IMPERIAL ETHIOPIAN GOVERNMENT

LIVESTOCK AND MEAT BOARD

SHIRE LOWLANDS DEVELOPMENT PROJECT

TIGRE PROVINCE

ETHIOPIA

JANUARY 1973

IMPERIAL ETHIOPIAN GOVERNMENT

SHIRE LOWLANDS DEVELOPMENT PROJECT

JANUARY 1973

Currency Equivalents

US $1= Ethiopian Dollars (E$) 2.30

E$1 = US $0.43

E$1 million ≒ US$430,000

Weights & Measures

Metric System

Abbreviations

AID Bank = Agricultural - Industrial Development Bank
IEG = Imperial Ethiopian Government
IDA = International Development Association
LMB = Livestock and Meat Board
TAHADU = Tach Adiabo and Hedekti Agricultural Development Unit
TAHECU = Tach Adiabo and Hedekti Cooperative Union

Report Prepared
by
Livestock and Meat Board
Project Office

D

IMPERIAL ETHIOPIAN GOVERNMENT

SHIRE LOWLANDS DEVELOPMENT PROJECT

TABLE OF CONTENTS

PAGE NO.

LIST OF FINANCIAL ANNEXES

LIST OF APPENDICES

SUMMARY OF SHIRE LOWLANDS

DEVELOPMENT PROJECT

A) This is an application by the Imperial Ethiopian Government (IEG) to the International Development Association (IDA) for an IDA credit to assist in the financing of an agricultural development project.

b) The major aims of the project are to improve land-tenure conditions in the project area and to settle as residents in the project area as many farmers as possible from the overcrowded highlands of Tigre in order to alleviate overcrowding in the highlands.

c) Total project area is 450,000ha with 10,000 resident and 14,000 temporary migrant farmers, farming about 3.0ha. on average each.

d) The first phase of development - the concern of this project - will affect half the project area and half its farming population. The areas and people to be incorporated in this project will be those areas containing farmers most eager to be ~~incorporated in the project~~ participate. The development phase of the project will last six years.

e) Under the project 12,000 farmers, grouped together in 20 villages, will be resettled on 5 ha. plots each, under greatly improved land tenure conditions.

f) They will grow mainly sorghum and sesame on these farms and will obtain a net annual farm income (after debt servicing and including subsistence) of about $500 after 5 years rising to $700 after 14 years.

g) Each village will be allocated a grazing area where farmers' livestock will be kept under improved conditions.

h) One commercial-type ranch will be established on 20,000 ha. to produce high-quality cattle for the Asmara or live-export quality markets.

i) A co-operative union will be established to handle supply, credit and marketing for primary co-operatives; and to construct or install many of the fixed investments proposed under the project.

j) An access road will be built from Enda Selassie to Sheraro and then to the main farming areas, and up to the Barentu/Adi Ugri road.

k) An agricultural development unit (under EPID of the Ministry of Agriculture) will be established to run land planning and allocation, agricultural research, training and extension, co-operative development, veterinary services and main road construction.

l) Total project development expenditure will be about Eth$17.2 million (U.S.$7.5million) with a foreign exchange component of Eth$4.6million (U.S.$2.0million)

m) The internal rate of return for the project as a whole is 17.2%.

n) It is proposed that the development costs should be financed by an IDA credit of Eth$12.5million (U.S.$5.4million) and an IEG contribution to development cost of Eth$4.4million (U.S.$1.9million). In the first 8 years of the project IEG will also have to contribute a further Eth$3.0million (U.S.$1.3million) to recurrent costs and working capital.

I. INTRODUCTION

1.01 This is an application by the Imperial Ethiopian Government (IEG) to the International Development Association (IDA) for a credit to assist the financing of a regional agricultural development programme in the western Shire lowlands of Tigre Province. Previous agricultural projects submitted by IEG to IDA for financing are the Wollamo Agricultural Development Project (169-ET), the Humera Agricultural Development Project (188-ET), the Addis Ababa Dairy Development Project (269-ET), all now in the process of implementation, the (290-ET) Coffee Processing Project for which a credit agreement was signed in 1972, the Livestock (and Products) Marketing Project for which negotiations between IDA and IEG took place in Washington in July 1972, and the Minimum Package Programme, to appraise which an IDA Mission visited Ethiopia in July 1972.

1.02 This Project, the Shire Lowlands Development Project, would settle some 12,000 small farmers, who already farm in the project area, on new and more satisfactory tenure terms, would introduce a greatly improved alternative to the present pattern of the communal grazing of livestock, and would raise the present average net farm family income (including subsistence) among participants over 14 years by about 160%, from Eth.$265 (U.S.$115) to Eth.$695 (U.S.$300) per annum. (In this application the conversion rate of exchange used throughout is 1$ U.S. = 2.30 Eth.$.)

1.03 This Project was prepared under the direction of an IEG Working Group representing interested departments of the IEG. Several departments of the Ministry of Agriculture, the Ministry of Land Reform and Administration, the Livestock and Meat Board, the Geological Division of the Ministry of Mines, the Ministry of National Community Development, the Technical Agency, the Institute for Agricultural Research, and the Imperial Ethiopian Air Force have all made important contributions to project preparation. Four outside consultants were employed for various studies on the project and staff of the IBRD's Permanent Mission in East Africa have also given assistance.

II. BACKGROUND

A. General

2.01 Ethiopia, with an area of 1.18 million km^2, lies between 3° and 18°N in East Africa, extending from the Red Sea southwest to Lake Rudolph. Much of the country is high plateau of 1,500 - 3,000 m.a.s.l., dissected by gorges or broad valleys. Surrounding the highlands are less broken areas of lower altitudes, between sea level and 1,500 m.a.s.l., generally of lesser rainfall than the highlands. Altitude rather than latitude determines climate (rainfall, temperatures, evaporation).

2.02 Population, GDP and Prices

The population of Ethiopia, at about 26 million, is increasing at approximately 2% per annum. About 92% of the people live in rural areas but urban population is growing rapidly. During 1961 - 1969 GDP grew at a rate of about 4.8. In 1969 it totalled Eth.$3,861 million (U.S.$1,679 million) nearly 53% of which came from agriculture. Per caput income at Eth.$165 (U.S.$72) is one of the lowest in the world. Retail prices (1967 - 1972) have been rising at about 1-1½% per annum (Addis Ababa wage-earners' index) and the wholesale (Addis Ababa) price index for imported commodities at just over 2% per annum.

2.03 Exports and Imports

In 1971 agriculture generated over 90% of the total exports, which were valued at Eth.$310 million (U.S.$134 million). Coffee contributed about 54% of total exports. Oilseeds were next in importance with 10.2%, then hides and skins with 8.9% and pulses (8.6%). The economy is over-dependent on coffee exports, whose price (quarterly average, C. and F. New York) over the last three years has fluctuated from 22% below to 22% above the 3-year average (1969 - 1971). Although imports normally far exceed exports (by about Eth.$158 million (U.S.$67 million) in 1971 or 50% of exports) there have been no acute balance of payments problems so far, due to capital inflows. This situation is unlikely to continue and increasing balance of payment problems are to be expected. By the end of 1971 Ethiopia's foreign exchange reserves were down to less than the equivalent of four months imports.

B. The Agricultural Sector

2.04 Contribution of Agriculture to the Economy

Agriculture provides 90% of employment but only 53% of GDP. The gross value added by agricultural production is estimated to have increased between 1961 and 1969 at only 2.2% per annum while GDP increased at 4.8% during the same period. The growth in agricultural output barely kept pace with population increase. The annual cereals price index (Addis Ababa wholesale) rose from 88.9 in 1962 to 146.2 in 1971 but there has been a sharp drop in the first half of 1972 to levels between 100 and 120. There is no evidence that this drop is due to any fundamental change in supply/demand relationship rather than to a single season's good crop.

2.05 Land Use

Only 10.6% of the total land area of Ethiopia is cultivated land while the remainder is taken up by pastures (54%), barren and built up (14.1%), and other (swamps, forests, water courses: 21.3%). (Source Third Five Year Plan).

2.06 Ethiopian agriculture is characterised by wide climatic and ecological diversity even between areas only a few kilometers apart, and a very wide variety of crops can be successfully grown. There is a small agricultural-estate sector (cotton, sugar and some cereals and vegetables), a larger commercial-farm sector (mostly coffee and cereals) but the vast majority of the agricultural work force are employed on small peasant farms, from which most of the agricultural output comes. Average farm size (cultivated area) ranges from about half to one and a half hectares in the different provinces. In the drier parts of Ethiopia in the south and east, nomadic or semi-nomadic livestock raising is the main agricultural activity. Only the estate sector has really taken advantage of modern technology. The commercial sector has adopted some modern technology (mainly in the form of mechanical power) and has shown some dynamism (e.g. near Selit Humera). But in many respects its operations are still very primitive and a large number of the commercial farmers have other occupations which prevent them giving adequate attention or finance to their farms. The peasant sector is still largely untouched by modern technology and is characterised by low human and resource productivity. Average peasant-farm output, at farm prices, is less than Eth.$300 (U.S.$130). Only in a very few cases is any attempt made to produce cattle specifically for sale as meat animals rather than as a bye-product of other activities.

2.07 Constraints on development

The systematic development of Ethiopian agriculture is in its infancy. General government administration in most rural areas is not yet well oriented towards development. Other services or institutions - a competitive or efficient marketing structure, credit, extension - are absent in most areas and are often weak even when present. There is a lack of proper research evidence on which to base innovations, and while the situation in this respect has greatly improved since the founding of the Institute for Agricultural Research in 1966, the climatic and ecological diversity of Ethiopia makes the solution of this problem a very long term matter.

2.08 The present systems of land tenure are a serious constraint to the development of Ethiopian agriculture. While, as in everything else, local variations abound, in general in the Northern Provinces (Eritrea, Tigre, Begemdir, Gojiam, northern Wollo, parts of northern Shoa) a system of communal ownership prevails, in which the individual only possesses a limited right to use a parcel of land. While the rights to this parcel are normally held for the full life of the individual, this is not always so and land may be taken away and reallocated to others. Boundary disputes and other litigation over rights to land are frequent, and are a cause of insecurity and much waste of time. In some parts of southern Ethiopia systems of individual land-ownership exist, but lack of an adequate system of land survey and registration, and disputes over inheritance mean that here too an adequate sense of security to induce long-term investments is lacking.

In areas where individual land ownership exists the method of land-use is often to instal tenants paying a share of the crop (which may be as high as 66%) as rent. In the tenancy systems neither tenants' nor landlords' rights and obligations are sufficiently defined or upheld, and neither party to a tenancy agreement is likely to risk capital in long or even medium-term improvements. In 1966 a Ministry of Land Reform and Administration was established. As a consequence the administration of land (registration and definition of government land) has improved, and detailed knowledge by IEG of the various land tenure systems has greatly increased. In 1970 a Landlord-Tenant Relations Bill was submitted by IEG to Parliament but no legislation has yet been passed on this subject (except for what already exists in the Civil Code).

2.09 Marketing of their agricultural produce presents a serious problem to all farmers, and especially to the small farmers who lack the necessary resources or outside contacts to give them a reasonable bargaining position. This is not just a question of knowing the going price. Transport from farm to the point of first sale is expensive and inconvenient, so that it may be impossible to refuse the price offered even if it is known to be inadequate. In the absence of an effective government inspection of weights and measures in rural areas, the apparent price offered may be fair but the merchant, who owns the scales, may underweigh by 15% or more (See CADU publication A.11). Collusion and co-operation between merchants to the disadvantage of farmers is common. Poor surface communications, high storage losses, and lack of storage or access to working capital with which to hold stocks except in a few central areas, lead to wide seasonal price variations, which are particularly acute in remote areas from where the same crops may be exported at harvest time to be reimported for sale for consumption six months later at twice the price. Data provided in Appendix Q to this application show how wide seasonal price variations can be even in a relatively competitive wholesale market as in Asmara (e.g. an 87% rise in prices between trough and peak prices for sorghum in 1971, 73% in 1970).

2.10 Ethiopia, with its estimated population of 26 million cattle, 12 million sheep and 11 million goats is the richest in livestock of all African countries. The productivity of this cattle herd however, is very low. Due to disease and feed shortages only about 50% of calves born reach three years of age. At any one time about 23% of the total national herd, or 50% of the highlands herd are draught-oxen. Milk yields are very low, on average less than 500 litres per lactation, and differ markedly according to season. Because of inadequate dry season availability of feed, plough oxen are at their weakest when requirements for animal-power are at their highest. In many areas while land for cultivation is allocated to, and cultivated by, individuals, grazing, even of crop residues, is shared communally. As a consequence the incentive and opportunity to keep fewer but better-fed animals of higher value is missing; and the scope for, and in many areas the incidence of progressive deterioration of pastures is high. This situation will probably worsen if disease-control programmes, such as the J.P. 15 Rinderpest Eradication Programme succeed.

2.11 Human population in Ethiopia is unevenly distributed, even in relation to the economic potential of the land, and pockets of serious overcrowding exist even in close proximity to underpopulated areas of high potential. While considerable migration between areas does occur, the pace of this is restricted by fear of disease and civil disorder in newly settled areas, lack of adequate capital to finance a move and settlement in a fresh area, and inappropriate conditions for the allocation of land.

2.12 Some successes in development

While the general conditions for agricultural development in Ethiopia are still poor, experience since 1967 has shown that if the right institutional and other measures are taken, effort is concentrated and the agricultural innovations introduced are based on sound technical lines, backed up by continuing field trials under local conditions, very satisfactory progress can be made and the response of Ethiopian farmers in these circumstances has exceeded expectations. The most prominent successes are those of CADU (Chilalo Agricultural Development Unit) in Arussi and WADU (Wollamo Agricultural Development Unit) in Sidamo Province. And the development of milk supply around Addis Ababa, and the joint Ministry of Agriculture/ FFHC fertiliser demonstration and credit programmes (leading to the Minimum Package Programme) and cotton outgrowers around Assayita in Wollo Province are other examples.

C. Tigre Province.

2.13 Most of what has been said about the development of Agriculture in Ethiopia as a whole is true also of Tigre Province. In recent years, however, its provincial administration has been very considerably more development-oriented than in most of Ethiopia, and as a consequence, for example, its surface communications are much above average as is the layout, maintenance, and general standard of public utilities in its urban areas. The people of the province have contributed substantial sums of money as well as labour services for their own development.

2.14 The human population of Tigre has been estimated at 1.5 million, of which 93% is in rural areas. The economically active population has been estimated at 487,000 or a little over 32% Of the economically active population over ninety per cent are engaged in agricultural occupations. Of these again probably 20% are pastoralists while the rest are engaged in crop farming.

2.15 There are eight sub-provinces (Awrajas) and fifty-five districts (weredas) in Tigre province. The province for general purposes of description can be divided into five major zones.

(a) The broad central part of the province's highland area from Maichew in the south up to the Eritrea border in the north and as far as Endeselassie in the western part of Tigre. This zone is characterized by high mountains, steep slopes, and a very heavy population pressure. Consequently the area is grossly overcultivated, crop yields are low and there is a very serious soil erosion problem.

(b) The Eastern foothills and rangelands is a continuation of an ecologically similar zone found in Wollo province. It covers a narrow belt 50 to 80 kilometres wide, running south-north through Reya and Azebo and Enderta awraja including part of the south of Hulet Awlailo awraja. There is usually inadequate rainfall for crop cultivation but the area is potentially excellent rangeland. Water shortage is a constraint to development.

(c) To the East of these foothills the area quickly changes to desert, with a rainfall of 200 millimeters and less, occupied by nomads with camels, goats and a few cattle. The area has a very limited scope for any kind of improvement.

(d) The fourth zone is comprised of small regions between the central highlands and the western foothills and including the lowland area of Shire awraja. These regions are characterised by a rainfall which though erratic enables cropping to be undertaken. They have been recently occupied by cultivators pressing down from the overcrowded highland areas but this development has only occurred in the last 15-20 years, pressure on the land is still relatively light, and there is scope for development both on the cropping and livestock sides.

(e) The last zone essentially the so-called Chercher plain, is a small area in the central part of the Reya and Azebo awraja stretching from the border with Wollo province up to Enderta west of the main road in a belt approximately 20 to 30 kilometers wide. This area has recently been opened up and from results already obtained shows high potential for cereal and oil seeds production. It is an area well suited to mixed farming with intensive cattle production based on crop products and fodders which could be grown in rotation. These areas and administrative boundaries are shown diagramatically on Map 1.

2.16 Tigre's Livestock

The total number of livestock in the farming areas of Tigre province has been estimated by the Central Statistics Office at 1.12 million head of cattle, .36 million sheep and .875 million goats. These figures represent an average holding of livestock per household of 3.6 cattle, 1.2 sheep and 2.8 goats. More recent additional survey work indicates that nomads in Tigre province may own a further 400,000 to 500,000 head of cattle and about 700,000 head of sheep and goats with average family holdings of 45 to 50 cattle and up to 100 head of small stock. The pastoralists are important contributors of trade stock.

2.17 The stock population of the highlands of Tigre is almost certainly diminishing due to the shrinkage of the grazing area, consequent on expanded cultivation, and to deterioration in the grass cover. Lack of grazing during the dry season has become extremely critical. That there are still good grazing resources in the eastern foothills and in the lowlands of Shire is due mainly to the limit placed upon grazing use by shortage of water. This is an important factor and points to the danger of any programme of providing additional water supplies without satisfactory control on stock number.

2.18 Seasonal stock movements are found in most parts of Tigre, highland livestock moving to the lowlands between December= and April and lowland stock moving sometimes to the highlands between July and October. This traditional stock movement is an important factor in planning development, pointing to certain difficulties in controlling stock population in any one part, and the difficulties in prevention of animal disease.

2.19 Tigre's Agricultural Holdings

The average size of cultivated area (including temporary fallow) per holding in Tigre Province is 1.27 ha., but since only 80% of households report any land holding at all, the average cultivated area per household is only 1.02 ha. However 45% of all holdings in the province (66% and 68% in the Awrajas of Adwa and Agame (Adigrat) respectively) have less than half a hectare of cultivated land[1]. Thirty-two percent of all households in the Province are reported as having no cattle, and a further 21% as possessing only two head of cattle per household. In the light of these figures, and the manifest low productivity of agriculture in the province it is clear that the majority of people in the province live under very difficult economic conditions. (Data in this and the preceding 6 paragraphs are drawn from the Central Statistical Office's "Report on a Survey of Tigre Province" 1967).

2.20 Tigre's land tenure system

In the traditional highland agricultural areas of Tigre province the system of land holding is communal. The rights in land are not enjoyed exclusively by individuals but shared collectively by a community by reason of common descent from a family founder called an Akni Abat who originally pioneered the area, and by kinship with other members of the community. Present landholders use the land by reference to the fact of their descent from the Akni Abat and cases have occurred where land has been successfully claimed by tracing back descent for twenty generations. Land in which the rights are not enjoyed exclusively by individuals but shared collectively by a community, are known as rist lands. The rist system does not apply to those parts of Tigre, mainly in the East, occupied by those who are purely pastoralist nor to areas very recently occupied, such as the lowlands area of Shire. In the pastoral areas the land nominally belongs to the Government. A fuller description of the system in the Shire lowlands is given later. Within the rist system some modification called Jiraf Gotet or Gebar Meret has been evolved to counteract absenteeism in the system of land holding. This modification is directed at ensuring that the land belonging to the community is used by resident members. A full description of the land tenure in Tigre province can be found in a report of the Ministry of Land Reform and Administration[2]. The relevance of the situation as regards this project is to show that in the highland areas

---

[1] To get cropped area per household or holding these figures should be reduced by a further 10-15%.

[2] Report on Land Tenure Survey of Tigre Province, 1969, especially pp 4-8, 15 and 56-58.

surrounding the Shire lowlands the land tenure system is a major constraint on agricultural development. This applies especially to livestock development since non-cultivated areas are grazed communally, that is, anybody may graze their stock, at any time, on any piece of land that is not under cultivation at the time, without limit to numbers. This includes the communal grazing of crop stubbles.

III. THE PROJECT

3.01 The Objective and Targets of the Project

(1) To settle existing resident farmers in the project area on satisfactory tenure terms. Five thousand of these will be settled by the project in this phase of the development.

(2) To settle the maximum number of additional farmers from the over-crowded highlands (Tigre and Eritrea) in the project area on satisfactory tenure terms, thereby relieving land pressure in the over-crowded highlands. Most of those settled in this way will be people who already migrate to the area annually during the crop season to farm there temporarily. Seven thousand of these migrants will be settled in this phase of the development.

(3) To obtain a satisfactory economic rate of return to the fresh investment involved. The Planning Commission's cut off rate is 10% but the project will yield 17%.

(4) To increase the net farm income of the farmers involved to a figure of not less than 50% above the average in the Tigre Highlands. A minimum income of Eth.$600 (cash plus subsistence crops) is believed to meet this target. By the 12th year of each farmer's participation in the project this target will be achieved.

(5) To initiate a mixed farming pattern for the area which is ecologically viable in the long term, and also which contains within itself the potential for future change to meet changing economic circumstances. The land planning procedures and land tenure system proposed will bring this about.

(6)[1] To establish a pattern for medium-cost mixed farming resettlement under improved tenure conditions in Ethiopia, which, by providing for the progressive assumption by local organisations from Central Government of the project's administrative and financial burdens, offers prospects of replicability in other projects in the future. Development costs per settler under the project amount to about Eth.$1,440 (U.S.$625) and by the 9th year of the Project IEG's net recurrent financial contribution to maintain the project's impact will be reduced to Eth.$232,000 p.a.

