 | Tr. | 3.4 | 154.1 | 117.9 | 112.2 | 122.5 | 44.8 | 0 | 0 | 554.9 |
| 1982 | 0 | 0 | Tr. | 10.6 | 21.0 | 33.2 | 76.1 | 90.4 | 87.2 | 72.0 | 0 | 0 | 390.5 |
| 1983 | 0 | 0 | 0 | 0 | 11.4 | 57.5 | 129.6 | 113.9 | 98.5 | 0.7 | Tr. | 0 | 411.6 |
| 1984 | 0 | 0 | 0 | 0 | 3.6 | 17.3 | 41.9 | 130.1 | 56.1 | 18.3 | 0 | 0 | 267.3 |
| 1985 | 0 | 0 | Tr. | 4.6 | 24.7 | 80.6 | 37.2 | 118.6 | 246.4 | 3.0 | Tr. | 0 | 515.1 |
| 1986 | 0 | 0 | 0 | 0 | Tr. | 29.5 | 144.5 | 147.6 | 236.7 | 1.8 | 0 | 0 | 560.1 |

Source: Sudan Meteorological Department, Khartoum.

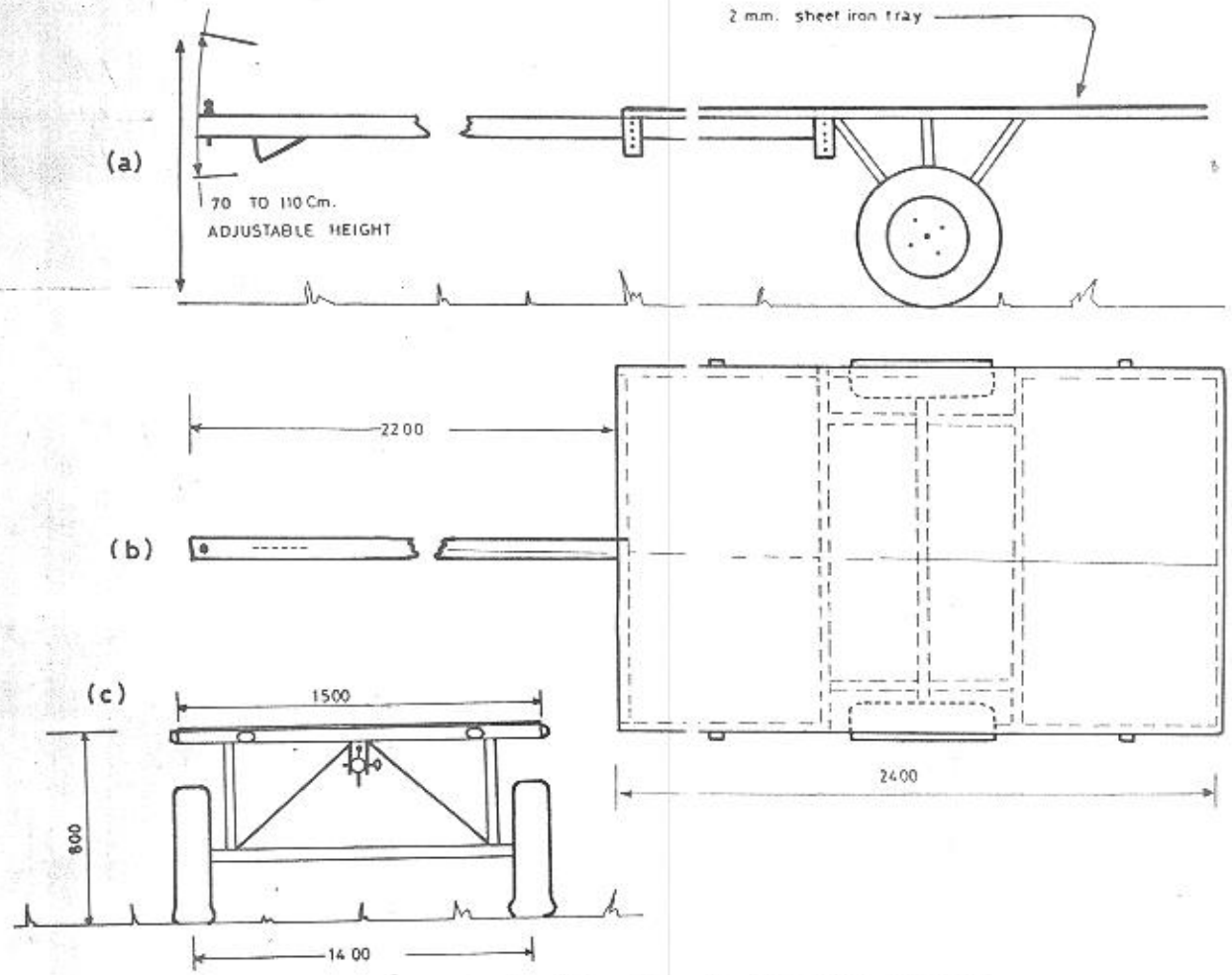
ANNEX IV FIG.(1) NUBA HOE



ANNEX IV FIG.(2) EBRA SEEDER



(a)(b)(c) Views of Original French Mal e Ox-Drawn Cart




(d)&(e) Recommended Alteration s in Original Model