3.02 Background of the Project Area

The project area, hereafter referred to as Lower Shire, is bounded on the north by the Mehreb river and on the south by the Takazze River. On the east side it is bounded by the escarpment rising to the highlands, which runs roughly along the line of the 38° East line of longitude. On the western side the project area is bounded by the effective

---

1. More formally the maximand is the number of additional farmers settled, while the other objectives are constraints.

line of demarcation between the administration of Tigre and Eritrea provinces. The line of effective administration is about 15 kilometres west of the provincial boundary normally shown on the maps. The project area covers about 450,000 hectares (4,500 km^2). Map 1 shows the location of the project in relation to the rest of Ethiopia, and Map 2 shows the project area's boundaries and main features.

3.03 Special studies carried out in project preparation

In the course of the preparation of this project a number of special studies have been undertaken in order to provide information on the existing situation in the area and to make proposals on the area's development. The reports of these studies are listed in Appendix A and will be made available to IDA on request. The following is a brief description of those studies which have contributed most to project preparation and the results of many of them are summarised in the Appendices to this application (See Appendices F, G, H, I, J and N).

3.04 In May 1970 a Project Identification Team from the Ministry of Agriculture visited the area for four days to collect background impressions and information. The soil samples collected on that occasion were analysed and the results of this analysis are given in Appendix F hereto. The report itself is listed under the Ministry of Agriculture in the Bibliography (Appendix A hereto).

3.05 In late 1970 the Livestock and Meat Board (LMB) put several teams into the field to estimate crop yields, to investigate the land-tenure situation and to collect certain information about household sizes, land holdings, livestock herds and incomes. The results of these investigations are summarised in Appendices G and H hereto and the reports are listed under the LMB in the Bibliography.

3.06 In early 1971 the LMB employed a consultant, Mr N. Cossins, as a livestock sociologist to examine the systems of animal husbandry of the area. His report is listed under Cossins in the Bibliography.

3.07 In April-June 1971 and again in August-September of the same year, a team of recent graduates from the Royal Veterinary College (London) carried out a survey of cattle diseases and related factors in the project area. Their report is listed under Royal Veterinary College in the Bibliography and is summarised in Appendix J hereto.

3.08 In late 1970 and early 1971, the Ministry of Mines (Geological Division) carried out a hydrogeological survey in the area and, with the assistance of equipment and crew from the Water Resources Department, drilled three test boreholes. The findings of this work is summarised in Appendix I hereto and the reports written appear under the Ministry of Mines in the Bibliography.

3.09 In July-September 1971 the LMB employed a consultant, Mr Ellman (financed by the British Government) to study and make recommendations on improved agriculture, land tenure and land allocation in the project area, and to advise on project organisation. His report is listed under Ellman in the Bibliography and forms one of the main bases on which this project has been prepared.

3.10 In early 1972, since a sound statistical basis for many of the planning parameters was still lacking, the LMB employed, Dr Watson, a consultant from Kenya, to carry out an aerial survey of the project area, using sampling techniques. His report is listed under Watson in the Bibliography and provides much of the statistical basis on which the land allocation and planning proposals of this application are based.

3.11 In addition to these major studies aerial photography of the area was carried out by the Imperial Ethiopian Air Force in February 1971, but the mosaics and photographs requested from them are still not available. A survey of the Eritrean meat market was carried out by the LMB and the Technical Agency. The Wildlife Conservation Department investigated the wildlife resources of the area. The District Engineer (Adigrat) of the Imperial Highways Authority did a brief inspection of the project area's roads and produced an estimate of the cost of raising these to feeder road standard. These minor studies, are also listed in the Bibliography.

3.12 Topography of Project area

The project area, most of which is at an altitude of 1,000-1,250 metres lies to the west of the Tigre highlands at the bottom of an escarpment which provides its western boundary. To the east the land slopes gently away across the province of Eritrea towards the Sudan. In very general terms the survey area consists of a black soil grassland basin, surrounded by red soil pediments forming a slightly raised lip, except in the east, where the major escarpment, descending from the Shire highlands, plunges abruptly to the floor of the basin. In the south a complex series of pediments descends from the escarpment westwards to meet the broken eroded hills of the Takazze valley. In the north two ranges of broken eroded hills divide the black soil basin from the Mehreb valley.

3.13 Communications

The project area is connected to the main Gondar-Asmara road and Enda Selassie by 120 kilometres of motorable track, taking 4-5 hours to traverse, which will allow laden lorries to pass in the dry season and 4-wheel drive vehicles, with difficulty, in the wet. Northwards a similar track leads across the Mehreb river into Eritrea Province to connect with the Barentu-Adi Ugri feeder road, but, because of the river, this track is impassible during the rains. Southwards a newly opened track leads across the Takazze River and then westwards to Setit Humera which can be reached in 4-5 hours. This track is also impassible during the rainy season because of the river. Within much of the project area there is a rough network of motorable tracks but the southwest part of the area is less accessible. During the dry season a daily bus service in both directions connects the area with Enda Selassie. There is a landing strip at Sheraro suitable for light aircraft that could, without much difficulty, be [illegible] to accept a D.C.3. There are no regular commercial telecommunications links to the rest of Ethiopia, but the police stations at Yrga and Sheraro operate radio links with Enda Selassie.

3.14 Geology

The Lowlands of Sheraro and Badime are part of the western branch of the East African Rift Valley crossing Ethiopia from Wollega up to Sheraro and continuing further to the north. The rifting was post laterisation. The Sheraro and Badime plains are rift valleys covered by a thin basalt which is weathered to a dark black soil. All the rocks in the project area except the sheet basalt and the alkaline trachyte are part of the pre-cambrian basement. Further geological information is given in Appendix I.

3.15 Soils

Four main soil types occur in the project area, which can be briefly described as black, red, pink and grey. An estimated 160,000 ha., 36% out of a total project area of about 450,000 ha. of land are estimated to be either already cultivated or to have potential for cultivation. Of these 160,000 ha., 50,000 (31%) are black soil, 69,000 ha (43%) are red soils, 9,000 ha. (6%) are pink soils, and the remaining 32,000 ha (20%) are grey soils. The black and red soils are acknowledged by local farmers to have much greater agricultural potential than the others but farmers like to have both some black soil fields and some red soil since the two types respond differently under different rainfall conditions, the red soil being better in years of heavy rainfall and the black in years of light. The black soils found on the flat plains are of a cracking type clay. Though the availability of plant nutrients may be poor from this kind of clay structure, the soils are only moderately leached. These black soils are difficult to handle, setting very hard during the dry season and being sticky during the rains. The red lateritic soils are found on the higher ground and on the slopes, and have been exposed to weathering. Elements such as iron, aluminium and manganese have changed the mineral structure to form oxides and/or trioxides usually known sesquosides. There is a high degree of leaching and the soils are consequently poor in plant nutrients. Soil samples from black and red soils were collected from around Badime, Endetelewa, Sheraro and along the roads as indicated on the map in Appendix F. The samples were analysed for plant nutrients like: Phosphorous, Nitrogen, Potassium, Sodium, Carbon and pH. The soils are generally rich in Potassium and poor to medium in Phosphorous. Details of the soil analysis are given in Appendix F.

3.16 Water supplies and prospects

During the rains there is plenty of water collected in depressions and ponds all over the area. After the rains the rivers cease their brief spates and most of the shallow pools dry up. A sample aerial census of water points, conducted at the height of the dry season (February 1972, see under Watson in Bibliography) revealed that in the north west of the project area there is a fair distribution of wells, mainly in sand rivers, to a density of about 1 in every 2 km.^{2}. In the south west of the project area there were found a number of riverine pools, at an average density of about 1 per km.^{2}. But in the central area, where much of the cultivation and habitation

is, there is a shortage of dry-season water supplies. Water deficiency in the dry season in the two weredas needs a strict definition. The problem is basically the labour that is required to get the water out of the shallow river-bed wells : more than the actual amount of water available. The level of the wells drops very considerably from January to May so that labour requirements at this time also increase. There comes a time when the labour input needed for watering, particularly for big livestock herds, exceeds the labour available so that herds tend to move either to shallower wells or the Takazze or Mehreb rivers where water can always be obtained.

3.17 Due to the different geological environments in the area, at least two major hydrogeological environments prevail as well. The Arkosic sandstones are a potential aquifer containing several hand dug wells, but the metavolcanics are unlikely to be a good aquifer because they contain much chloritic granodioritic gneiss around Badime and Endetelewa and are intensively intruded by the grey granodiorite. Only the upper weathered surface may contain water. Three test bore hole sites were located and drilled in the project area, one in Sheraro township, the second in Chamuskavit and the third at Endetelewa. Water has been found at exploitable depths at all three locations, but since pumping tests have not yet been carried out, no accurate details are as yet available on yield.

3.18 Further details of the hydrogeological survey are given in Appendix I, and the map in that Appendix shows the probability of finding ground water in different parts of the project area. In summary in a central strip, running southwest to north east, and covering 26% of the project area, there are good chances of finding ground water in reasonable quantities. Along the western edge of the area, covering 32% of the total; there is almost no chance of finding ground water in adequate quantities except in a few locations, for example where there are barriers of bedrock in river beds or where weathered basement rock is in contact with river bed water. In the south-west part of the area, covering 40% of the total there is a moderate chance of finding ground water, and further hydrogeologic surveys would determine the most promising places. But the existence of fairly large numbers of riverine pools in this area could mean that less expensive forms of water supply can be found. In the south west of the area (in the area where it is proposed to establish a co-operative ranch) two synclines offer very good prospects of finding ground water.

3.19 Climate

Average annual rainfall in the project area is probably in the region of 550-600 millimetres. Records are available for a few places in the project area, spasmodically over 6 years, but are insufficient to present a reliable picture. The records are given in Appendix D and there is further discussion and figures of rainfall for neighbouring areas in Appendix O. The variation shown by the existing records, and acknowledged by local experience, indicate that rainfall is somewhat erratic and subject to considerable variation in one year within a single area. There is no evidence from the vegetation, however, that long run averages differ much between different parts of the project area although precipitation is affected by altitude and by the exposure of

different slopes to rain-bearing wind. The area is subject to the typical monomodal regime affecting the northern part of the country and almost all the rainfall falls between June and the middle of September. In view of the limited annual amount the fact that it falls in a limited period is a help for crop production but is not so good for the grazing. It is likely that the rainfall, both because of its amount and unreliability, will put a ceiling on crop yields. Poor crops or crop-failure due to lack of rain should be expected about once in five years, but cultivation practices can moderate the extent of failure.

3.20 In comparison to rainfall, temperatures show much less variation either from year to year or from month to month. The diurnal variation is from a mean of 18°C to a mean of 35°C, the greatest diurnal variation being in the months of December, January and February. Available temperature records are shown in Appendix D. There are no records concerning wind or evapotranspiration. At Asmara, 150 kilometres to the north east, at an altitude 1,000 metres higher than the project area, but with a rainfall similar in amount and timing, potential evapotranspiration has been calculated at an annual amount of 1,500-1,650 mm, with daily figures at their highest (about 6 mm) in May, and at their lowest (3-4 mm) in July and August.

3.21 Vegetation

No detailed vegetation study of the project area has been carried out on the ground. A low altitude aerial survey, lasting five days, however, conducted by an ecologist with several years of East African experience provided certain outline information. Four major vegetation types are apparent. The first, covering 20% of the project area at about 1,100 m.a.s.l., is open Hyparrhenia -Setaria-Sporobolus grassland, with scattered Balanites sp., Acacia spp., trees and good grass cover. This type occurs on the black cotton soils, with impeded drainage, in the central plain of the project area. The second type, covering 13% of the project area at the same altitude, and surrounding the first type to the north and south, is fairly open Acacia-Terminalia-Combretum woodland on Hyparrhenia grassland with fair grass cover and mainly red soils. The third type found in the more rugged country near the Takazze and Mehreb rivers, and covering 42% of the project area, at heights between 600 m.a.s.l. and 1,500 m.a.s.l. is medium-dense Acacia-Euphorbia-Terminalia-Combretum-Delonix-Sterculia bush-woodland, with Baobab trees. Grassland is Hyparrhenia-Sporobolus-Cymbopogon type with poor grass cover. There are widespread outcroppings of rocks and abundant stony hillsides. The predominant soil is red. The fourth major vegetation type, covering 18% of the project area at altitudes of 900-1,500 m.a.s.l., occurs in the south-west of the project area between the escarpment foot and the Takazze valley. It is Acacia-Commiphora-Combretum woodlands, with thickets of Sanseveria and Aloe. The grass is Hyparrhenia-Cymbopogon-Sporobolus with fair cover. There are occasional rock outcrops and stony surfaces are widespread. Drainage is well developed.

3.22 The people in the project area

People who use the project area are of the following four major kinds. There are pastoralists from outside the area who use the area for grazing throughout the year or at particular times. There are other people who are permanent residents in the area, with permanent houses who farm and keep livestock. In this group some regard farming as their predominant occupation while others (fewer) are predominantly livestock owners. A third group are the migrant cultivators who come down from the highlands of Tigre or Eritrea for a few weeks each year to plant a crop and later to harvest it, but whose permanent homes are elsewhere. A fourth group are the hired labourers working for others.

3.23 The tribal origins of the area's users also differ slightly. The pastoralists from outside are mainly people from Eritrea province although a few come also from Begemdir. Of the permanent residents a minority (less than 10% of the total) are of the Kumyama tribe who speak their own language (although most of them also speak Tigrinya) and who have lived in the area longer than other tribal groups. In the northern part of the project area almost all the permanent residents are of Eritrean origin. In the southern part of the project area the permanent residents are about half of Eritrean and half of Tigrean origin. Among the migrant cultivators Tigreans outnumber Eritreans by about 9:1. The Tigreans and those Eritreans who use the project area are not ethnically distinct, and their languages are basically the same, albeit with minor differences of dialect. Nevertheless, the two groups tend to see themselves as different and co-operation is higher between members of each tribal group than between members of different groups.

3.24 Precise figures of human population are difficult to obtain. Estimates of the number of permanent resident farmers in the project area vary from 3,000 (Ellman) to 6,000 (number of registered taxpayers) to 9,500 (based on an estimate of the number of occupied dwellings made by Watson in March 1972). The figure is undoubtedly increasing over time, Watson's figure is the best-based and for planning purposes a figure of 10,000 resident farmers is used.

3.25 Figures of migrant cultivators (Mofer Zemach as they are known locally) are even harder to come by. In the northern part of the project areathere are more residents than Mofer Zemach, while in the southern part Mofer Zemach outnumber residents by 2 or 3 to 1. Overall Ellman estimated that there are about 3 Mofer Zemach to 2 residents, and this ratio, which is consistent with an estimate of average (cropped) farm size of about 2 ha., and a total cultivated area of about 70,000 ha., has been used for planning purposes and gives an overall estimate of 14,000 Mofer Zemach (migrant farmers) for the whole project area. The number of pastoralists from outside who use the area in any one year might reach 200-300 herd-owners. No estimate exists for the number of people who work as hired farm labour.

3.26 Provincial administration

The project area is part of Shire Awraja of Tigre Province. The capital of Shire Awraja, where the Awraja Governor lives and works, is Enda Selassie. The project area itself is mainly comprised by two Weredas (Districts). There is some confusion about the proper names of these districts, (this is worth noting since statistics for one district are often recorded under the name of the other) but in this application the northern wereda, whose headquarters and governor are at Yrga (see Map 2) is known as Tach Adiabo, while the other wereda, whose headquarters and governor are are Sheraro, is called Hedekti. The project area may spill over into other weredas on its eastern edge, but this is not very significant since wereda boundaries are normally neither well defined nor particularly permanent. On the western side of the area the location of the boundary between Eritrea and Tigre is rather uncertain. There are a number of villages scattered over the project area, often comprising only a dozen huts. The only settlements of any size are at the wereda capitals of Yrga and Sheraro. The latter is growing very fast and has a town electricity supply and a town borehole, and its population (including women and children) is now probably about 2,000.

3.27 Administratively the weredas are split up into chikas (villages) of which there are 36 in the two weredas. A chikashum (headman) normally elected by the community, is responsible for each chika. His responsibilities include tax collection, land allocation and the maintenance of public security, and he is assisted by a local part-time and un-uniformed tribal police force (See also Appendix H).

3.28 Land Tenure

Conflicting accounts have been given of the land tenure position in the project area. One account is that it is communal land, another that a large part of it is the personal estate of one person. A third account is that it is government land. The precise legal status of the land is not, in practice, as important as the political practicability of imposing particular land-use patterns on it. With the support of the Governor-General of Tigre the pattern proposed in this application is practical, and the actual legal status of the land makes this solution also juridically feasible. A large part of the project area cannot, legally, be the property of one person since, for it to be personal property, the owner must have consistently paid land tax on it. In any case the alleged owner does not claim it as his personal property. Nor is the land communal land as in the highlands of Tigre. While no precise legal definition of communal land exists, a working definition of it in Tigre is that communal (rist) land is land where, for a person to be able to claim a right to use it, he must be able to trace his ancestry back to the original first settler (or Akni Abat) on the land. This is not the system used for land allocation in the project area. In fact the land is government-land, both because government in Ethiopia is the residual owner and because it has been commonly recognized as government-land in the last twenty years and more, as an LMB-sponsored investigation (Reported in Appendix I, part A hereto) in late 1970 recorded it. The following two paragraphs summarise the land tenure position.

But in recognizing the fact that legally the land belongs to government it must also be recognized that government could not here, as it can in some other parts of Ethiopia, allocate the land to outsiders or in disregard of the existing users of the land.

3.29 Basically the land tenure system is gabar, that is to say the land is Government land and is allotted by the chikashums to farmers. This allotment started in 1933 E.C. (1941 G.C.) and at the start was mainly allocated to people of the Kunama tribe. Later highlanders, most from Eritrea, who used to graze their cattle in the area as pastoralists settled as farmers and received allocations of land. This allocation has proceeded since then reaching big proportions only in the last ten years. The most important factor in relation to the user's right to his land is the payment of land and agricultural income tax. As long as these taxes are payed a farmer is held to have a usufructuary right for life. The place of residence of the farmer does not affect his right on the land. The land is inherited by the farmer's children only if these have resided in the area before the death of their father. Inheritance customs vary considerably throughout the district. Ownership of the land is not affected, if the land is not cultivated. Sale, mortgage or antichresis of agricultural land in the district is prohibited since the land is held to be owned by the Government. Holdings vary in size in spite of the fact that in recent years allocations have been limited by order to six hectares per family. Previously married sons could be allocated holdings separate from their father but due to shrinkage in the available land for allocation this system is being curtailed and a married son is required to share his father's holding. In cases of failure to pay the taxes, land is taken from the defaulter and reallocated. All pastureland is used communely. There is no privately owned grazing. Even the cultivated areas after harvest are communely used.

3.30 There are no clear cut tenancy rules in the area. Most land-holders, however, have at least one sharecropper cultivating part of the land on a yearly agreement. The aim of these sharecroppers is to save money in order to buy oxen when they will then apply for an allocation of land on their own behalf. Many farmers engage temporary labour during ploughing, weeding or harvesting. Average rates are stated to be Eth.$1.50 per day without food or Eth.$1.25 with food and housing. Labourers are also hired on a monthly basis, the rate being 5 to 7 dollars per month with food and housing.

3.31 Crop farming

The project area at present produces two major crops, sorghum and sesame. In addition a substantial amount of incense is collected from the wild incense trees of the areas. Sorghum and sesame yields are low. While in good years the sesame yields of resident farmers may reach as high as 3.5 quintals per ha. the average for all farmers over the long term is about 2 quintals per ha. Long term-average sorghum yields are about 7 quintals per ha. although in good years among residents they may rise to over 10 quintals. Yields achieved by Mofer Zemach farmers are probably lower than those of residents. Along the Takazze and Mehreb rivers some farmers have been able to use irrigation to produce higher value crops, but these are only a very small minority.

3.32 A wide range of estimates have been made in different studies of the average areas cropped by individual farmers and the size of their fields. The 1970 Ministry of Agriculture Project Identification Team reported an average size of holding as high as 29 ha, with individual holdings going up to 100 ha. No later surveys have produced figures remotely approaching these and there must be some suspicion that a translating error confused hectares with the local unit of measurement, the timad, which is about 0.14 ha., although the team were aware of the difference. Ellman, after painstaking enquiry in 18 villages, and some actual measurement of fields (although he was unable to use random sampling methods) concluded that average farm (cropped) size is about 2.2 hectares, held in an average of 3.15 different parcels (fields). An LMB survey, in late 1970, which randomly sampled 2 farmers out of each of 16 non-randomly selected villages (but these represented 50% of all villages) and which asked these farmers the size of their holdings (but did not measure them) reported an average size holding for the whole area of 2.6 ha., held in an average of 2.8 different parcels, but with holdings in Hedekti being slightly larger at 3.05 ha., in more parcels, averaging 3.2 per farmer, than in Tach Adiabo where holding size averaged 2.06 ha. in an average of 2.5 different holdings. The LMB crop-yield survey, held at about the same time added confirmation to the approximate correctness of these figures, by measuring randomly selected field sizes and computing an average field size of .35 ha. (sorghum .42, sesame .28). Watson, using photogrammetry in March 1972 computed an average field size of 1.6 ha but there is some doubt whether he was able to distinguish, individual fields properly, and Watson may really have been measuring patches of cultivation. Provided he measured these accurately his estimates of total cultivated area will have been correct.

3.33 Cultivation techniques, and their potential for improvement, are discussed in more detail in Appendix O. Present yields are very low for a number of reasons among which are: late and inadequate seed bed preparation for which, with existing seed bed preparation techniques, there is inadequate time; low seed germination rates which may be due to poor seed or to seedbed preparation; declining fertility of land; inability to control weed growth, especially Striga Hermonthica in sorghum fields; no means of insect control.

3.34 Watson, in February 1972, estimated that 86,000 ha of land in the project area had been cultivated in 1971, a further 26,000 were fallow, 3,000 ha. were being cleared apparently for the first time, and that a further 48,000 ha. of land are of similar quality to land already cultivated, and therefore appear to be cultivable but have not yet been cultivated. These estimates have been broadly accepted for planning purposes in this proposal, except that the area actually under cultivation in 1971 may have been slightly over estimated by Watson, and a figure of 70,000 which is within a reasonable margin for sampling error from Watson's estimate, has been used instead. A figure of 70,000 ha. appears to be more consistent with what is though to be the farming population and the availability of draught oxen.

3.35 Livestock

Crop growing is regarded as the primary use of suitable land by the inhabitants of the area, with cattle grazing as a definitely secondary occupation. One of the more important reasons why cattle are kept in fact is to produce work oxen for cropping. The total number of cattle estimated as using the two weradas in March 1972 (Watson) was approximately 60,000. Of the total cattle numbers at that time probably about 65-80% were owned by residents of the weradas, 10-20% came in temporarily from Eritrea and 8-16% from elsewhere. This figure for total cattle numbers, however, represents only the cattle present in the area. The total number of cattle owned by the residents is probably a great deal more. Tach Adiabo people keep a number of cattle in Wolkait in Begemder province. It is stated, however, that there are probably more remaining in the werada than at Wolkait. There could be anything up to 8,000 cattle from Tach Adiabo out of the area and 15,000 from Hedekti. During the ploughing season large numbers of additional animals, possibly as many as 30,000, come down with Mozer Zemach farmers from the highlands to plough. Expansion in the cropping area means an increased demand for draught animals and there is at present an obvious deficit of draught animals in Adiabo. This is reflected in prices for young male animals, and this relative deficit of males, because of the demand for draught animals, puts a constraint on the future development of parts of the area for commercially-oriented ranching.

3.36 An intensive veterinary survey of the project area was undertaken by a team of four veterinarians in 1971. Over 2,000 animals were examined, as a sample of the total population. Preliminary indications are that there should be no insuperable problems to adequate disease control in the area. Rinderpest is still a major scourge, but with the existence of a highly effective vaccine its control is only a matter of good organisation. Sporadic outbreaks of anthrax and blackleg can be similarly controlled. Tryponosomiasis which is commonly reported by the local people and was feared to be a major obstacle to development plans, was not found during the survey and if it does exist it is probably limited to small areas. Symptoms are probably confused by the local stockowners with other fever conditions associated with tickborn diseases. Ticks are certainly an important problem in the region and their control must be an important part of disease work in any development project. The findings of the veterinary team are summarised in Appendix J hereto.

3.37 There are considerable seasonal movements of cattle throughout the project area. All herd movements are caused by a combination of grazing and water shortage. Shortage of grazing is the most critical factor and stimulates most of the moves in an average year. Immigrant cattle herds are more ready to move in response to grazing shortages than cattle owned by residents. During the rains there is plenty of water collected in depressions and ponds all over the area. The cattle herds are scattered at this time, their distribution being determined mainly by cultivations. By early February the herds have retreated to the more permanent watering places and are concentrated in these areas in large numbers. With the exception of the Tekezzie and Mehreb rivers and the springs at Maiteni, Maintebteb and Chamuskavit the rest of the water supplies used by cattle are subsurface and nearly all in the beds of dry rivers.

The same group of herds tends to use the same watering places year after year. A well is owned by the man or group of men who dig it. Generally two or more herds use a well each day. The owners of the well have first option. When they have finished, arrangements are made for others to use it. In the dry season cattle are watered every second day. On the watering day they are watered twice, once in the morning and again in the afternoon. As is usual under these conditions, the grazing round the wells is grossly over utilized, the situation improving with distance from the watering point.

3.38 Data available on herd composition and size are self-contradictory and unreliable due to the absence of a proper statistical framework for collecting it. A household survey, run by the LMB, recorded average resident-farmer holdings of cattle of 2.4 oxen per family and 11.1 cows. The age distribution is not given. Cossins reports an average herd size (per owner) of 38.7 head of cattle (20-30 being the more common size) of which oxen represent 10.5% and other males a further 23%. Few of these figures are plausible in the light of the extent of cultivated land in the project area and the fact that, given the limited time available for ploughing, a pair of oxen are most unlikely to be able to cultivate more than 3 ha. If 10,000 resident farmers cultivate 3 ha. each, there must be 20,000 oxen in the area in June each year belonging to the residents, and this is not consistent with the low proportion of oxen shown in the two survey results given above, and with the maximum conceivable stocking capacity of the land under present management conditions. The low proportion of oxen recorded is most atypical of farming areas in Ethiopia. For the farming areas of Tigre as a whole the proportion of oxen is 31% (other males are a further 18%).

3.39 Watson, in March 1972 found about 58,000 head of cattle in the project area (± standard error of about 12%). Some of these will have belonged to pastoralists from other areas, although possibly it was early in the season for many of those yet to have come in. Some resident farmers of the project area will also have had cattle herds outside the area at that time, although again it may have been too early for there to be very many. For planning purposes it has been assumed that 65,000 head of cattle is about the number belonging to resident farmers that the project should count on having to find room for. Such a total herd is not quite self-sustaining in terms of providing the number of oxen (and their replacements) necessary to farm the resident farmers' land, and this is consistent with the high prices paid for draught oxen in the area and complaints about their shortage. Mofer Zemach migrant farmers also have cattle, but these are probably much fewer per household in number.

3.40 Evidence collected by Cossins and the veterinary team suggest that livestock mortality is high, adult mortality about 12%, calf mortality about 33%. Fertility rate among cows is about 50-55%.

3.41 Credit

There is no organised or official credit institution operative in the project area. The nearest bank is a branch of the Commercial Bank of Ethiopia in Edna Selassie. This branch gives credit to local merchants mainly in order to purchase grain at harvest time when it is cheap and store it until the prices rise. In lending out money the bank requires lien on town properties (either land or buildings). Nevertheless, farmers do acquire credits mostly in kind from merchants or wealthier farmers or relatives. A common system is to borrow one quintal of sorghum during the season and return one quintal of sesame after harvest. Assuming that the price of sorghum at the time of borrowing is 15-20 dollars per quintal and the price of sesame is 40 dollars per quintal when repaid, this represents a rate of 66% to 100% interest over six months or up to 200% per annum. There is some cash lending as well. Eth.$26-28 is lent by merchants for the return of one quintal of sesame. This is roughly 50% interest over six months or 100% per annum. Cash repayments are uncommon except when a farmer borrows from his kin and returns it without interest. In most cases repayments are on time and in full. The purposes for which the money is used are mainly for purchasing food for the family up to harvest time, draught animals, and seed.

IMPLEMENTATION OF THE PROJECT

3.42 Phasing of Development

Development of the Lower Shire area will take place in two phases. The development period of the first phase, which forms the subject of the present proposal, and which is hereafter referred to as the project, will take place over six years. It provides for the development of about half the project area, and the settlement of about half the number of farmers who will eventually occupy the project area. The second phase, which will start when the funds for it have been secured, and when sufficient experience has been derived from the first phase to indicate any desirable changes in approach, will provide for the development of the remaining land and farmers. The land and farmers to be developed in the first phase will be selected according to whether the majority of groups of farmers occupying contiguous farms appear ready to accept incorporation into the project. But the outline land-use of the whole project area will be planned in the first stage, so as to ensure equally fair access to land by farmers both in the first and second stages.

3.43 Summary of Proposed Project Components

It is proposed that the project should have the following major components:-

a) Land planning and allocation of land to different uses.

b) The identification and establishment of the organisations and persons to whom land will be allocated, and the establishment and enforcement of appropriate land-use regulations; the settlement of farmers on their farms under satisfactory tenure terms.

c) Improvement of crop-cultivation methods, and introduction of new crops.

d) Improving the management, health, and hence commercial offtake, of individually owned livestock on village grazing areas, or on cultivable holdings.

e) The establishment of a commercial-type ranch, run by a ranching co-operative.

f) Improved storage and marketing of outputs and the supply of commercial inputs.

g) Credit.

h) Improved communications

i) Supporting crop and livestock trials.

j) Improved domestic water supplies and provision of grain milling facilities for villagers.

3.44 Summary of the main organisations involved

The main organisations involved will be:-

1) Individual farmers - about 12,000 of them.

2) About 20 village level organisations, with the legal status of co-operatives but under detailed supervision and control of IEG who will gradually devolve responsibility on the members as they become ready and able to accept it.

3) A ranching co-operative to run the commercial-type ranch in which IEG initially will be the main investor.

4) A co-operative union to carry out certain functions, for both IEG and farmers.

5) A project development unit, under the Extension and Implementation Department of the Ministry of Agriculture, to carry out the functions of some central government departments in the area (other than the provincial administration, health, education, and law courts)

6) The local provincial administration, charged with helping in defining which farmers should be initially selected for inclusion in the project.

7) The AID Bank, to be the channel for providing the short and long term credits required.

3.45 Land Planning and Allocation by Use

Two areas have been tentatively and voluntarily allocated by the local people as suitable for commercial-type ranches. A large part of the cultivable area is already cultivated. Nevertheless, further land planning work is required in order to:-

1. Confirm the suitability of the land provisionally allocated for a commercial ranch - and define its boundary.

2. Define the exact amount and limits of the cultivable land, and group it into suitable village units in accordance with sociological and physical (propinquity and suitable combinations of different soil types) criteria.

3. Within the cultivable land of each village demarcate land required for access roads and drainage, and roughly demarcate the land for individual farmers' holdings (holdings may comprise one or more separate plots).

4. Identify separate village grazing areas for each village, with an overall stock carrying capacity in proportion to that village's allocation of cultivable land.

5. Locate the sites for fixed investments on village grazing areas and commercial ranches.

6. Identify a limited amount of land for general public or government use (roads, towns, government research stations, grazing reserves on stock routes etc.).

7. Arrange and supervise a small amount of removal of farms from areas to be reserved for ranches and grazing, and of relocation of these farms on vacant land in cultivable areas.

Much of the land planning can be done on the basis of aerial photographs (Scale 1:20,000) and photomosaics now being prepared. Preliminary identification of land suitable for cropping, village grazing areas, and the commercial ranch has been done on the basis of a sample-based aerial Survey (by Watson in March 1972). This is discussed further in Appendix N hereto. In view of the low and uncertain rainfall, and hence the limited potential of the project area's land, the cost of land planning must be kept low else it will not be justifiable. On the basis of information at present available, the results of land allocation in the first stage will be:-

		Hectares
a)	20 village cultivation units of 600 farmers each, with 5 ha. of cropping land to each farmer	60,000
b)	20 village grazing areas, averaging 6,000 ha. each	120,000
c)	Land required for public use	10,000
d)	Land unsuitable for cultivation, in and around the cultivable lands of the villages participating in the first stage, to be used for rough grazing	20,000
e)	One commercial-type ranch, of 20,000 ha	20,000
f)	Land not to be developed or allocated in the first stage	220,000
	TOTAL PROJECT AREA	450,000

3.46 The choice of 5 ha. as the size of plot for each farmer is based on the target income aimed at, and on the agricultural techniques which already esist or which can easily be introduced. While there is some uncertainty about the average size of existing holdings, and their size distribution, on balance it seems likely that only few existing farms have cultivated holdings in excess of 5 ha.

3.47 Although there are some 50,000 ha. of land in the whole project area which have not yet been cropped, but which are similar in quality to that which is already cropped, (and can therefore be classified as cultivable, not yet cultivated) these are not all available for a potential increase in the total cultivated area. Some 16,500 of the 50,000 ha. are located in small patches in areas which it seemed sesible to reserve for village grazing areas, while a further 9,000 ha. of cultivable land, not yet cultivated, will be required to compensate farmers moved from existing farms within the village grazing areas. Only about 25,000 ha. of this land will, therefore, be available for a net expansion of the cultivated area in the future. The future total cultivated area (including land to be developed in the second stage as well as in the first) is then made up from the following sources:

Cropped in 1971	70,000
Fallow, or cleared for cropping in 1971	29,000
Net addition from land cultivable not yet cultivated	25,000
TOTAL	124,000

All these figures for cropped, fallow, and cultivable not yet cultivated, land are estimates based on sampling techniques, and are therefore subject to sampling error as well as to straight-forward measuring errors.

3.48 The land tentatively identified as being suitable for the future village cultivation units lies in the middle of the project area in a fairly regular shaped central block averaging about 55 kms long by 30 kms wide. While the precise way in which farms and farmers are grouped into village units must be based on sociological, historical and ecological criteria, an average size of village area (including both cultivated land and uncultivable land mixed in amongst it) of 40 km^2 represents a convenient size for the provision of marketing, supply and other facilities.

3.49 Some land needs to be reserved for general public services (in addition to land in, or adjacent to, each village's cultivable area which should be reserved specifically to provide facilities, i.e. farm roads, space for housing, and other constructions, for that particular village). Such public services would be an agricultural research station, one or more towns or administrative centres, public roads, stock routes and their grazing reserves, etc. Tentatively, an amount of 10,000 ha. (2.3% of the total project area) is estimated to be required for such purposes, mainly around the settlements of Yrga and Sheraro.

3.50 The stock-carrying capacity of the vegetation on the grazing land in the area has been tentatively estimated (by the World Bank 1970 Mission) at 4 ha. per livestock unit (L.U.). Other less optimistic estimates have put it at 8 ha. per L.U. In March 1972, about 60,000 head of cattle, say 50,000 L.U., excluding goats, were in the area (i.e. 9 ha. per L.U.). Not too much stress can be put on this figure, however, since most of the livestock were then feeding on crop residues; and at ploughing time up to 30,000 oxen may come down into the area from the highlands. The present carrying capacity is considerably less than the potential, both because of maldistributed water supplies and of present management practices which have allowed hyperrhenia, which is unpalatable for all but a short period of the year, to dominate more promising grass species. The potential carrying capacity, however, of different parts of the project area, probably differs widely, and land allocation for grazing purposes needs to recognize this.

3.51 The land in the extreme north and south of the project area has much less potential for cultivation than that in the centre. At certain times of the year, however, it is extensively used for grazing by the cattle of bot. resident farmers and immigrant herdsment from the north and west. In the long-term the cattle of these immigrant herdsmen will have to be excluded from the project area, but the proposed pace and phasing of development will allow time for adjustment.

3.52 Of the 280,000 ha. of grazing land (140,000 in the first phase) required, some 220,000 can be quickly identified in two continuous blocks, one in the south and one in the north and north east of the project area. Some patches of cultivation may have to be moved out of these areas in order to clear them for grazing (since fencing of isolated patches of cultivation is likely to be uneconomic). It is proposed that each village of 600 farmers will be allocated 6,000 hectares of grazing land.

3.53 Land Tenure, Land-holders, and Land-use Regulations, Settlement.

The project area is one of comparatively recent (not more than 30 years) settlement. The present conditions of land tenure are ill-defined and unsatisfactory, leading to insecurity, some abuse of administrative power, and lack of conditions conducive to proper long-term development. The situation, however, is still flexible and a satisfactory tenure system could still be imposed by Government if it acts quickly.

3.54 The tasks on the land-tenure side are to:-

a) Decide on satisfactory tenure conditions.

b) Determine the future legal status of the land.

c) Decide on, and set up, appropriate organisations or persons to:-

i) Own
ii) Allocate
iii) Use
iv) Supervise the use of the land in the project area.

d) Following demaracation of ranch boundaries, and of village cultivation and grazing areas by the land planners, to register and allocate the land to the appropriate organisations, and to maintain appropriate records of this demarcation and allocation.

e) Police the fulfillment of land tenure conditions.

3.55 Appropriate tenure conditions are ones which will:-

1. Secure for the users of the land the profits from its use.

2. Give the users the necessary incentive to improve and develop the land, and enable them to lead secure lives.

3. Prevent the uneconomic fragmentation of holdings.

4. Enable future adjustments to holdings' size and location to be made in accordance with changing circumstances.

5. Enable the land to be exploited in an efficient way.

3.56 It is proposed that full (equivalent to freehold) title in the land should <u>not</u> be given to <u>individual</u> farmers. Such full individual title would:-

a) Involve administrative costs in demarcation, survey, and registration higher than the agricultural potential of this area can bear or justify.

b) Lead to future uncontrollable fragmentation of holdings.

c) Lack the necessary flexibility for future reorganisation.

d) Carry the risk of subsequent loss of the land by its users to money lenders, land speculators or other unscrupulous people.

e) Prevent the efficient exploitation of the land by livestock.

3.57 It is proposed that the ranching co-operative running the commercial-type ranch should be given land on a long (say 50 years) lease. The lease will be terminable if specified conditions regarding stock, investments, prevention of soil erosion or subletting are not fulfilled, but would be renewable at the end of fifty years subject to mutually acceptable fresh conditions. A low rent will be payable, not exceeding the amount of land tax that would otherwise be obtained from the land, plus the amortisation of any expenses actually incurred by government in the land-use planning, demarcation and registration of the ranch.

3.58 The 220,000 hectares, which it is proposed should remain unallocated in the first stage, will be under the administration of the Ministry of Land Reform and Administration, who will be concerned only in preventing people from cultivating land intended eventually for grazing land or from trying to exercise proprietory rights over it. The 10,000 ha. of land required for public use will also be under the administration of the Ministry, who will allocate any part of it on such terms, excluding outright grant, as will be appropriate for its development in the required use. An amount of 1,000 hectares will be required for crop and livestock trials and

3.59 It is proposed that land demarcated as suitable for cultivation or for village grazing areas should be progressively allocated by the Ministry of Land Reform and Administration over a five year period to village level primary co-operative societies to be formed during this period. The cultivable land (together with the uncultivable land in and around it) and the grazing lands will each be the subject of separate lease agreements between the co-operatives and the Ministry. The leases should be for an unlimited period subject to fulfillment of the conditions therein, and provided that IEG is not called on to honour guarantees given by it in respect of credit. (See Below)

3.60 The lease agreement for grazing land will contain conditions concerning:

a) The maximum number of stock to be grazed on it.

b) The minimum amount of investments to be made on it - and the time by which they must be made.

c) The adoption by the co-operative of grazing bye-laws acceptable to the Ministry and not to be changed without the Ministry's consent, regulating:

1. who may graze their livestock on village grazing areas; and the issue of grazing licenses;

2. Grazing fees (covering capital and recurrent costs of all services including dipping, vaccination and watering provided);

3. Number of stock to be kept on the area by any individual co-operative member;

4. Dipping, spraying and vaccination of cattle;

5. The right of the co-operative to manage the grazing including watering and rotation of grazing areas.

d) No fragmentation of the grazing area by sub-letting parts of it.

3.61 The lease agreement between the Ministry and a primary co-operative concerning the cultivable land to be allocated to each co-operative will contain the following provisions:

a) Allocation of cultivable land by the co-operative on subleases is to be to co-operative society members, but to no one else.

b) The maximum size of holding thus sub-let is to be restricted (normally to 5a.).

c) Continued residence of the sub-lease holder in the project area.

d) Sub-leases are not to be transferable by court order but only by voluntary agreement of the holder or on his death. If before his death a holder does not designate, a person to take over the sub-lease then the co-operatives' bylaws should specify to whom the sub-lease should pass (e.g. to the eldest son, or to one of the heirs chosen by lot).

e) Sub-leases are not to be split either voluntarily or, on the death of a holder, between his heirs, nor may they in turn be sub-let to tenants.

f) Sub-leases are normally to be of indefinite duration but may be revoked (on payment of compensation for unexhausted improvements) if the holder fails to observe the specified land-use regulations (as laid down in the primary co-operative's bye laws) or defaults on repayments of credit to the primary co-operative.

g) A sub-lease may also be revoked, even where a holder does observe the regulations or bye-laws, where his holding is required in order to facilitate some reorganisation of the land pattern; provided that he is offered other land of equivalent value plus compensation for unexhausted improvements.

h) The constitution of a special "Land Committee" of the co-operative to supervise land allocation and observance of tenure rules.

i) The land allocation and land use on the primary co-operative's cultivable land shall be in accordance with the land-use plan.

j) That the co-operative as a whole follows good husbandry rules concerning the prevention of erosion, the maintenance of soil fertility, and the prevention of over-grazing on the cultivable areas.

k) The adoption by the co-operative of farming bye-laws, to be approved by the Ministry and not to be changed without its consent, governing the above and similar matters.

l) The payment of a moderate rent covering the equivalent of land tax and any expenditures incurred by government in the planning, demarcation and registration of the land (it is not proposed to do any land development work such as contouring or bunding) and administration of the leases. Such rent may be increased where a co-operative is in default of its credit repayments and government has to honour its guarantee to AID Bank (see below)

3.62 Certain major issues will arise in the course of the allocation of land to different users, and especially of cultivable land to primary co-operatives. They are:-

1. The speed at which village primary co-operative societies can be established.

2. The selection of the members of these societies.

3. The reduction in the size of some existing holdings.

4. Compensation or payments for existing investments.

5. Financing the starting-up costs of new settlers.

3.63 No registered co-operatives at the moment exist in the area, although a 464 member grain co-operative in Hedekti is currently applying for registration. The project envisages the creation of 20 village-level primary co-operative societies over a period of five years. Although the Governorate General of Tigre has a good record of communal self-help activities, it is unlikely that this number of new co-operatives will be established in such a short period if the rate of development is left purely to "Grass Roots" pressures. The co-operatives will have to be established initially as government-sponsored and guided facades, behind which a proper "Grass Roots" co-operative foundation can be built up. Responsibility and power of control can then be progressively devolved on to the members of the co-operatives when they seek it and are deemed competent to exercise it. This is the way that some of East Africa'x most successful co-operatives grew up (as well as democratic local government institutions). The Co-operative Proclamation of 1966 has provisions (Articles 14 and 18 (b)) by which IEG can help to sponsor and guide co-operative societies.

3.64 Since only members of village-level primary societies will be eligible to be allocated land for cultivation, designation as being eligible for the initial membership of a society confers an important privilege. A land adjudication team, which will spend the first year of the project, in conjunction with the land planners, in studying the social and historical criteria for splitting up the area into villages, will subsequently be responsible, in co-operation and with the aid of the Provincial Administration, for the designation of individuals as members of a village. Initial designation as a village member should be along the following criteria, in order of priority, until sufficient members are designated to take up all the village's available cultivable land:-

a) Existing resident farmers on land, grazing and cultivable, allocated to their village;

b) Existing non-resident farmers willing to become resident;

c) Other people, preferably those already working as labourer's or tenants, who wish to become resident farmers.

3.65 Although average present size of cultivated area per holding is probably in the region of 3 ha. or a little less, some existing holdings are undoubtedly bigger than this, although the bigger holdings probably have tenants on a larger part of them. It has not been possible to obtain firm figures on the size distribution of holdings, but there are probably a handful in the project area as big as 15 - 20 ha., and possibly several hundred in the range of 5-10 ha. The owners of these holdings do not have proper legal title to them but to dispossess these people of them will cause some resentment against the project, although a certain amount of arbitrary dispossession is quite normal in the area. However, not to dispossess them is to run the risk of a tremendous land-grab in the next 2-3 years, when people learn that if they have more than 5 ha. at the start of the project they will be allowed to keep them. To allow

holdings of more than 5 ha. will limit the number of settlers who can be moved down from the highlands, and will cause also disparities in wealth and power than may cause difficulties in village primary co-operatives. However, the big land-holders are often also the most influential leaders in an area. It is, therefore, proposed to allow them to retain that part of their holdings, subject to an absolute maximum of 20 ha., that they cultivated in any of the three years prior to the crop season 1971/72, with their own resources and not with tenants. These larger holdings will not be subject to the same non-fragmentation rules as the standard holding and they are, therefore, likely to be temporary phenomena.

3.66 The land-use planning and allocation of land to different uses will inevitably lead to the necessity of some relocation of existing farms, in order to remove some (not many) from the proposed ranches or village grazing areas, and to allow the orderly positioning of access roads and drainage ways, and the rational grouping of new holdings in the proposed cultivation areas. This will involve the owners of these displaced farms in some loss. It is proposed that compensation should be paid to those disturbed at the rate of between $10 and $70 per ha. (depending on the amount of bush which has to be cleared) for land which the person displaced has cultivated within the three years previous to displacement, and an appropriate amount for any buildings. Where a person is displaced from the area of the co-operative ranch, the compensation should be paid immediately after displacement. Where a person is displaced from village grazing or cultivation land, he will be offered a holding in that village, and compensation will be paid by the co-operative over a period of five years from displacement. The co-operative will recoup this compensation through grazing fees and rents (which will be higher for those occupying land previously cleared by others). Costs of compensation, therefore, have been included in the financial calculations for the ranch (Annexe IV). Both the new settlers from the highlands, and those previously in the area who have been wholly or partially displaced by the land-allocation procedure, will need some start-up capital, principally for land-clearing, to get themselves started on their new farms. This start-up capital will be provided as loans through the primary co-operatives.

3.67 <u>Improvement of crop cultivation practices and introduction of new crops</u>.

A crop trials, extension, and credit programme will be implemented with the objective of substantially improving on the present levels of productivity per man and per ha. from cultivation. A doubling of existing levels should not be difficult. The trials and extension programme will be financed by IEG, while credit will be channeled from AID Bank, through the co-operative union and village-level primary co-operatives, to the farmer. The programme (as far as cultivable areas are concerned), which will last for five years, will concentrate on the following:-

a) Improved varieties, planting dates, seed bed preparation, pest control, weed control, fertilisation and crop-husbandry techniques for sorghum and sesame.

b) Adaptation trials for other crops.

c) Crop rotation.

d) Production, conservation and utilisation (including fattening) trials of fodder crops.

e) Economic research on optimum farm management patterns.

f) Testing of improved tools.

Gradually over time there is likely to be a switch away from growing sorghum for grain, towards other crops or to using sorghum for fodder. As a consequence, average per hectar output (in value) should rise by more than 100% (lagged over several years).

3.68 The applicable results arising from the trials will be communicated to farmers by an extension programme which allocates one field worker, on average, to 600 farmers (one worker per village-level co-operative), although while farmers are being first incorporated into the project, i.e. during the first two years of each co-operative's existence, the ratio will be one field extension worker per 100 farmers. This is a higher ratio than in the Minimum Package Programme but low in comparison to resettlement schemes in other countries (e.g. Kenya).

3.69 As part of the extension programme a training school will be established in the project area which will train both the junior field extension workers and the farmers. However, as this training centre will be quite small and demands made on it will be large, part of the training of extension workers will take place at the proposed Mekelle training centre of the Ministry of Agriculture; and discussions have been started with the Education, Training and Information Department about this.

3.70 To enable the farmers to take advantage of the extension programme they will be provided with convenient access to sources of credit. AID Bank will give credit, in bulk and on suitable terms as to maturity etc., to the co-operative union, which will re-allocate to the primary co-operatives, who in turn, will pass it on to farmers to to improve the productivity of cultivation. Credit will be required for the following purposes:-

a) An initial start-up loan for new settlers, or for those extensively displaced by the land planning process.

b) Credit for seed, fertiliser and pesticides.

c) Credit for improved tools and structures (e.g. plough, harrow, ox-cart).

d) The purchase of plough oxen and some breeding cattle (especially by Mofer Zemach).

The details of the innovations to be introduced, their purpose and timing are discussed in Appendix O, and the financial particulars are shown in Annexe 1, especially Table 1. Market prospects for crops are disscussed in Appendix R.

3.71 Improving the management of individually owned livestock

At present the commercial offtake from the livestock in the area is extremely small. Disease and other hazards lead to high mortality, and the prime function of cattle herds is to provide a source of replacement draught oxen. The availability of sufficient ploughing oxen appears to be a constant source of worry to present farmers in the area.

3.72 The relatively low potential productivity of the grazing in the project area, and the relatively high proportion of the area that is already cropped, or can be cropped, means that the area will not be a substantial exporter of high quality steers while ploughing continues to be done by oxen. The reason for this is that too high a proportion of the herd has to be engaged simply in producing replacements for the ploughing oxen. While the differential between the prices paid for young finished steers and for culled work oxen remains at its present level, and until per ha. productivity of cropping increases substantially (and above the levels forecast in the first six years of the project), thereby increasing the opportunity cost of land which has to be reserved for growing feed for oxen, a change-over from ox-ploughing to mechanical ploughing is still not profitable or economically justified. Experience so far in the project area with tractor ploughing has not been encouraging.

3.73 While the area is unlikely, for a few years, to be an exporter of substantial numbers of young finished steers, the proposals for livestock development under the project will enable it to become self-sufficient in cattle, and to produce a large number (4,500 - 5,000 annually from first-phase developments) of culled plough oxen in quite good condition for slaughter. This will be a very substantial improvement on the present situation. After year 4 the area will also start supplying finished steers for the export market.

3.74 It is proposed that each village-level primary co-operative formed under the project will be allocated 6,000 ha. of grazing land (termed village grazing areas), which may be at some distance away from the cropped land of the village, on which investments for the improvement of animal husbandry can be made, and where grazing can be managed and controlled. In addition each village will have a certain amount of rough grazing land around and mixed up with its cropping land. But it will be virtually impossible to control or manage the grazing on this. Each farmer will also graze animals on his own farm on crop residues and on fodder crops.

3.75 The present ownership of cattle in the project area is unevenly distributed, with many small farmers possessing no cattle and some very large herds. However, the largest herds appear to be owned by non-residents, and will in due course be excluded from the project area. Nevertheless, if, as must happen, the right to graze cattle on village grazing areas is given equally to all members of primary co-operatives, in time the herds of all farmers are likely to tend to be similar in size. Even immediately some large herd owners will have to get rid of some of their cattle

(by sale or by grazing them out of the project area). However, in other cases, farmers, who do not yet own the full quota of cattle which they are entitled (ie. have grazing licenses for) to graze on the village grazing area, will be allowed to allocate their grazing licenses (against payment if desired) on an annual basis to those who wish to retain more than their quota. In practice this arrangement will lead to the lending/hiring of work oxen between those who have a surplus and those who have too few (this hiring of cattle rather than shortage of land is the basis of much of the landlord/tenant relationship at present existing in the project area).

3.76 The fixed investments to be installed on village grazing areas will be:-

a) Watering places. In financial projections costs of boreholes have been used but often cheaper sources will be available.

b) Dips. Dipping will be compulsory.

c) A perimeter fence.

d) Crushes.

e) Firebreaks, also acting to split up the area into units for the management of grazing.

Lips, crushes and watering places for cattle will also be installed near village cropping areas. In addition to the services arising from these investments, compulsory vaccinations, limited veterinary services (drugs etc.) hyaena control and improved castration methods will be provided through the primary co-operative to members' cattle. All these services, except for the limited veterinary services, will be covered by a fixed grazing fee charged per livestock unit. (e.g. about Eth.$10 per adult male annually). The veterinary services will be charged for as and when provided. The primary co-operative will increasingly take an active part in "managing the grazing" on the village grazing areas, as the example set by the commercial type ranch shows the utility of this. When this happens the stock carrying capacity of the land will improve.

3.77 It is assumed that initially the stock carrying capacity of the village grazing areas will be 6 ha. per livestock unit; and that over five years this can be improved (by fencing, leading to control of stock numbers, and some management of grazing) to a figure of 4.ha per L.U. It is also forecase that each farmer will be able to keep three L.U.-equivalents on his 5 ha. farm. In his farm plan he will grow 2 ha. of fodder crop, and there will be some other crop residues as well. T ere will also be a very limited amount of rough grazing on the land around the village's cropping area. On the basis of these assumptions each farmer will, on average, be able to keep 4.66 livestock unit-equivalents (say 5.8 head of cattle) initially; and this figure will rise to 5.5 livestock units (6.9 head of cattle) over five years. Each farmer will also be able to keep some goats, and it is assumed that their feeding habits will improve, rather than compete with, the grazing for cattle. They are not, therefore, taken into account in the calculation of livestock unit-equivalents above.

3.78 This herd will not make a great contribution to the farmer's cash flow, since a large part of the value of net sales (after replacement) will be required to pay the grazing and other fees and veterinary expenses. The farmer will, however, get some milk from his cows, the valuable use of his draught oxen, and a small net cash income from his livestock. A significant contribution to his cash flow position from his livestock herd will have to await a switch to mechanised ploughing, if and when this becomes profitable, or a rise in the price paid for quality beef, when a switch in his cropping pattern, from growing sorghum from grain to growing fodder crops for beef-fattening, might be justified.

3.79 There is futher discussion of animal health and husbandry in Appendix O. Financial details (a model) concerning the development and running of village grazing areas and other facilities for privately owned livestock, are given in Annexe II, and especially in Tables 1 - 7. Appendix R discusses market prospects.

3.80 The Co-operative Ranch

A commercial-type ranch of 20,000 hectares will be established. Its objective will be to supply finished animals for the Asmara or export (live) markets. Its product will be too high quality for the canning factories of Asmara. The ranch will start by operating a cow-calf system. But as village grazing areas become effectively established and their stocking rates increase, they will start to turn off numbers of immature animals, and the ranch will then increasingly go in for the business of purchasing and finishing immature males. An important side effect of the ranch will be to develop anddemonstrate animal and grazing management techniques, which can then also be adopted on village grazing areas.

3.81 The area tentatively earmarked for the commercial-type ranch is in the south west of the project area. The legal status of the ranch will be that of a co-operative society. The profits made by the ranch will be distributed both by way of dividends on shares and subsequently as bonuses to those members making most use of it (i.e. selling the largest numbers of immatures to the ranch). Initially membership will be by those large herd-owners who contribute their surplus cattle in return for shares, and by IEG which will have to put up cash.* Subsequently either individual small farmers and/or the village level primary co-operatives will become members and IEG's capital will be correspondingly retired when this happens. Since the co-operative ranch is not expected to distribute any profits until the seventh year of its operations the sale of shares in it will have to be promoted with caution, and it is likely that in fact IEG will have to put up almost all the initial capital. Financial and other details of the co-operative ranch are shown in Annexe IV.

---

*In order for IEG to be able to subscribe more that 20% of the shares the society will have to be a secondary one (Vide Article 19 of the Co-operative Societies Proclamation 1966). It is proposed that IEG will designate the LMB as its executive agency to look after its interest in the ranch but the funds required will have to come from the government budget.

3.82 Storage, marketing and supply of inputs

Storage marketing and supply will be handled by the primary co-operative societies, the co-operative union and the ranching co-operative. The primary village-level co-operatives will provide sufficient storage to handle immediate crop collection, and the distribution of inputs. The co-operative union will handle long-term storage and the transporting and sale of the project area's crops. The Co-operative Union will put in a livestock market in market in the centre of the project area. The ranching co-operative will handle its own marketing, but cattle traders will be encouraged to attend the livestock market. The co-operative union will purchase the inputs (fertiliser, seed, pesticides, herbicides and farm equipment) required by farmers and co-operatives (including fencing, cement and pumping equipment) in bulk. Village level primary co-operatives will install one or more central sources of domestic water supply for their members, for the use of which they will charge a fixed fee per family. Primary co-operatives will also install a grain mill for the use of members.

3.83 Credit

In order to fulfill the objectives of the project, an adequate and well-administered supply of credit will be required. The following table summarises the proposed purposes and terms of, and sources by which credit will be supplied. Share subscriptions to co-operatives, even when required to finance working capital, are not included in this table.

3.84 It is proposed that AID Bank should be the ultimate source (in Ethiopia) of all credit requirements except for certain very short term funds borrowed by the union for its own purposes which will be borrowed on overdraft from commercial banks. It is proposed that AID Bank will lend directly to the ranching co-operative for its short and long term credit requirements. It would cearly be immpossible for AID Bank to lend directly to 12,000 individual farmers for their seasonal credit requirements, and difficult to do so for their long-term requirements. It is, therefore, proposed that AID Bank should lend directly to the co-operative union to cover all the short, and long term credit requirements of the union itself, of the primary village-level co-operatives, and of the individual farmers; and that the co-operative union should then relend to the primary societies and these in turn to the individual farmers. However, if AID Bank preferred this, and were willing to establish a branch office in Lower Shire to make it feasible, AID Bank could lend directly to the primary co-operative for the long term credit requirements of these co-operatives themselves and of their members. It would still, however, make sense for the co-operative union to handle all the short term credit requirements. The union will take a small margin on the funds it onlends to primary co-operatives, and they will in turn do so in relending to farmers.

3.85 The question of the appropriate security for the loans made by AID Bank raises problems. For the reasons given previously it is not proposed to give individual farmers full freehold rights to their land. In any case it is doubtful if mortgage rights over 5 ha. plots would give

Ultimate Borrower	Purpose	Repayment period (incl.any grace period). (Years)	Grace period for repayment of principal (Years)	Interest rate to final borrower % p.a.*	Source of credit in Ethiopia
I.Farmers	A. Seasonal Credit	0.8	-	12%	AID Bank
	B. Long Term Loans	10	4	10%	AID Bank
II.Primary Co-operatives	A. Working Capital	1	-	10%	AID Bank
	B. Long Term Loans	15	5	9%	AID Bank
III. Co-operative Union	A. Engineering Unit, Long Term	5	1	8½%	AID Bank
	B. Other Long Term Loans	15	5	8½%	AID Bank
	C. Working Capital to finance operations	1	-	9½%	Commercial Banks
	D. Working Capital to hold stocks of crops until sale	0.7	-	10%	Commercial Banks
IV.Co-operative Ranch	A. Long Term Loan	15	5	8½%	AID Bank
	B. Short Term Loan	1	-	10%	AID Bank

*After margins are taken by intermediaries.

AID Bank any real rather than just conventional appearance of security. It is proposed that the main form of security should be a lien by AID Bank over all the crops and other products produced by farmers and handled by the co-operatives. But in addition to this IEG should, as it can do without resourse to additional legislation under Article 32(2) of the Co-operative Proclamation 1966, give a guarantee to AID Bank for repayments of loans made to the co-operatives under the project. Government's own remedy, if called upon to honour this guarantee, lies in its ability to raise rents, or in the last resort to revoke land leases given to co-operatives and to dispose of the land to other users in a way that will recoup its losses. Government, in giving this guarantee will, therefore, be acting as other landlords already do in guaranteeing the loans taken by their tenants.

3.86 Annex VI shows the effects of its credit operations on AID Bank's own financial position. It is proposed that AID Bank should receive an IDA Credit, through IEG, on which AID Bank should pay IEG interest at the rate of 6½% per annum. However, since some development loans to farmers will have to be made after the expiry of the development phase of the project, when further disbursements from IDA cannot be expected, it is proposed that AID Bank pay IEG only 4½% on the outstanding balance of the IDA credit in the first seven years of the project, thereby accumulating sufficient surplus to finance these later loans, and that in the eighth year AID Bank pays the accumulated remaining interest (i.e. the difference between 4½% and 6½% for the first seven years) and thereafter repays the principal of the IDA credit, with annual interest at 6½%, up to the fifteenth year of the project.

3.87 Improved Communications

The existing motor tracks from Sheraro to Enda Selassie, and from Sheraro through Yrga and Shembuko to the Barentu-Adi Ugri road will be improved, and a new access road leading south-south-east from Sheraro will be constructed. The average development cost per kilometre of these roads will be Eth.$6,500. These roads will be constructed and maintained at IEG expense. Further details are given in Appendix P and Annexe VII, Tables 10 and 11. The village and ranch co-operatives will be responsible for the cost of construction and maintenance of their own very low cost access roads which will connect with the main road system.

3.88 Crop and livestock trials.

The contents of the crop trials programme has already been touched on. The whole programme will be in the nature of trials oriented towards quick practical short-term results, and no basic reaearch will be financed under this project. On the livestock side trials will be concentrated on:-

1. Discovering appropriate range management techniques, and especially on black soils, to discover methods of replacing Hyperrenhia with more palatable and nutritious varieties.

2. Discovering maximum sustainable stocking rates in different ecotypes, under different management systems.

3. Some cross breeding of local Barka cattle with Borena bulls

4. Cattle fattening trials.

A meteorological station will also be established and run.

3.89 The trials programme, which will be financed by IEG, will be directed by the Institute for Agricultural Research along lines agreed annually with the project's management. No professional (i.e. university-graduate) research staff will be located in the project area. Economic research into optimum allocation offarm resources will form part of the research project, and programming techniques may prove particularly suitable for planning operations on the homogeneous farms proposed for the project.

3.90 Construction and other services

Because of the isolated position of the project area, the provision of construction and technical services (mechanical and other repairs, etc.) by normal commercial concerns, will either be impossible or very expensive, although there is at least one quite competent Ethiopian building contractor and a small brick-burning enterprise at Sheraro. It is proposed to set up a well-staffed engineering unit in the co-operative union, which will undertake construction and other technical services (including bore-hold drilling) both on behalf of other co-operative societies and for IEG. This engineering unit could sub-contract to local contractors where appropriate.

3.91 Project Organisation

Because of the inclusion of settlement, land tenure, and livestock components in this project, it is too complex simply to be added as one other area to the Minimum Package Programme of the Ministry of Agriculture. Nevertheless, it is not a very large, or technically a very complex, project and so, once the project has been got going, continued IEG direction and financial involvement in the project on a substantial scale is not necessary. For this reason, and because IEG is going to find the direct administration of more and more regional projects scattered all over Ethiopia an increasing financial and administrative burden, this project is planned from the outset with the intention that after seven to ten years (subject to the requirements of a second phase) during which the project is started and got on its feet, IEG's subsequent involvement will be limited to certain routine functions (such as land administration, audit and inspection of co-operatives, agricultural extension cover, maintenance of main roads, livestock vaccinations and veterinary inspections, etc.) which it sets out to provide on a nation-wide scale in any case. The remaining functions, credit, supply of inputs, marketing, running of water points, etc. will be run by organisations of the farmers themselves.

3.92 A similar intention was expressed when CADU was set up, but CADU has in practice found it very difficult to transfer functions once undertaken by government to local organisations. It is, therefore, proposed in this project, to set up some organisations which, right from the start, are in form local organisations, although initially some will be government-run and later subject to a considerable degree of

government control. Control of these organisations will, however, be devolved on local people as soon as they can be trained, and are willing, to accept this reponsibility. In order to ensure unified direction and control of the government's effort during the critical early years of the project the economic functions of government (agriculture, land administration, co-operative development) but not its social functions (security, health, justice, education) will be vested in a single organisation.

3.93 The local organisations will be the village-level primary co-operatives, the Tach Adiabo and Hedekti Co-operative Union (TAHECU)* and a ranching co-operative. IEG will provide, at IEG's expense, a co-operative secretary for each primary co-operative for the first two years of its existence. IEG will also, for as long as is necessary (probably about 3 years in each case) to build up a genuine co-operative institution, in which farmers, who are its members, can play informed and effective parts, provide the direction of the primary co-operative (as it can do under the provisions of Articles 18(1b) and 23 of the Co-operative Proclamation 1966). IEG will also provide a manager for TAHECU for up to five years. For the first two years his entire emoluments will be at IEG's expense. Thereafter TAHECU will pay him the salary necessary to attract a good Ethiopian manager. IEG will also control TAHECU in the same way as it will the primary co-operatives, but this control is likely to last longer in the case of the Union, and it may take 7-10 years to transfer complete control to the Union's other members (i.e. the village-level primary co-operatives). IEG will provide a manager, on similar terms, to the ranching co-operative, of which the Union, the primary co-operatives and individual farmers will all be encouraged to be members. The functions (and internal organisation) of the Union, the primary co-operatives and the co-operative ranch are set out below.

3.94 The single IEG organisation to run all government economic functions in the project will be the Tach Adiabo and Hedekti Agricultural Development Unit (TAHADU)*. Its functions and organisation are set out below. It will be similar to CADU and WADU, except that it will not have the marketing, credit or supply functions of those organisations, nor most of their construction functions. It will, however, by arrangement with the Ministry of Land Reform and Administration, have land adjudication, allocation and administration functions for the whol project area. TAHADU will fall under the Extension and Project Implementation Division (EPID) of the Ministry of Agriculture. To ensure close co-operation and co-ordination, the Director of TAHADU will initially also be chairman of the Co-operative Union (TAHECU).

3.95 Functions and Organisation of Primary Co-operatives

The primary co-operatives will have the following functions:-

a) To distribute crop land to members on lease; to assess and collect rents and to pay them to IEG; to police fulfillment of land-use regulations among members; to calculate any compensation due in respect of land reallocation affecting its land and members; to pay this compensation, and to recover it.

---

*TAHECU and TAHADU are convenient temporary acronyms. Better names can be thought of later.

b) To operate the facilities (water, dips, crushes, castration, fencing) on village grazing areas; to allocate grazing permits, to collect grazing fees, to ensure that only cattle with permits use the area, and that all animals are dipped and vaccinated on schedule.

c) To run a hyaena control programme.

d) To order and to procure from TAHECU, and to supply to members (for cash or credit) capital and consumable farm supplies (and spare parts for these).

e) To provide credit to members to purchase inputs, and for start-up loans.

f) To collect marketable crops from members and to hand them over to TAHECU.

g) To run village domestic water supplies (for fees).

h) To run grain mills (for fees).

i) To construct and to maintain (contracting out the work, e.g. to TAHECU, where necessary) village access roads;

3.96 Primary co-operatives will have separate committees to direct land, grazing, credit and other matters. In addition to a co-operative secretary, they will need a store keeper/accountant and someone to look after the equipment on the village grazing area. It is expected that these Primary co-operatives will be formed at the rate of 3 in the second year of the project, 6 each in the third and fourth years, and five in the fifth year.

3.97 In order to keep the level of costs to a minimum each primary village-level co-operative will share some facilities (boundary fencing, boreholes on grazing areas and a borehold operator) with between one and four other village-level co-operatives.

3.98 Investment by village-level co-operatives will be financed by share capital contributed by members, by a long term loan from AID Bank and by a short term loan from the same source. These co-operatives will be permitted to borrow ten times the amount of their share capital. Financial forecasts for their activities are given in Annex II.

3.99 Functions and Organisation of the Ranching Co-operative

The ranching co-operative will have an Ethiopian manager, and will have an appropriately chosen executive committee. The function of the ranch will be to run a profitable business, selling finished cattle in Asmara or for export markets, and to provide an outlet for the project area's immature animals.

3.100 For the reasons already given, it is proposed that IEG subscribe the initial share capital which will be refunded to IEG in later years (the 7th to the 17th year of operations) when share capital from local people is expected to be forthcoming. The financial forecasts for the ranch's activities are shown in Appendix IV. Capital investment on the ranch will be financed in the ratio of $4 of shares : $6 of loan capital. The internal rate of return to all

investment is a modest 11% but from the 7th year of operations onwards modest annual dividends or bonuses will be in the region of 5% of outstanding share capital, rising to 50% when all loan capital has been repaid.

3.101 Functions and Organisation of Tach Adiabo and Hedekti Co-operative Union (TAHECU)

The functions of TAHECU will be:-

a) To collect crops from primary co-operatives, store, transport and market them.

b) To procure, stock and sell to primary co-operatives, farm (and associated) supplies and spare parts. These goods will be both of a capital and consumable nature.

c) To supply long and short term finance to primary co-operatives, and through them to farmers.

d) To run a livestock market on behalf of LMB until the market throughput, and the development of other livestock markets in the vicinity, justifies LMB doing the job itself.

e) To construct dips, crushes, fences, stores, houses, and other structures on behalf of primary co-operatives and other organisations (e.g.IEG).

f) To drill boreholes, and to construct other water facilities on behalf of primary co-operatives and other organisations.

g) To construct permanent facilities (e.g. bridges and culverts) on access roads to primary co-operatives, on behalf of the primary co-operatives.

h) To maintain, on behalf of primary co-operatives and other organisations, waterpoints, fences, buildings, permanent structures on access roads, etc.

i) To run vehicle-fuel pumps and a workshop able to do simple maintenance and repairs on vehicles, machinery and other equipment.

j) To provide a book-keeping service to primary co-operatives.

These functions will be carried out at the request of a customer (e.g. a primary co-operative) at a price which covers full costs. (In many cases TAHECU will also provide the credit to enable the customer to meet the cost.

3.102 TAHECU will be financed by share capital subscribed by IEG and by loan capital lent by AID Bank. Later, when it is well established and has a sound financial reputation, it will borrow on overdraft from commercial banks for some of its short term needs. Forecasts of its financial operations are in Annexe III.

3.103 TAHECU will be controlled by IEG (i.e. EPID) for as long as necessary or until all IEG-guaranteed loans to it are repaid. An expatriate engineer will be attached to it for up to 5 years. The project director of TAHADU will be ex-officio chairman of TAHECU in the initial years. TAHECU will have an unlimited duration of life. TAHECU's internal organisation is shown in Appendix M.

3.104 Functions and Organisation of Tach Abiabo and Hedekti Agricultural Development Unit (TAHADU).

TAHADU will have the following functions:

a) To organize a suitable crop and livestock trials programme.

b) To run a farmers' training centre and an extension service.

c) To provide a veterinary service to farmers and to the ranching co-operative.

d) To construct and maintain project roads.

e) To 1. promote,
2. establish,
3. provide a secretary at government expense (for the first two years in each case)
4. control, until they are able to stand on their own feet,
5. train staff and members for

twenty village primary co-operative societies.

f) To plan land use in the project area; that is:-

1) To identify and demarcate twenty village crop and grazing areas,
2) To identify and demarcate land for a commercial-type ranch,
3) To identify and demarcate land for public use,
4) To identify and demarcate unallocated land,
5) On land identified and demarcated under 1) and 3) above, to site, as appropriate, access road alignments, drainage reserves, sites for facilities etc.

g) To identify those farmer's who wish, and have a right in terms of specified criteria, to be designated as members of villages, and so to be entitled to an allocation of land.

h) On behalf of the Ministry of Land Reform and Administration to allocate, register and lease land within the project area to primary co-operatives, a ranching co-operative, TAHECU and other organisations and persons; to enforce land-use conditions in leases; to collect rents.

3.105 TAHADU will be part of the Ministry of Agriculture and will be controlled by the EPID of that Ministry. Its internall organisation is shown in Appendix L. TAHADU will have a life of 7-10 years. Thereafter it will be disbanded and its remaining functions transferred to the appropriate ministries (subject to second phase developments). Cost of the remaining functions, however will be counted as project costs. Financial forecasts for TAHADU are shown in Annexe VII.

3.106 Expatriate Staff

Wherever possible Ethiopians will be appointed to key positions in the project. In some cases, however, it may be necessary to appoint expatriates, and financial provision is made in the financial plans for hiring expatriates in the following posts for upto five years maximum.

I. TAHADU

a) Head of Extension Department
b) Head of Land Planning Department

II. The Co-operatives

a) Head of Engineering Department (TAHECU)

3.107 Tentative time schedule of Lower Shire project

It is proposed that the development of the project will have the time schedule shown below (actions listed to be carried out are to be taken by TAHADU in most cases).

Preliminary:

a) Recruit key staff

1st Year:

a) Do co-operative education and propaganda, and select 3 village for starting in following year.
b) Plan outline land use of whole project area.
c) Do detailed land planning for 3 villages and for commercial-type ranch to be started in following year.
d) Start crop trials and meteorological station.
e) Establish TAHECU (Co-operative Union); TAHECU builds staff housing and offices.
f) Start project roads construction.
g) Establish training centre; select and train extension workers.
h) Finalise list of farmers for following year's 3 co-operatives.

2nd Year:

a) Do co-operative education and propaganda and select 6 villages for following year.
b) Establish and allocate land to 3 primary co-operatives.
c) Do detailed land planning for 6 co-operatives for following year.
d) Continue crop trials; start animal and range management trials.
e) TAHECU puts in fixed investments for 3 co-operatives and further staff housing; starts supply, credit and marketing programme.
f) Continue roads construction.
g) Establish and allocate land for commercial-type ranch
h) Start extension programme. Train farmers and extension workers.
i) Finalise list of farmers for following year's 6 co-operatives.
j) Manage, supervise and audit co-operatives already started.
k) TAHECU starts livestock market (on behalf of LMB).

3rd Year:

a) Do co-operative education and propaganda; and select 6 villages for following yeara.
b) Establish and allocate land to 6 new primary co-operatives.
c) Do detailed land planning for 6 co-operatives for following year.
d) Continue crop, range and animal trials.
e) TAHECU puts in fixed investments for 6 new co-operatives; and more staff housing; continues supply, credit and marketing programme.
f) Continue project roads programme.
g) Continue extension and training programme.
h) Finalise lists of farmers for following year's 6 co-operatives.
i) Continue to manage, supervise and audit existing co-operativves.
j) TAHECU continues to run livestock market.

4th Year:

a) Do co-operative education and propaganda. Select 5 villages for following year.
b) Establish and allocate land to 6 new primary co-operatives.
c) Do detailed land planning for 5 co-operatives for following year.
d) Continue crop, range and animal trials.
e) TAHECU puts in fixed investments for 6 new villages; continues supply, credit and marketing programme.
f) Continue project roads programme.
g) Continue extension and training programmes.
h) Finalise list of farmers for 5 co-operatives for following year.
i) Continue management, supervision and audit of co-operatives.
j) TAHECU continues livestock market.

5th Year:

a) Establish and allocate land for 5 new primary co-operatives.
b) Continue crop, range and animal trials.
c) TAHECU puts in fixed investments for 5 new villages; continues supply, credit and marketing programme.
d) Continue project roads programme.
e) Continue extension and training programmes.
f) Continue management, supervision and audit of co-operatives.
g) TAHECU continues livestock market.

6th Year:

a) TAHECU continues supply, credit and marketing programme.
b) Maintain roads.
c) Continue extension and training programme.
d) Continue management, supervision and audit of co-operatives.
e) TAHECU continues livestock market.

IV. FINANCE

4.01 Development Costs

The total real development (investment) cost of the project is estimated at Eth.$17.2 million (U.S.$7.5 million), as set out in Annexe VIII, Table 1. Because the project will finance not only the constructions themselves but also the purchase of some of the equipment necessary to instal the constructions (e.g. a timber treating plant), the financial requirements are about Eth.$0.3 million (U.S.$0.1 million) higher than the real development cost. The foreign exchange component of the project is estimated at Eth.$4.6 million (U.S.$2.0 million), and amounts to 27% of the development cost. The major investment components over the six years of the development phase of the project are summarised in the table below:-

Item	Eth.$ million		US$ million	
	Total	F.E.	Total	F.E.
On farm investments	6.5	1.0	2.8	0.4
Village grazing areas and facilities	1.7	1.1	0.8	0.5
Co-operative Union (excl. engineering unit)	1.2	0.3	0.5	0.1
Co-operative Ranch	0.8	0.1	0.3	0.1
TAHADU Development Unit (incl. project roads)	7.0	2.1	3.1	0.9
TOTAL	17.2	4.6	7.5	2.0

4.02 Because a very substantial portion of the total development cost consists of on-farm investments on 12,000 peasant farms, and since these farmers have to be phased into the project at a realistic rate, it is proposed that the development period of the project (i.e. the IDA disbursement period) will last six years. It is not desirable to reduce this period because of the adverse effect this would have on the ratio between overhead project costs and directly productive on-farm investments.

4.03 A full breakdown of the individual investment items, and project components, is given in Annexes I-IV and VII with a summary in Annexe VIII. The major physical components are livestock, staff, constructions (buildings, water supplies and fencing), vehicles and equipment. Expatriate salaries amount to Eth.$1.0 million (U.S.$0.4 million). One reason for the low foreign exchange component of the project is the high proportion of total development costs which consist of the purchase of cattle and staff costs. The table overleaf gives an analysis of the value of the various physical components.

ANALYSIS OF PHYSICAL COMPONENTS
BY VALUE AND YEAR

ITEM	YEAR						
	1	2	3	4	5	6	Total
Livestock	6.3	438.8	453.7	895.4	1131.1	1020.5	3945.8
Staff	552.0	710.0	712.2	716.5	539.3	147.0	3377.0
Building	663.4	264.1	258.7	136.8	184.1	69.4	1576.5
Fencing	-	111.3	122.4	122.4	102.0	-	458.1
Water Supplies	17.0	158.1	202.7	202.8	169.0	-	749.6
Cattle Dips	-	27.0	54.0	54.0	45.0	-	180.0
Other Permanent Structures	9.0	37.3	7.8	7.8	6.5	-	68.4
Equipment	787.0	72.6	290.3	50.3	263.0	236.7	1699.9
Vehicles	403.1	39.2	51.1	117.8	2.3	-	613.5
Farm Tools	-	-	-	117.0	586.9	939.6	1643.5
Agricultural Chemicals	-	-	57.6	115.2	199.8	265.2	637.8
Other Development Costs	259.9	301.4	304.8	341.9	395.6	236.0	1839.6
Contingencies	132.7	142.2	158.5	117.9	121.2	55.4	727.9
TOTAL	2830.4	2302.0	2673.8	2995.8	3745.8	2969.8	17517.6

4.04 Cost estimates are based on current price levels in the Asmara area (where applicable), costs of contemporary projects and the best available information on price levels in the project area. Prices are taken at conservative levels and a contingency margin is added. Should price movements exceed the estimated margins the project could be adjusted to match available funds.

4.05 In addition to the development (investment) costs listed above a further Eth.$6.9 million (U.S.$3.0 million) will be required in the first eight years after development starts to meet the recurrent and replacement costs of IEG services (TAHADU) and for those incremental working capital needs of farmers and co-operatives which are not financed by cash surpluses generated. A summary of these requirements is given in Annexe VIII, Table 6.

4.06 Sources of Finance

In order to illustrate how the project might be financed under an agreement between IEG and IBRD/IDA the following assumptions are made:-

a) Farmers will contribute 10% of on-farm investments and 7% of investments in village level facilities.

b) IDA would finance the long-term credit components of investments on farms, in village-level facilities, and village grazing areas, on the co-operative ranch and in the co-operative union. In addition IDA would finance the costs of vehicles, constructions, and equipment of IEG's project organisation, TAHADU, and the foreign exchange component of expatriate salaries.

Using the above formula the IDA/IBRD loan would amount to Eth.$12.5 million (U.S. $5.4 million) or 73% of project development costs. IEG would contribute Eth $4.4 million (U.S.$1.9 million) towards project development costs, a futher Eth.$0.8 million (U.S$0.3 million) would come from farmers and the balance would be financed by internally generated surpluses of project organisations [These contributions total Eth. $0.5 million more than the total development cost stated - the discrepancy arises because of the double financing requirement mentioned in paragraph 4.01 above and because IDA will finance Eth.$0.24 million of the salary of an expatriate which has been misclassified as a recurrent cost]. Of the additional financial requirements for recurrent costs and working captial of Eth.$6.9 million (U.S.$3.0)million), 44% (Eth.$3.0 million) will be financed by the IEG, 5% (Eth.$0.3 million) by farmers and 47% by AID Bank (Eth.$3.3 million). The remaining 4% will be financed by IDA as stated above. AID Bank will be able to generate by the time it is required all but Eth.$400,000 of its contribution by the interest margin it gets on handling on-lending of the IDA credit to farmers and co-operatives.

4.07 The table below summarizes the proposed financing:-

SUMMARY OF PROPOSED FINANCING. FIRST EIGHT YEARS.

Item	Total	IDA/IBRD	IEG	Farmers	AID BANK
DEVELOPMENT COSTS					
A. Farmers Dvelopment Costs	6.5	5.8	-	0.7	-
B. Primary Co-operative Development Costs	1.7	1.6	-	0.1	-
C. TAHECU Co-operative Union					
1. Engineering Union	0.3	0.3	0.03	-	-
2. Other	1.2	1.1	0.04	-	-
D. Co-operative Ranch	0.8	0.5	0.3	-	-
E. TAHADU	7.0	2.9	4.1	-	-
F. Subtotal (A-E)	17.5	12.2	4.4	0.8	-
REPLACEMENT & SUBSEQUENT INVESTMENT					
A. New On-Farm Investment	2.7	-	-	0.3	2.4
B. TAHADU Replacements	0.1	-	0.1	-	-
C. Subtotal (A + B)	2.8	-	0.1	0.3	2.4
WORKING CAPITAL & RECURRENT					
A. Farmers' Short term loans	0.7	-	-	-	0.7
B. Primary Co-operative Short term loans	0.03	-	-	-	0.03
C. TAHECU Incr. Working Capital	0.4	-	0.3	-	0.1
D. Co-operative Ranch Incr. Working Capital	0.4	-	0.3	0.05	0.05
E. TAHADU Recurrent Cost	2.6	0.3	2.3	-	-
Subtotal (A to E)	4.1	0.3	2.9	0.05	0.9
TOTAL	24.4	12.5	7.5	1.1	3.3

Source: Annexe VIII, Table .

4.08 The table below summarises the disbursement of funds to meet development costs (including the double counting involved in the financing of the engineering unit).

DISBURSEMENT OF FUNDS - DEVELOPMENT COSTS ETH.$ Million

Source of Finance	Total	Project Years					
		1	2	3	4	5	6
IBRD/IDA	12.2	2.2	1.3	1.6	1.9	2.8	2.5
IEG	4.4	0.6	1.0	1.0	0.9	0.7	0.2
Farmers	0.8	-	0.03	0.1	0.2	0.2	0.2
AID Bank	-	-	-	-	-	-	-
Generated Surpluses	0.1	-	-	-	-	0.05	0.03
TOTAL	17.5	2.8	2.3	2.7	3.0	3.7	3.0

Source: Annexe VIII, Table 6. Figures may not sum exactly due to rounding.

V. BENEFITS AND JUSTIFICATION

5.01 Based on calculations presented in Annexe VIII, Table 5, the economic internal rate of return of the project is 17.2%, and the present values of net (economic efficiency) project benefits, discounted at 10%, is Eth.$8.9 millions. The assumptions on which these calculations are based are further elaborated in Appendix B. Some sensitivity analysis has also been carried out to ascertain the effects of more pessimistic assumptions about crop yields, and the result of this analysis is also contained in Appendix B. The project area will become an important earner of foreign exchange for Ethiopia. The sesame crop alone from the farmers participating in the project, which currently earns about Eth.$190,000 in foreign exchange, will increase to earn up to Eth.$3.9 million (valued alongside ship at Massawa port) annually by the tenth year of the project. A high proportion of this will be net foreign exchange earnings, since the nature of the farming operations proposed is labour-intensive and sparing in the use of imported inputs. Increases in the output of sorghum and trade cattle will also have favourable implications for the foreign exchange balance.

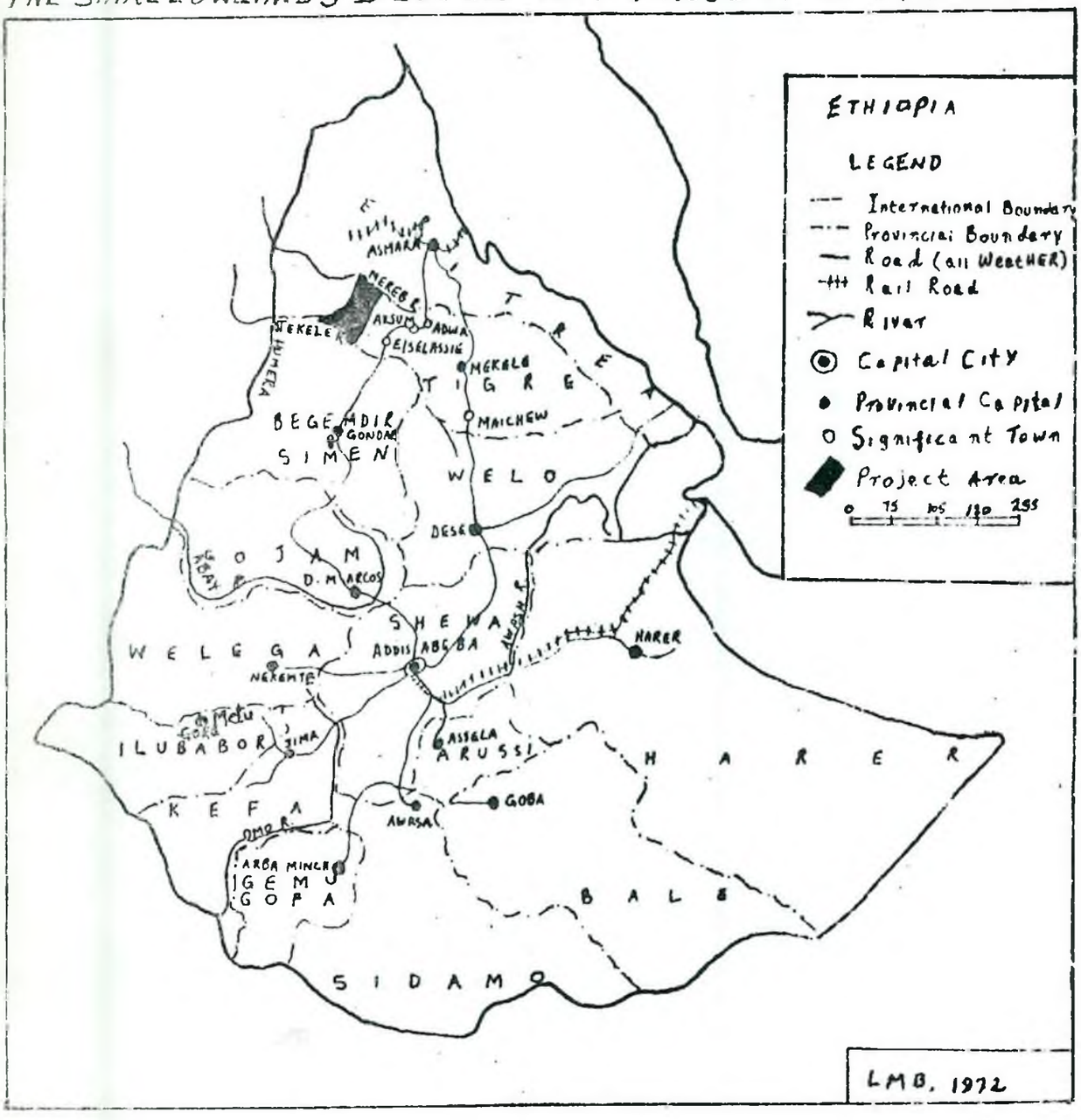
5.02 As a result of the project, 12,000 farmers whose current net annual cash income averages about Eth.$120, and whose net total income (including the value of home-consumed subsistence products) averages between Eth.$255 and Eth.$285 per year, will receive immediate and subsequently substantial rises in income. Within two years of his joining the project, the net cash income of a participating farmer will go up by one third, it will almost double within five years, and treble within fifteen years. A participating farmer's total (including subsistence) income will rise to nearly Eth.$500 within five years of his joining the project, and to Eth.$700 within fifteen years. In addition to these quantifiable benefits, participating farmers will also, for the first time, be able to obtain relatively clean supplies of domestic water and a secure title to their farm. The full details of cash and subsistence income are shown in Annexe I, Tables 2-7.

5.03 Given present agricultural techniques, the highlands of Tigre and of other provinces in central Ethiopia are supporting too high a human population for the welfare of either present or future generations. Ecological deterioration is manifest, and probably accelerating. Agricultural holdings are in many cases too small to offer the prospect of providing adequate farm-incomes even under vastly improved agricultural techniques. The problem of the overcrowded highlands will have to be tackled both by direct action to improve agricultural and soil- and moisture-conservation techniques in the highlands, and by measures to remove part of the human population into non-farming activities or into other less crowded farming areas. This first phase in the development of the Shire Lowlands will move 7,000 highland families out of the highlands into the less crowded lowlands of the project area. Subject to the success of the first phase, a further 7,000 families could be similarly moved in a second phase. In addition to these direct effects, however, the project offers an opportunity for IEG to obtain experience in the planning and management of resettlement, and, subject to the lessons learnt from this experience, and with necessary local adaptations, to repeat this project in other areas. Other ecologically fairly

similar areas occur in the western parts of Begemdir and in the Takazze valley in the Abbi-Addi region. But the general approach of this project to project organization and to land tenure may be applicable in ecologically dissimilar areas suitable for resettlement in west Gojjam, Wollega, and further south. The land tenure system proposed for this project, both in respect of cropping land and of communal grazing, may also offer a solution to the problems of those parts of the highlands where communal tenure traditionally prevails. A new land-tenure system would be easier to introduce into these highland areas, however, after both government and people had obtained experience of its operation; and this experience will be easier to obtain in the Shire Lowlands, where the tenure system is still flexible, than in any part of the traditionally communal areas of the highlands. The project has been designed in a way that is economical both in financial and in administrative resources. The investment cost of Eth.$1,430 per farmer (or Eth.$2,040 if certain recurrent costs are treated as investments) is reasonable both in relation to what has been achieved or planned in other projects in Ethiopia and elsewhere, and in relation to the total financial resources available to IEG for the development of this and other sectors and regions of Ethiopia (details are given in Appendix B). The project is designed to allow a progressive shifting of administrative responsibility to local organisations as soon as these can be trained, and obtain the necessary experience to bear this.

MAP 1

THE SHIRE LOWLANDS DEVELOPMENT PROJECT IN ETHIOPIA



MAP 2

SHIRE LOWLAND DEVELOPMENT PROJECT

Map compiled from USAID Preliminary Base Map and Geological Survey of Ethiopia - 1971
Contours in feet

C.H. Pennant

MAP 2

Model Farmer

Table 1 - Development Cost and Financing - Eth.$

CATEGORY	Unit	Unit Cost	Model Farmer's Years											
			1		2		3		4		5		Total 1-5	
			No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
A. RESIDENT FARMER 1/														
1. Coop. Subscription	Family	10	1	10	-	-	-	-	-	-	-	-	1	10
2. Livestock 4/														
a. Oxen	hd.	130	-	-	1	130	-	-	-	-	-	-	1	130
b. Heifer 3-4 yrs	hd.	90	-	-	1	90	-	-	1	90	-	-	2	180
c. Heifer 1-2 yrs 6/	hd/	50	-	-	-	-	.5	25	-	-	-	-	.5	25
3. Fertilizer 2/	ha.	20	-	-	1	20	-	-	1	20	-	-	2	40
4. Insecticide 2/	ha.	6	-	-	2	12	-	-	-	-	-	-	2	12
5. Herbicide 2/	ha.	9	-	-	-	-	-	-	3	27	-	-	3	27
6. Hand Sprayer 3/	No.	35	-	-	-	-	1	35	-	-	-	-	1	35
7. Cart	No.	156	-	-	-	-	-	-	1	156	-	-	1	156
8. Harrow	No.	30	-	-	-	-	1	30	-	-	-	-	1	30
9. Plough	No.	40	-	-	-	-	-	-	1	40	-	-	1	40
10. Sorghum Seed 2/	ha.	1	-	-	-	-	1	1	1	1	-	-	2	2
11. Sesame Seed 2/	ha.	2	-	-	-	-	1	2	-	-	-	-	1	2
12. TOTAL (1 to 11)	-	-	-	10	-	252	-	93	-	334	-	-	-	689
13. Financing														
a. Long Term Loan	-	-	-	-	-	225	-	85	-	300	-	-	-	610
b. Farmer's Contribution	-	-	-	10	-	27	-	8	-	34	-	-	-	79
c. TOTAL (a+b)	-	-	-	10	-	252	-	93	-	334	-	-	-	689

Model Farmer

Table 1 - Development Cost and Financing - Eth.$ (Continued)

CATEGORY	Unit	Unit Cost	Model Farmer's Years											
			1		2		3		4		5		Total 1-5	
			No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
B. MOFER ZEMACH 5/														
1. Coop. Subscription	Family	10	1	10	-	-	-	-	-	-	-	-	1	10
. Livestock 4/														
a. Oxen	hd.	130	-	-	-	-	1	130	-	-	-	-	1	130
b. Heifer 3-4 yrs.	hd.	90	1	90	1	90	-	-	-	-	-	-	2	180
c. Heifer 1-2 yrs 6/	hd.	50	-	-	-	-	-	-	.5	25	-	-	.5	25
3. Fertilizer 2/	ha.	20	-	-	1	20	-	-	1	20	-	-	2	40
4. Insecticide 2/	ha.	6	-	-	2	12	-	-	-	-	-	-	2	12
5. Herbicide 2/	ha.	9	-	-	-	-	-	-	3	27	-	-	3	27
6. Hand Sprayer 3/	No.	35	-	-	-	-	1	35	-	-	-	-	1	35
7. Cart	No.	-	-	-	-	-	-	-	1	156	-	-	1	156
8. Harrow	No.	30	-	-	-	-	1	30	-	-	-	-	1	30
9. Plough	No.	40	-	-	-	-	-	-	1	40	-	-	1	40
10. Sorghum Seed 2/	ha.	1	-	-	-	-	1	1	1	1	-	-	2	2
11. Sesame Seed	ha.	2	-	-	-	-	1	2	-	-	-	-	1	2
12. Land Clearing	ha.	50	-	-	-	-	1	50	1	50	-	-	2	100
13. House	No.	50	1	50	-	-	-	-	-	-	-	-	1	50
14. TOTAL (1 to 13)	-	-	-	150	-	122	-	248	-	319	-	-	-	839
15. Financing														
a. Long Term Loan	-	-	-	125	-	110	-	225	-	285	-	-	-	745
b. Farmer's Contribution	-	-	-	25	-	12	-	23	-	34	-	-	-	94
c. TOTAL (a+b)	-	-	-	150	-	122	-	248	-	319	-	-	-	839

1/ 250/Village
2/ 1st application of new variety.
3/ 9 Lt. backpack unit.
4/ Incremental purchases.
5/ 350/Village
6/ The average requirement of 0.5 head is derived from Annexe II Table 1 (C2). For the purposes of summing credit requirements the "nonsense" average is used here.

Model Farmer Budget (Resident) 7/

Table 2 - Gross Income: Cash and Subsistence - Eth.$

Items	Unit	Unit Value	Farmer's Years 1/																			
			1		2		3		4		5		6		7		8		9		10 - 20	
			No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
I. CROPS																						
A. Sorghum	qtl	2/	14.0	196	19.0	266	19.4	272	22.1	309	23.8	250	25.0	263	26.2	275	27.5	289	28.9	303	30.3	318
B. Sesame	qtl	47.	2.0	94	2.0	94	3.5	165	4.5	211	5.5	259	5.8	273	6.1	287	6.4	301	6.7	315	7.0	329
C. Beans 5/	qtl	22	-	-	-	-	1.2	26	3.8	84	3.9	86	4.1	90	4.3	95	4.5	99	4.7	103	4.9	108
D. SUBTOTAL (A-C)	-	-	-	290	-	360	-	463	-	604	-	595	-	626	-	657	-	689	-	721	-	755
II. LIVESTOCK SALES 6/																						
A. Oxen	hd.	3/	.24	20	.28	23	.35	29	.38	32	.38	40	.38	40	.38	40	.38	40	.38	40	.38	40
B. Cows	hd.	3/	.10	8	.13	11	.18	15	.28	23	.32	34	.35	37	.36	38	.36	38	.36	38	.36	38
C. Steers 1-2	hd.	50	-	-	-	-	-	-	-	-	.10	5	.14	7	.19	10	.18	9	.18	9	.18	9
D. Heifers 3-4	hd.	90	.11	10	.21	19	.14	13	.13	12	.14	13	.26	23	.12	11	.12	11	.12	11	.12	11
E. Heifers 1-2	hd.	50	-	-	-	-	-	-	-	-	-	-	.05	3	.10	5	.08	4	.08	4	.08	4
F. SUBTOTAL (A-E)	-	-	-	38	-	53	-	57	-	67	-	92	-	110	-	104	-	102	-	102	-	102
III. DAIRY																						
A. Milk 4/	lt.	.18	140	25	160	29	190	34	230	41	270	49	330	59	330	59	330	59	330	59	330	59
IV. TOTAL INCOME (I to III)				353	-	442	-	554	-	712	-	736	-	795	-	820	-	850	-	882	-	916
Less																						
V. SUBSISTENCE CONSUMPTION																						
A. Sorghum	qtl	2/	10.0	140	10.0	140	9.4	132	9.0	126	8.8	92	8.7	91	8.7	91	8.6	90	8.6	90	8.5	89
B. Beans	qtl	22	-	-	-	-	1.2	26	3.8	84	3.9	86	4.1	90	4.3	95	4.5	99	4.7	103	4.9	108
C. Milk	lt.	.18	140	25	160	29	190	34	230	41	270	49	330	59	330	59	330	59	330	59	330	59
D. SUBTOTAL (A-C)	-	-	-	165	-	169	-	192	-	251	-	227	-	240	-	245	-	248	-	252	-	256
VI. GROSS CASH INCOME (IV minus V)	-	-	-	188	-	273	-	362	-	461	-	509	-	555	-	575	-	602	-	630	-	660

1/ Assume average farmer begins in Project Year 3.
2/ Sorghum price ex-farm is $14/qtl. Project Years 1-6 (i.e. Farmer's year 1,2,3,4); $10.50/qtl thereafter.
3/ $83/head, Project Years 1-6; $106/head thereafter.
4/ The farmer may convert it into butter. The value of milk is the equivalent for the local butter price of $3-3.50 per kg.
5/ Canadian Wonder or Lubia.
6/ The number of livestock sold are derived from Annexe II Table 1. The figures given here are averages.
7/ The Mofer Semach Income only differs by a very few dollars so is not shown separately.

Model Farmer Budget (Resident and ex Mofer Zemach)

Table 3 - Recurrent Cost - Eth.$

Items	Unit	Unit Cost	Farmer's Years 1		2		3		4		5		6		7-20	
			No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
A. CROP INPUTS																
1. Fertilizer	ha.	20	-	-	-	-	1	20	1	20	2	40	2	40	2	40
2. Insecticide	ha.	6	-	-	-	-	2	12	2	12	2	12	2	12	2	12
3. Herbicide	ha.	9	-	-	-	-	-	-	-	-	3	27	3	27	3	27
4. Sorghum Seed	ha.	1	-	-	-	-	-	-	1	1	2	2	2	2	2	2
5. Sesame Seed	ha.	2	-	-	-	-	-	-	1	2	1	2	1	2	1	2
6. Bean Seed	ha.	20	-	-	-	-	.2	4	.3	6	.3	6	.3	6	.3	6
7. Crop Storage Levy	qtl	.77	4	3	11	8	13.5	10	17.6	14	20.5	16	22.1	17	27.0	21
8. SUBTOTAL (1 to 7)	-	-	-	3	-	8	-	46	-	55	-	105	-	106	-	110
B. LIVESTOCK																
1. Purchases																
a. Oxen 4/	hd.	130	.3	39	.3	39	.3	39	.3	39	.3	39	.2	26	-	-
b. Heifers 3-4 years 4/	hd.	90	.17	15	.17	15	.17	15	.17	15	.17	15	-	-	-	-
2. Village Grazing Fee 2/	LU	10.30	-	-	1.66	17	2.08	21	2.55	26	2.55	26	2.55	26	2.55	26
3. Veterinary Care	hd.	1.50	-	-	5	8	6	9	8	12	8	12	9	14	9	14
4. Herding Costs (on Grazing)	hd.	1.50	-	-	2	3	3	5	4	6	4	6	4	6	4	6
5. Village Dipping Costs + Water 2/	family	9.74	.25	2	.50	5	1	10	1	10	1	10	1	10	1	10
6. SUBTOTAL (1 to 5)	-	-	-	56	-	87	-	99	-	108	-	108	-	82	-	56
C. OTHER COSTS																
1. Office/Store 2/	yr.	8.44	.25	2	.5	4	1	9	1	9	1	9	1	9	1	9
2. Water Supply 2/	yr.	7.13	.25	2	.5	3	1	7	1	7	1	7	1	7	1	7
3. Mill 2/	yr.	3.72	.25	1	.5	2	1	4	1	4	1	4	1	4	1	4
4. Road 2/	yr.	2.36	.25	1	.5	1	1	2	1	2	1	2	1	2	1	2
5. Cooperative Union Fee 2/	yr.	12.00	.25	3	.50	6	1	12	1	12	1	12	1	12	1	12
6. Land Tax 3/	yr.	5.00	-	-	-	-	-	-	-	-	-	-	1	5	1	5
7. Land Rent 3/	yr.	11.00	-	-	-	-	-	-	-	-	-	-	1	11	1	11
8. SUBTOTAL (1 to 7)	-	-	-	9	-	16	-	34	-	34	-	34	-	50	-	50
D. TOTAL RECURRENT COSTS (A-C)	-	-	-	68	-	111	-	179	-	197	-	247	-	238	-	216

1/ Annex II Table 4. 2/ Annex II Table 7. These are payments for services supplied by the Primary or Union Cooperatives.
3/ Remission given for 5 years to help farmer accumulate his own contribution to investment.
4/ Average annual purchases per farmer (from Annex II Table 1) not financed in Annex I Table 1.

Model Farmer Budget

Table 4 - Cash Flow - Resident Farmer - Eth.$

Items	Farmer's Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I. CASH INFLOW														
A. Revenue (Table 2.VI)	188	273	362	461	509	555	575	602	630	660	660	660	660	660
B. Short-term Loan 1/	-	-	27	30	67	67	67	67	67	67	67	67	67	67
C. Long-term Loan (Table 1.A.13.a)	-	225	85	300	-	-	-	-	-	-	-	-	-	-
D. TOTAL CASH INFLOW	188	498	474	791	576	622	642	669	697	727	727	727	727	727
II. CASH OUTFLOW														
A. Development Cost (Table 1.A.12.)	10	252	93	334	-	30	75	-	156	61	61	61	61	61
B. Recurrent Costs (Table 3.D.)	68	111	179	197	247	238	216	216	216	216	216	216	216	216
C. Short-term Loan - Debt Service														
1. Interest 2/	-	-	3	4	8	8	8	8	8	8	8	8	8	8
2. Principal	-	-	27	30	67	67	67	67	67	67	67	67	67	67
D. Long-term Loan - Debt Service														
1. Interest 3/	-	-	22	31	61	61	57	52	42	32	22	12	5	-
2. Principal	-	-	-	-	-	37	51	101	102	102	102	65	50	-
E. TOTAL CASH OUTFLOW	78	363	324	596	383	441	474	444	591	486	476	429	407	352
III. CASH BALANCE (I.D minus IIE)	110	135	150	195	193	181	168	225	106	241	251	298	320	375
IV. REBATE (from Cooperatives) 4/	-	-	10	10	23	8	8	10	9	11	9	9	11	22
V. NET CASH BALANCE (III + IV)	110	135	160	205	216	189	176	235	115	252	260	307	331	397
VI. SUBSISTENCE														
A. Crop Consumption (Table 2.V.D)	165	169	192	251	227	240	245	248	252	256	256	256	256	256
B. Water - home use 5/	7	19	38	38	38	38	38	38	38	38	38	38	38	38
C. Milling - home use 5/	1	2	4	4	4	4	4	4	4	4	4	4	4	4
D. SUBTOTAL	173	190	234	293	269	282	287	290	294	298	298	298	298	298
VII. NET INCOME (V + VI.D)	283	325	394	498	485	471	463	525	409	550	558	605	629	695

1/ 75% of Recurrent Cost of fertilizer, seeds, insecticide, herbicide.
2/ 12% p.a. repaid in same year.
3/ 4 years grace on principal, at 10% p.a., Total of 10 years.
4/ From Annex II Table 12 (VII).
5/ Value of consumption.

Annex I
Table 4.

Model Farmer Budget

Table 5 - Cash Flow - Mofer Zemach - Eth.$

Items	Farmer's Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I. CASH INFLOW														
A. Cash Income 5/	174	273	362	461	509	555	575	602	630	660	660	660	660	660
B. Short-term Loan 1/	-	-	27	30	67	67	67	67	67	67	67	67	67	67
C. Long-term Loan (Table 1.B.15.a)	125	110	225	285	-	-	-	-	-	-	-	-	-	-
D. TOTAL CASH INFLOW	299	383	614	776	576	622	642	669	697	727	727	727	727	727
II. CASH OUTFLOW														
A. Development Cost (Table 1.B.14) 7/	150	122	248	319	-	30	75	-	156	61	61	61	61	61
B. Recurrent Costs (Table 3.D.)	68	111	179	197	247	238	216	216	216	216	216	216	216	216
C. Short-term Loan - Debt Service														
1. Interest 2/	-	-	3	4	8	8	8	8	8	8	8	8	8	8
2. Principal	-	-	27	30	67	67	67	67	67	67	67	67	67	67
D. Long-term Loan - Debt Service														
1. Interest 3/	-	12	23	46	74	72	69	61	49	36	24	13	5	-
2. Principal	-	-	-	-	20	39	76	123	123	125	105	86	48	-
E. TOTAL CASH OUTFLOW	218	245	480	596	416	454	511	475	619	513	481	451	405	352
III. CASH BALANCE (ID minus IIE)	81	138	134	180	160	168	131	194	78	214	246	276	322	375
IV. REBATE (from Cooperatives) 6/	-	-	10	10	23	8	8	10	9	11	9	9	11	22
V. NET CASH BALANCE (III + IV)	81	138	144	190	183	176	139	204	87	225	255	285	333	397
VI. SUBSISTENCE (Table 4.VI.D.) 4/	173	190	234	293	269	282	287	290	294	298	298	298	298	298
VII. NET INCOME (V + VI)	254	328	378	483	452	458	426	494	381	523	553	583	631	695

1/ 75% of Recurrent Cost of fertilizer, seeds insecticide, herbicide.
2/ 12% repaid in one year.
3/ 4 years grace on principal, 10% p.a. Total of 10 years.
4/ Value of house not included.
5/ Table 2 VI, modified for 1st year to account for smaller 1st year sesame crop of Mofer Zemach.
6/ From Annex II Table 12 (VII).
7/ Includes replacement cost of equipment after year 6.

Model Farmer

Table 6 - Private Rate of Return - Resident Farmer - Eth.$

Item	Farmer's Years									
	1	2	3	4	5	6	7	8	9	10-20
I. INCREMENTAL INFLOW										
A. Revenue 1/	-	81	170	269	325	371	391	418	446	476
B. Subsistence 2/	8	25	69	128	139	152	157	160	164	168
C. TOTAL INFLOW (A+B)	8	106	239	397	464	523	548	578	610	644
II. INCREMENTAL OUTFLOW										
A. Development Cost (Table 1) 3/	10	252	93	334	-	30	75	-	156	61
B. Recurrent Cost (Table 3) 4/	-	36	104	122	168	159	137	137	137	137
C. Short-term Loan Interest	-	-	3	4	8	8	8	8	8	8
D. TOTAL OUTFLOW (A to C)	10	288	200	460	176	197	220	145	301	206
III. BALANCE (IC minus IID)	(2)	(182)	39	(63)	288	326	378	433	309	438
IV. REBATE (From Annex II Table 12)	-	-	10	10	23	8	8	10	9	18
V. NET BALANCE (III + IV)	(2)	(182)	49	(53)	311	334	386	443	318	458

INTERNAL RATE OF RETURN IS

1/ Incremental revenue is gross cash income for that year (Table 2 Line VI) less pre-development cash revenue which is valued at $192 in years 1-4 and $184 thereafter. The implication is that without the project incomes do not increase. (See Appendix 2)

2/ Incremental subsistence is subsistence income for that year (Table 4.VI D) less predevelopment subsistence income which is valued at $165 in years 1-4 and $130 thereafter.

3/ Includes replacements for equipment after year 6.

4/ Incremental recurrent Cost is recurrent cost for that year less predevelopment recurrent cost which is valued at $74 - 79 per year.

Model Farmer Budget

Table 7 - Private Rate of Return - Mofer Zemach - Eth.$

Item	Farmer's Years									
	1	2	3	4	5	6	7	8	9	10-20
I. INCREMENTAL INFLOW										
A. Revenue 1/	18	117	206	305	362	408	428	455	483	513
B. Subsistence 2/	33	50	94	153	164	177	182	185	189	193
C. TOTAL INFLOW (A+B)	51	167	300	458	526	585	610	640	672	706
II. INCREMENTAL OUTFLOW										
A. Development Cost 3/	150	122	248	319	-	30	75	-	156	61
B. Recurrent Cost 4/	29	72	140	158	208	199	177	177	177	177
C. Short-term Loan Interest	-	-	3	4	8	8	8	8	8	8
D. TOTAL OUTFLOW (A to C)	179	194	391	481	216	237	260	185	351	246
III. BALANCE (IC minus IID)	(128)	(27)	(91)	(23)	310	348	350	455	321	460
IV. REBATE (From Annex II Table 12)	-	-	10	11	23	9	8	10	9	18
V. NET BALANCE (III + IV)	(128)	(27)	(81)	(12)	333	356	358	465	330	478

INTERNAL RATE OF RETURN IS

1/ See footnote 1/ to Table 6. Pre development cash revenue is estimated at $136 in years 1-4 and at $122 thereafter.

2/ See footnote 2/ to Table 6. Pre development subsistence is valued at $140 in years 1-4 and at $105 thereafter.

3/ Includes replacements for equipment after year 6.

4/ See footnote 4/ to Table 6. Pre development recurrent cost is valued at $39.

Annex I
Table 7.

Table 8 - Model Farmer's Crop Output and Phasing of Area Under Cultivation

I. Phasing of Crop Yields Per Hectare (Qtl/ha)

Crop	Farmer's Years									
	1	2	3	4	5	6	7	8	9	10
Sorghum - Plot A (1 ha)	7.0	11.0	13.0	13.0	14.0	14.7	15.4	16.2	17.0	17.8
Plot B (1 ha)	7.0	8.0	8.0	13.0	14.0	14.7	15.4	16.2	17.0	17.8
Sesame	2.0	2.0	3.5	4.5	5.5	5.8	6.1	6.4	6.7	7.0
Beans (Canadian Wonder)	-	-	12.0	12.5	13.0	13.6	14.3	15.0	15.8	16.5

Note: Incremental yields in Year 1-5 due to initial application of new inputs, incremental yield in years 6-10 due to inputs of improved quality and better crop husbandry practices.

II. Phasing of Cropping Pattern and Area Under Cultivation (Ha/farmer)

Crop	Farmer's Years					
	Year 1		Yr.2	Yr.3	Yr.4	Yr.5-20
	Resident	Mofer Zemach				
Sorghum	2.00	2.00	2.0	1.8	1.7	1.7
Sesame	1.00	.86	1.0	1.0	1.0	1.0
Beans	-	-	-	.2	.3	.3
Fodder	-	-	-	1.0	2.0	2.0
Total Area Under Cultivation	3.00	2.86	3.0	4.0	5.0	5.0

III. Phasing of Total Yield Per Farmer (Qtl./Farmer)

Crop	Farmer's Years										
	1		2	3	4	5	6	7	8	9	10-20
	Res.	M.Z.									
Sorghum	14.0	14.0	19.0	19.4	22.1	23.8	25.0	26.2	27.5	28.9	30.3
Sesame	2.0	1.7	2.0	3.5	4.5	5.5	5.8	6.1	6.4	6.7	7.0
Beans	-	-	-	1.2	3.8	3.9	4.1	4.3	4.5	4.7	4.9

Note: "Res." = Resident Farmer;
"M.E." = Mofer Zemach.

IV. Subsistence Consumption Per Farming Family (Qtl./Year)

Crop	Farmer's Years									
	1	2	3	4	5	6	7	8	9	10-20
Sorghum	10.0	10.0	9.4	9.0	8.8	8.7	8.7	8.6	8.6	8.5
Beans	-	-	1.2	3.8	3.9	4.1	4.3	4.5	4.7	4.9

Table 8 - Model Farmer's Crop Output and Phasing of Area Under Cultivation (Continued)

V. Phasing of Farmers into Project (Number of Farm Families)

Year of Farmer's Development	Project Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
1st	-	1,800	3,600	3,600	3,000	-	-	-	-	-	-	-	-	-
2nd	-	-	1,800	3,600	3,600	3,000	-	-	-	-	-	-	-	-
3rd	-	-	-	1,800	3,600	3,600	3,000	-	-	-	-	-	-	-
4th	-	-	-	-	1,800	3,600	3,600	3,000	-	-	-	-	-	-
5th	-	-	-	-	-	1,800	3,600	3,600	3,000	-	-	-	-	-
6th	-	-	-	-	-	-	1,800	3,600	3,600	3,000	-	-	-	-
7th	-	-	-	-	-	-	-	1,800	3,600	3,600	3,000	-	-	-
8th	-	-	-	-	-	-	-	-	1,800	3,600	3,600	3,000	-	-
9th	-	-	-	-	-	-	-	-	-	1,800	3,600	3,600	3,000	-
10th or more	-	-	-	-	-	-	-	-	-	-	1,800	5,400	9,000	12,000

VI. Phasing of Project Area's Crop Output ('000 Qtl/year)

	Project Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
A.1. Sorghum Production	-	25.2	84.6	153.7	220.0	249.2	268.4	289.1	305.2	320.3	336.2	350.2	359.4	363.6
2. Less: Subsistence Needs	-	18.0	54.0	88.9	116.0	112.1	107.9	105.7	104.5	103.9	103.3	102.7	102.3	102.0
3. Sorghum Sales	-	7.2	30.6	64.8	104.0	137.1	160.5	183.4	200.7	216.4	232.9	247.5	257.1	261.6
B. Sesame Production & Sales	-	3.6	10.8	20.7	33.9	44.7	56.9	65.1	70.9	74.5	78.1	81.1	83.1	84.0
C. Bean Production & Subsistence	-	-	-	2.2	11.2	25.0	38.7	47.9	50.0	54.8	56.9	58.2	58.8	58.8
D. TOTAL AVAILABLE for Storage (A3+B)	-	10.8	41.4	85.5	137.9	181.8	217.4	248.5	271.6	290.9	310.0	328.6	340.2	345.6

VII. Phasing - Crop Silo Requirement (Number of Silos - Rounded Up)

Crop Silos (500 Ton)	Project Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
Sorghum	-	2	7	13	21	28	32	37	40	43	47	50	52	53
Sesame	-	1	3	4	7	9	12	13	14	15	16	16	17	17
TOTAL NUMBER	-	3	10	17	28	36	44	50	54	58	63	66	69	70

Annex II
Table 1

Model Primary Cooperative

Table 1 - Village[1] Cattle Herd Projection

	Before Development	Primary Cooperative Year 1	2	3	4	5	6	7	8-20
A. HERD COMPOSITION [3]									
1. Cows	406	420	563	909	1,013	1,077	1,150	1,143	1,138
2. Heifers 3-4 years (in calf)	132	276	506	335	323	350	283	283	282
3. Heifers 2-3 years	75	87	91	125	280	464	376	371	371
4. Heifers 1-2 years	94	99	132	295	488	394	391	391	391
5. Heifer Calves	107	144	210	364	415	441	472	464	463
6. Work Oxen	785	913	1,001	1,188	1,193	1,191	1,200	1,210	1,205
7. Steers 3-4 years [2]	64	66	70	86	119	181	314	301	301
8. Steers 2-3 years	72	76	91	125	190	329	316	317	317
9. Steers 1-2 years	83	99	132	200	346	333	334	334	335
10. Bull Calves	107	144	210	364	415	441	472	464	463
11. Total Animals [4]	1,925	2,324	3,106	3,991	4,782	5,201	5,308	5,278	5,266
12. Total Livestock Units	1,386	1,658	2,075	2,556	2,889	3,093	3,171	3,163	3,142
B. BIRTHS	1,711	2,036	2,686	3,263	3,952	4,371	4,426	4,350	4,340
1. Heifer Calves	159	192	262	428	461	490	524	516	515
2. Bull Calves	159	192	262	428	461	490	524	516	515
3. Total	318	384	524	856	922	980	1,048	1,032	1,030
C. PURCHASES									
1. Heifers 3-4 years	100	300	600	350	300	180	-	-	-
2. Heifers 1-2 years	-	-	-	100	150	-	-	-	-
3. Work Oxen	176	300	300	400	220	180	129	-	-
D. MORTALITY									
1. Cows	64	43	56	53	64	67	72	72	71
2. Heifers 3-4 years	20	30	55	22	21	23	23	19	19
3. Heifers 2-3 years	3	7	8	7	15	24	18	20	20
4. Heifers 1-2 years	2	8	12	16	26	21	22	24	23
5. Heifer Calves	52	48	52	64	46	49	52	52	52
6. Work Oxen	102	92	110	74	75	75	75	76	76
7. Steers 3-4 years	3	6	6	5	6	9	16	15	16
8. Steers 2-3 years	6	7	8	7	10	17	17	17	17
9. Steers 1-2 years	13	8	12	10	18	21	22	24	23
10. Bull Calves	52	48	52	64	46	49	52	52	52
E. SALES									
1. Cull Cows	58	75	77	107	169	192	205	218	217
2. Barren Heifers	11	69	126	84	81	87	88	71	70
3. Heifers 3-4 years	-	-	-	-	-	-	70	3	-
4. Work Oxen	138	144	168	209	226	226	226	228	230
5. Steers 1-2 years	-	-	-	-	-	61	85	114	106
6. Heifers 1-2 years	-	-	-	-	-	-	28	57	50
F. PRODUCTION DATA									
1. Mortality - Adults	12%	8%	8%	5%	5%	5%	5%	5%	5%
Calves	33%	25%	20%	15%	10%	10%	10%	10%	10%
2. Culling Rate, Barren Heifers, cows, oxen	20%	20%	20%	20%	20%	20%	20%	20%	20%
3. Conception Rate	56%	70%	70%	70%	70%	70%	70%	70%	70%

1/ Total of cattle individually owned by village members.

2/ Uncastrated steers serve as bulls to herd.

3/ End of year.

4/ Livestock units (L.U.s) in this table are calculated on the basis of "animal units" (see US-AID Ethiopia - National Range Development Project) and then converted to L.Us. on the basis that one adult male = 1L.U. consequent equivalents are :- Adult males = 1.0 L.U.

Adult cows and other 3-4 years old =0.75 L.U.
1- 3 year olds = 0.4 L.U.
Calves = 0.1 L.U.

Annex II
Table 2.

Model Primary Cooperative

Table 2 - Village Grazing Reserves - Development Cost - Eth.$

4 Village Grazing Reserves [1] of 6,000 ha. per reserve

Items	Unit	Unit Cost	No. of Units	Total Cost	F.E.
		Primary Cooperative Years			
I 1. Fencing (Common boundaries) [2]	m	.80	102,000	81,600	65,280
2. Boreholes [3]					
a. Set up	hole	350	3	1,050	
b. Drilling - 6"	m	175	150	26,250	
c. Casing - 6"	m	40	75	3,000	
d. Pump test (24 hrs.)	hole	1,000	3	3,000	
e. Submersible pump - 6"	No.	850	3	2,550	
f. Diesel generator, 2 Kw unit	No.	1,500	3	4,500	
g. pump shed	No.	500	3	1,500	
h. Troughs + pipes	Set	1,000	3	3,000	
i. Storage tanks, 45,000 lt.	No.	2,000	3	6,000	
j. Subtotal				50,850	35,600
3. Fire breaks	km.	40	102	4,080	
4. Dips	No.	6,000	2	12,000	4,800
5. Gates, rustic	No.	20	15	300	-
6. Castration equipment	No.	8	30	240	-
7. TOTAL (1 to 6)				149,070	105,680
8. Contingencies @ 10%				14,910	10,570
9. TOTAL Development Cost for 4 Reserves (7+8)				163,980	116,250
II. TOTAL Development Cost for One Village	At 25% of total for 4 Reserves			40,995	29,062

1/ Cost per reserve are cheaper if certain facilities, e.g. fencing and boreholes are shared.

2/ The dimension of each village's grazing reserve is 5km x 12km. Half the boundary of 34 kilometres is shared with another village, so each village on average pays for 75% of its boundary.

3/ Three holes are shared by four grazing reserves. Mean depth of borehole is 50m.

Model Primary Cooperative

Table 3 - Village Grazing Reserves - Recurrent Cost - Eth.$

4 Units of 6,000 ha./Unit

Items	Unit	Unit Cost	Primary Cooperative Years: Year 2 No.	Year 2 Total	Year 3 No.	Year 3 Total	Year 4-20 No.	Year 4-20 Total
I. A. Labour								
1. Foreman	year	900	4	3,600	4	3,600	4	3,600
2. Casual Labour	year	300	4	1,200	4	1,200	4	1,200
3. Pump/Dip Supervisor	year	1,200	1	1,200	1	1,200	1	1,200
Subtotal	-	-	9	6,000	9	6,000	9	6,000
B. Operating Costs								
1. Borehole 1/ (3 holes)								
a. Fuel	'000lt	400	11.7	4,680	15.6	6,240	19.5	7,800
b. Oil, grease	year	250	3	750	3	750	3	750
c. Subtotal	-	-	-	5,430	-	6,990	-	8,550
2. Dip Chemicals - BHC 5/	L.U.	.90	3864	3,480	4989	4,400	6120	5,500
3. Veterinary Costs	L.U.	.25	3864	970	4989	1,250	6120	1,530
4. Subtotal (1-3)	-	-	-	9,880	-	12,640	-	15,580
C. Maintenance Costs								
1. Fencing 2/	year	8,160	1	8,160	1	8,160	1	8,160
2. Borehole, pumps, generator 3/	year	2,340	1	2,340	1	2,340	1	2,340
3. Fire breaks 3/	year	200	1	200	1	200	1	200
4. Dips 2/	year	1,200	1	1,200	1	1,200	1	1,200
5. Hyena control 4/	year	360	1	360	1	360	1	360
6. Subtotal (1-5)	-	-	-	12,260	-	12,260	-	12,260
D. TOTAL (A-C)	-	-	-	28,140	-	30,900	-	33,840
E. Sundries @ 5%	-	-	-	1,407	-	1,545	-	1,690
F. TOTAL (A-E)	-	-	-	29,547	-	32,445	-	35,530
II. Cost Per One Reserve	-	-	4	7,387	4	8,111	4	8,883
Cost Per L.U. 5/	-	-	3864	7.65	4989	6.50	6120	5.81

L.U. Livestock Unit.

1/ 30,400 m^3/borehole. This requires 18,740 Brake Horse Power/Year, or 6,480 lt. diesel fuel at full development.

2/ At 10% of capital cost.

3/ At 5% of capital cost.

4/ Chemicals and labour.

5/ The number of livestock units shown in this line does not (after dividing by 4) tally with the number shown in Table 1(A12) because some of the village's cattle are kept on farmers' holdings, and the dipping etc. costs of these cattle are covered in Table 6 of this annex.

Model Primary Cooperative

Table 4 - Village Grazing Reserves - Cost and Revenues - Eth.$

I. COSTS

A. Total Costs Per Reserve and Per L.U. (4th - 20th years)

	4 Reserves	Per Reserve	Per L.U. (6120 LU)
1. Recurrent Cost (Table 3)	35,530	8,883	5.81
2. Depreciation on Capital Over 15 years (Table 2)	10,932	2,733	1.79
3. Interest on Capital at 10%	16,398	4,100	2.68
4. Total Annual Costs (1 to 3)	62,860	15,716	10.28
B. Annual Cost By Use			
1. Health			
a. Recurrent Costs	8,590	-	-
b. Depreciation	800	-	-
c. Interest	1,200	-	-
d. Subtotal (a to c)	10,590	2,648	1.73
2. Water			
a. Recurrent Costs	12,090	-	-
b. Depreciation	3,390	-	-
c. Interest	5,085	-	-
d. Subtotal (a to c)	20,565	5,141	3.36
3. Grazing and Overhead			
a. Recurrent Costs	14,850	-	-
b. Depreciation	6,742	-	-
c. Interest	10,113	-	-
d. Subtotal (a to c)	31,705	7,927	5.19
4. TOTAL (1 to 3)	62,860	15,716	10.28

II. REVENUE - Per Grazing Reserve 1/

Item	Unit	Unit Revenue	Year 2		Year 3		Year 4-20	
			No.	Total	No.	Total	No.	Total
Grazing Herd	L.U.	10.30	996	10,259	1,248	12,854	1,530	15,759

1/ Grazing Fee:

Type of Cattle	Fee Per Head/Year
Cow & Heifer 3-4 years	$7.73
Heifer Calf to Heifer 2-3 yr.	$4.12
Oxen	$10.30
Steer 3-4 years	$7.73
Bull Calf to Oxen 2-3 yrs.	$4.12

Model Primary Cooperative

Table 5 - Village Facilities - Development Cost and Financing - Eth.$

Items	Unit	Unit Cost	Primary Cooperative Years 4/ Year 1 No.	Year 1 Total Cost	Year 1 F.E.	Year 2 No.	Year 2 Total Cost	Year 2 F.E.	Total Cost	Total F.E.
I. Office/Store										
A. Building (33x10m)										
1. Floor-partial	m^2	8.00	40	320	-	-	-	-	-	-
2. Toilet	No.	150.	1	150	-	-	-	-	-	-
3. Roof	m^2	3.30	360	1,188	-	-	-	-	-	-
4. Walls (Surface area)	m^2	5.00	300	1,500	-	-	-	-	-	-
5. Door - outside	No.	16.00	6	96	-	-	-	-	-	-
6. Labour + Misc. 20%	-	-	-	650	-	-	-	-	-	-
7. Subtotal (1-6)	-	-	-	3,904	1,100				3,904	1,100
B. Equipment										
1. Scale - 300 kg	No.	240	-	-	-	1	240	-	-	-
2. Desk & chair	Set	120	-	-	-	1	120	-	-	-
3. Safe	No.	500	-	-	-	1	500	-	-	-
4. Adding Machine	No.	250	-	-	-	1	250	-	-	-
5. Poles for bag storage	No.	2.00	-	-	-	90	180	-	-	-
6. Subtotal (1-5)	-	-	-	-	-	-	1,290	750	1,290	750
C. TOTAL (A+B)	-	-	-	3,904	1,100	-	1,290	750	5,194	1,850
II. Water Supply										
A. Well - (10mx1m)-2	man days	2.00	70	140	-	-	-	-	-	-
1. Labour - digging	m	10.00	16	160	-	-	-	-	-	-
2. Concrete liner	m	15.00	4	60	-	-	-	-	-	-
3. Screen mesh	-	-	-	360	-	-	-	-	360	-
4. Subtotal (1-3)										
B. Pump & Fittings										
1. Pump	No.	2,000	2	4,000	-	-	-	-	-	-
2. Generator 6KVA	No.	4,000	1	4,000	-	-	-	-	-	-
3. Tap & Meter	Unit	500	2	1,000	-	-	-	-	-	-
4. Pump house	No.	360	2	720	-	-	-	-	-	-
5. Wire, piping	Set	600	1	600	-	-	-	-	-	-
6. Subtotal (1-5)	-	-	-	10,320	8,250	-	-	-	10,320	8,250
C. Tank Trough, Dip										
1. Tank - 20,000 lt.	No.	4,500	2	9,000	-	-	-	-	-	-
2. Dip	No.	6,000	1	6,000	-	-	-	-	-	-
3. Troughs & pipes	Set	750	2	1,500	-	-	-	-	-	-
4. Subtotal (1-3)	-	-	-	16,500	11,550	-	-	-	16,500	11,550
D. TOTAL (A,B,C.)	-	-	-	27,180	19,800	-	-	-	27,180	19,800
III. Village Milling Center										
A. Building	m^2	24.50	24	588	-	-	-	-	-	-
B. Mill, 15H.P. diesel	No.	3,900	1	3,900	-	-	-	-	-	-
C. Subtotal (A+B)	-	-	-	4,488	2,900	-	-	-	4,488	2,900
IV. Roads	Km.	833	6	5,000					5,000	
V. Total Development Costs										
A. Total (I-IV)	-	-	-	40,572	23,800	-	1,290	750	41,862	24,550
B. Contingencies 1/	-	-	-	4,028	2,400	-	110	70	4,138	2,470
C. TOTAL (A+B)	-	-	-	44,600	26,200	-	1,400	820	46,000	27,020
IV. Financing - Development Cost										
A. Long Term Loan 2/ 3/	-	-	-	41,600	-	-	1,400	-	43,000	-
B. Village Contribution	-	-	-	3,000	-	-	-	-	3,000	-
C. TOTAL	-	-	-	44,600	-	-	1,400	-	46,000	-

1/ Approximately 10%

3/ All in Year 1.

Model Primary Cooperative

Table 6 - Village Facilities - Recurrent Costs - Eth.$

Item	Unit	Unit Cost	Primary Cooperative Years							
			Year 1		Year 2		Year 3		Year 4-20	
			No.	Total Cost	No.	Total Cost	No.	Total Cost	No.	Total Cost
I. LABOUR 1/										
A. Secretary/Accountant	Month	150	6	-	12	-	12	900	12	1,800
B. Clerk/Storekeeper	"	80	6	480	12	960	12	960	12	960
C. Miller/Pump Supervisor	"	50	6	300	12	600	12	600	12	600
D. Assistant Supervisor	"	10	6	60	12	120	12	120	12	120
E. Day Labour	day	1	300	300	600	600	600	600	600	600
F. Subtotal (A-E)	-	-	-	1,140	-	2,280	-	3,180	-	4,080
II. OFFICE/STORE 2/										
A. Building Maintenance	Year	390	-	-	1	390	1	390	1	390
B. Stationery	Month	30	6	180	12	360	12	360	12	360
C. Subtotal (A+B)	-	-	-	180	-	750	-	750	-	750
III. MILLING CENTER 2/										
A. Building Maintenance	Year	60	-	-	1	60	1	60	1	60
B. Repair on Equipment 2/	Year	400	-	-	1	400	1	400	1	400
C. Fuel, Oil, etc. 3/	Year	590	.5	295	1	590	1	590	1	590
D. Subtotal (A-C)	-	-	-	295	-	1,050	-	1,050	-	1,050
IV. WATER SUPPLY										
A. Maintenance 2/	Year	1,650	-	-	1	1,650	1	1,650	1	1,650
B. Fuel, Oil 4/	Year	1,500	.5	750	1	1,500	1	1,500	1	1,500
C. Dipping, Chemicals	L.U.	.90	-	-	692	623	927	834	1,800	1,620
D. Subtotal (A-C)	-	-	-	750	-	3,773	-	3,984	-	4,770
$V. Road Maintenance 2/	Year	500	-	-	1	500	1	500	1	500
VI. SUBTOTAL (I-V)	-	-	-	2,365	-	8,353	-	9,464	-	11,150
VII. Coop. Union Levy	Year	7,186	.25	1,796	.50	3,593	1	7,186	1	7,186
VIII. Primary Coop. Recurrent Costs	-	-	-	4,161	-	11,946	-	16,650	-	18,336

1/ Provided by MNCO free of charge for 24 months.

2/ At 10% per ann annum.

3/ 1,350 lt. diesel fuel.

4/ 73,060 m^3/year, requires 3,400 lt. diesel fuel.

Table 6

Model Primary Cooperative

Table 7 - Village Facilities -- Costs & Revenues

I. COST OF VILLAGE COMPONENTS.	Primary Cooperative Years 5-20 Items Cost p.a.	Total Cost p.a.	Cost Per Family p.a.
A. Office/Store II)			
1. Recurrent Cost (Table 6.IA,IB,IF,	4,110		
2. Depreciation on Capital (15 years)	381		
3. Interest (10% on Capital)	571		
4. Subtotal		5,062	8.44
B. Water Supply - Human Consumption			
1. Recurrent Cost (60% of IVA.B.; 20% of I.C.D.)	2,106		
2. Depreciation on Capital (60% over 15 years)	875		
3. Interest (10% on 60% of Capital)	1,300		
4. Subtotal		4,281	7.13
C. Water Supply + Dip - Cattle			
1. Recurrent Cost (IV.C, 40% of IV A.B.; 20% of I.C.D)	3,024		
2. Depreciation on Capital (40% over 15 years) + dips	1,127		
3. Interest (10% on Capital)	1,690		
4. Subtotal		5,841	9.74
D. Mill			
1. Recurrent Cost	1,410		
2. Depreciation on Capital (over 15 years)	329		
3. Interest (10% on Capital)	494		
4. Subtotal		2,233	3.72
E. Roads			
1. Recurrent Cost	500		
2. Depreciation on Capital (over 15 years)	367		
3. Interest (10% on Capital)	550		
4. Subtotal		1,417	2.36
F. Cooperative Union Fees (Annex III Table 15)		7,186	12.00
G. TOTAL COSTS & FEES (A-F)		26,020	43.39

II. REVENUE

Type of Fee	Per Family	No. Fam.	Primary Coop. Years 1	2	3	4
1. Subscription	10.00	600	6,000	-	-	-
2. Primary Coop. Fee	31.39	600	4,708 1/	9,417 2/	18.834	18,834
3. Coop. Union	12.00	600	1,796 1/	3,593 2/	7,186	7,186
4. TOTAL	-	-	12,504	13,010	26,020	26,020

1/ 25% of full year's charge.
2/ 50% of full year's charge.

Model Primary Cooperative

Table 8 - Credit Cash Flow

Item	Primary Cooperative Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
I. CASH INFLOW														
A. Long term loan for Cooperative 7/														
1. Grazing Reserve	37,995	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Village Facilities 8/	41,600	1,400	-	-	-	-	-	-	-	-	-	-	-	-
3. Subtotal	79,595	1,400	-	-	-	-	-	-	-	-	-	-	-	-
B. Receive Long Term Loans for Farmers 1/	43,750	94,750	100,000	174,750	-	-	-	-	-	-	-	-	-	-
C. Receive Short Term Loans for Farmers	-	-	16,200	18,000	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200
D. Loan Repayments by Farmers														
1. Long Term	-	4,200	13,550	23,850	48,150	63,350	77,750	102,650	96,200	89,850	76,150	53,900	32,300	-
2. Short Term	-	-	18,000	20,400	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
3. Subtotal		4,200	31,550	44,250	93,150	108,350	122,750	147,650	141,200	134,850	121,150	98,900	77,300	45,000
E. TOTAL INFLOW	123,345	100,350	147,750	237,000	133,350	148,550	162,950	187,850	181,400	175,050	161,350	139,100	117,500	85,200
II. CASH OUTFLOW														
A. Own Debt Service 4/														
1. Interest	-	7,164	7,289	7,289	7,289	7,289	6,561	5,832	5,103	4,374	3,645	2,916	2,187	1,458
2. Principal	-	-	-	-	-	8,099	8,099	8,099	8,099	8,099	8,100	8,100	8,100	8,100
3. Subtotal	-	7,164	7,289	7,289	7,289	15,388	14,660	13,931	13,202	12,473	11,745	11,106	10,287	9,558
B. Transmit repayment by Farmers 5/														
1. Interest	-	3,938	14,085	23,265	41,213	40,582	38,522	34,980	28,833	22,644	16,431	10,829	6,657	4,020
2. Principal	-	-	16,200	18,000	47,200	63,100	79,550	108,500	108,750	109,450	102,450	86,550	69,500	40,200
3. Subtotal	-	3,938	30,285	41,265	88,431	103,682	118,072	143,480	137,583	132,094	118,881	97,379	76,157	44,220
C. Make Loans to Farmers 6/														
1. Short term	-	-	16,200	18,000	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200
2. Long term	43,750	94,750	100,000	174,750	-	-	-	-	-	-	-	-	-	-
3. Subtotal	43,750	94,750	116,200	192,750	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200	40,200
. TOTAL OUTFLOW	43,750	105,852	153,774	241,304	135,920	159,270	172,932	197,611	190,985	184,767	170,826	148,685	126,644	93,97

Table 8 - Credit Cash Flow

Footnotes

1/ These are funds borrowed from the Coop. Union (or directly from A.I.D. Bank) that are to be on lent to the farmers (long-term).

2/ These funds are to be on lend to the farmers (short-term).

3/ This is the repayment, by the farmer, to the primary cooperative, for both the short-term and long-term funds that he has borrowed. See Annex I, tables 4 and 5 for the individual repayments. There are 250 resident farmers and 350 Mofer Zemach per primary cooperative.

4/ This is debt service on the primary cooperative's own long-term debt, as listed in I.A. above. Repaid at 9%, over 15 years, with 5 years grace on principal.

5/ This is the repayment to the Coop. Union of the funds borrowed to provide farmers with long and short term loans. Interest at 9% on long-term, 10% on short-term.

6/ This is the loaning of long and short term credit to the farmer. (The counterpart of the borrowing under IB and IC.)

7/ Annex II Table 2.

8/ Annex II Table 5.

Model Primary Cooperative

Table 9 - Consolidated Development Cost - Eth.$

Item	Primary Cooperative Years							
	1		2		3-6		Total Yr.1-6	
	Total	F.E.	Total	F.E.	Total	F.E.	Total	F.E.
I. Village Grazing Reserve (Table 2.)	40,995	29,062	-	-	-	-	40,995	29,062
II. Village Facilities (Table 5)	44,600	26,200	1,400	820	-	-	46,000	27,020
III. TOTAL DEVELOPMENT COST	85,595	55,262	1,400	820			86,995	56,082

Table 10 - Consolidated Recurrent Cost - Eth.$

Item	Primary Coop. Years				
	1	2	3	4	5-20
I. Village Grazing Reserve (Table 3)	-	7,387	8,111	8,883	8,883
II. Village Facilities (Table 6)	2,365	8,353	9,464	11,150	11,150
III. Coop. Union Levy (Table 6)	1,796	3,593	7,186	7,186	7,186
IV. TOTAL RECURRENT COST	4,161	19,333	24,761	27,219	27,219

Table 11 - Consolidated Revenue - Eth.$

Item	Primary Coop. Years				
	1	2	3	4	5-20
I. Village Grazing Reserve (Table 4)	-	10,259	12,854	15,759	15,759
II. Village Facilities (Table 7)					
A. Subscription	6,000	-	-	-	-
B. Primary Coop. Fees	4,708	9,417	18,834	18,834	18,834
C. Coop. Union Fees	1,796	3,593	7,186	7,186	7,186
D. Subtotal	12,504	13,010	26,020	26,020	26,020
III. TOTAL REVENUES	12,504	23,269	38,874	41,779	41,779

Model Primary Cooperative

Table 12 - Consolidated Cash Flow - Eth.$'000

Items	Primary Coop. Years															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
I. CASH INFLOW																
A. Cash Revenue 1/	12.5	23.3	38.9	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.
B. Own Long Term Loan 2/	75.6	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. Funds for onlending to farmers 3/	43.7	94.8	116.2	192.7	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40
D. Loan Repayment by farmers 4/	-	4.2	31.6	42.3	93.2	108.4	122.8	147.7	141.2	134.9	121.2	98.9	77.3	45.0	45.0	45
E. Own Short Term Loan -- 12/	1.6	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. TOTAL CASH INFLOWS (A to E)	133.4	128.4	186.7	276.8	175.2	190.4	204.8	229.7	223.2	216.9	203.2	180.9	159.3	127.0	127.0	127
II. CASH OUTFLOWS																
A. Development Cost 5/	85.6	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	
B. Recurrent Cost 6/	4.2	19.3	24.8	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27
C. Own Long Term Loan Debt Service 7/	-	7.2	7.3	7.3	7.3	15.4	14.7	13.9	13.2	12.5	11.7	11.1	10.3	9.6	8.8	
D. Transmittal of Loan repayment by farmers 8/	-	3.9	30.3	41.3	88.4	103.7	118.1	143.5	137.6	132.1	118.9	97.4	76.2	44.2	44.2	44
E. Loans to Farmers 9/	43.6	94.8	116.2	192.7	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	4
F. Repayment Own Short term loan 13/	-	1.8	5.2	-	-	-	-	-	-	-	-	-	-	-	-	
G. TOTAL CASH OUTFLOW (A to F)	133.4	128.4	183.8	268.5	163.1	186.5	200.2	224.8	218.2	212.0	198.0	175.9	153.9	121.2	120.4	116
III. CASH BALANCE (IF minus IIG)	-	-	2.9	8.3	12.1	3.9	4.6	4.9	5.0	4.9	5.2	5.0	5.4	5.8	6.6	11
IV. REBATE FROM COOP. UNION 10/	-	-	4.9	-	3.8	1.0	0.4	1.1	0.3	20	0.1	0.2	1.0	1. 3	3.2	4
V. CASH BALANCE (III + IV)			7.8	8.3	15.9	4.9	5.0	6.0	5.3	6.9	5.3	5.2	6.4	7.1	9.8	15
VI. PAYMENT TO RESERVE 11/	-	-	2.0	2.0	2.0	-	-	-	-	-	-	-	-	-	-	
VII. NET CASH BALANCE (REBATE) 14/	-	-	5.8	6.3	13.9	4.9	5.0	6.0	5.3	6.9	5.3	5.2	6.4	7.1	9.8	15

Table 12 - Consolidated Cash Flow

Footnotes

1/ Table 11. III.

2/ Table 8. I.A.3.

3/ Table 8 I.B and C.

4/ Table 8. I.D.3.

5/ Table 9.

6/ Table 10.

7/ Table 8. II·A.3.

8/ Table 8. II.B.3.

9/ Table 8. II.C.3.

10/ Rebate from Coop. Union Annex III. Table 17.

11/ 25% of net balance until share capital is equalled ($6,000).

12/ Short term loan to cover cash shortfalls.

13/ Repayment at 10% in following year.

14/ The whole of this net cash balance is paid out as a rebate to the farmers; and is shown as a cash inflow to farmers in Annex I Table 5(IV).

Cooperative Union

Table 1 - Crop Store Development Cost - Eth $ '000

Items	Unit	Unit Cost	Project Years												Total Yrs 1 - 6	
			Yr. 1,2,4			Yr. 3			Yr. 5			Yr. 6				
			No.	Total	F.E.	No	Total	F.E.	No.	Total	F.E.	No.	Total	F.E.	Total	F.E.
1.Building[1]	no.	69.4	-	-	-	1	69.4	20.8	1	69.4	20.8	1	69.4	20.8	208.2	62.4
2.Silo[2]	no.	3.3	-	-	-	20	66.4	25.6	20	66.4	25.6	20	66.4	25.6	199.2	76.8
3.Equipment																
a.scale[3]	no.	.2	-	-	-	6	1.2	.4	6	1.2	.4	6	1.2	.4	3.6	1.2
b.conveyor[4]	no.	2.0	-	-	-	6	12.0	7.2	6	12.0	7.2	6	12.0	7.2	36.0	21.6
c.other[5]	set	.2	-	-	-	3	.6	-	3	.6	-	3	.6	-	1.8	-
d.bags	'000	1.5	-	-	-	100	150.0	-	100	150.0	-	100	150.0	-	450.0	-
e.subtotal equipment			-	-	-	-	163.8	7.6	-	163.8	7.6	-	163.8	7.6	491.4	22.8
4.Office Eq[6]	set	1.0	-	-	-	1	1.0	.7	-	-	-	-	-	-	1.0	.4
5.Total	-	-	-	-	-	-	300.6	54.4	-	299.6	54.0	-	299.6	54.0	899.8	162.4
6.Contingency-		-	-	-	-	-	30.1	5.4	-	29.9	5.4	-	29.9	5.4	89.9	16.2
TOTAL(1-6)	-	-	-	-	-	-	330.7	59.8	-	329.5	59.4	-	329.5	59.4	989.7	178.6

[1] building to house 20 silos of 500 ton capacity. Dimensions: 160m x 32.5m. Includes roof, walls, floor and "well" for loading and unloading silos

[2] silo, 13.5m diameter by 6m. 500 ton capacity, top-load, bottom-empty.

[3] 300Kg.

[4] 2 HP system, reaches 6.8m up or down

[5] ladder, trolley cart, other

[6] desk, chair, cash box, and other includes adding machine

Annex III
Table 1

Cooperative Union

Table 2 - Crop Store - Recurrent Cost - Eth $

Category and Items	Unit	Unit Cost	Project Years Yr. 3		Yr. 4		Yr. 5		Yr. 6	
A. Staff										
1. Crop Storeskeeper	month	300.	12	3,600	12	3,600	12	3,600	12	3,600
2. Driver/Loader [1]	month	75.	-	-	72	5,400	72	5,400	144	10,800
3. Casual Labour	man day	1.25	-	-	414	518	649	811	842	1,053
4. Guard	month	30.	6	180	12	360	18	540	24	720
5. Subtotal	-	-	-	3,780	-	9,878	-	10,351	-	16,173
B. Maintenance										
1. Building [2]	yr.	3500	-	-	1	3,500	1	3,500	2	7,000
2. Silos [2]	yr.	165.	-	-	20	3,300	20	3,300	40	6,600
3. Equipment [3]	yr.	700.	-	-	1	700	1	700	2	1,400
4. Subtotal	-	-	-	-	-	7,500	-	7,500	-	15,000
C. Operating Costs										
1. Chemicals [4]	'000qtl	40.	-	-	85.5	3,420	137.9	5,516	181.8	7,272
2. Bags [5]	'000	1500.	-	-	-	-	37.9	56,850	181.8	272,700
3. Fuel Conveyor	'000qtl	3.30	-	-	85.5	282	137.9	455	181.8	600
4. Stationery	yr/unit	360.	-	-	1	360	1	360	2	720
5. Transport	'000qtl	(6)	-	-	85.5	157,716	137.9	254,724	181.8	335,820
6. Subtotal	-	-	-	-	-	161,778	-	317,905	-	617,112
Total (A+B+C)	-	-	-	3,780	-	179,156	-	335,756	-	618,285

Continued on next page -

Project Years						
Category	Yr. 7		Yr. 8		Yr. 9-20 (mean)	
A.						
1.	12	3,600	12	3,600	12	3,600
2.	144	10,800	216	16,200	216	16,200
3.	997	1.246	1149	1,436	1420	1,775
4.	30	900	36	1,080	36	1,080
5.	-	16,546	-	22,316	-	22,655
B.						
1.	2	7,000	3	10,500	3	10,500
2.	40	6,600	50	8,250	60	9,900
3.	2	1,400	3	2,100	3	2,100
4.	-	15,000	-	20,850	-	21,500
C.						
1.	217.4	8,696	248.5	9,940	331.9	13,276
2.	117.4	176,100	248.5	372,750	331.9	497,850
3.	217.4	717	248.5	820	331.9	1,095
4.	2	720	3	1,080	3	1,080
5.	217.4	403,924	248.5	461,748	331.9	609,897
6.	-	590,157	-	846,341	-	1,123,198
D.	-	621,703	-	889,507	-	1,167,353

(Continued from previous page)

1) employed to load, unload and supervise storage area.
2) At 5% of capital cost
3) At 10% of capital cost excludes bags.
4) Phostoxin tablets
5) Bags purchased for replacement only, other bags purchased as development cost.
6) Commercial cost of transporting from farm to Asmara (-for sesame $286/qtl) and Enda-Selassie (Sorghum at $1.68/qtl)

Cooperative Union

Table 3 - Crop Store - Revenue - Eth $

Project Years

Item	Unit	Unit Cost	Yr. 3		Yr. 4		Yr. 5		Yr. 6	
			No.	Total	No.	Total	No.	Total	No.	Total
A. Cost of bag [1]	'000	1500	-	-	85.5	129,900	137.9	206,850	181.8	272,700
B. Transport [2]	'000qtl	-	-	-	-	157,176	-	254,724	-	335,820
C. Commission [3]	'000qtl	690	-	-	85.5	58,995	137.9	95,151	181.8	125,442
D. Direct Handling Cost [4]	'000qtl	80	-	-	85.5	6,840	137.9	11,032	181.8	14,544
E. TOTAL Revenue [5]	-	-	-	-	-	352,911	-	567,757	-	748,506

Continued below –

	Yr. 7		Yr. 8		Yr. 9-20 (mean)	
A.	217.4	326,100	248.5	372,750	331.9	497,850
B.	-	403,924	-	461,748	-	609,897
C.	217.4	150,006	248.5	171,465	331.9	229,011
D.	217.4	17,392	248.5	19,880	331.9	26,552
E.	-	897,422	-	1,025,843	-	1,363,310

1) Included in price merchant pays Cooperative Union when he purchases the crop at Asmara or Enda-Selassie
2) See Table 2, footnote 6. Received by TAHECU as difference in sale price between project area and point of sale.
3) Includes staff overhead, stationery, maintenance costs, depreciation on facilities and interest charges $69/qtl
4) Includes cost of chemicals, loading and unloading, and other handling charges $08/qtl.
5) Farmer pays the commission and direct handling costs. Therefore $.77/qtl is taken off the price he receives, ex-Sheraro.

Annex III
Table 4

Livestock Market - Capital Cost - Eth $

	Unit	No.of Units	Unit Cost	Project Yr. 2	Foreign Exchange
A. Cattle Pens - Fencing					
1.Fencing posts(15cmx230cm) [1]	No.	184	1.20	221	
2.Rails (10cmx400cm) [1]	No.	906	.50	453	
3.Nuts bolts and washers(20mmx26cm)	No.	856	.50	428	
4.Nuts bolts & washers (20mmx12cm)	No.	736	.25	189	
5.Steel gates (1.3mx1.3m)	No.	5	70.00	350	
6. Rustic gates	No.	8	13.00	104	
7. Subtotal (1to6)				1,745	617
B. Concrete sales pen & entrance race	2m.	31	9.00	279	
C. Administrative Block					
1. Office	No.	1	235.00	235	
2Traders shelter	No.	1	162.00	162	
3. Subtotal (1+2)				397	180
D. Crush/spray Race	No.	1	1,300.00	1,300	
E. Sheep & Goat Section					
1. Fencing of pens (1m. high)	M.	88	2.00	176	
2. Metal gates	No.	1	30.00	30	
3. Wooden gates	No.	7	10.00	70	
4. Clerks shelter	No.	1	100.00	100	
5. Subtotal (1to4)				376	
F. Labour - Installation [2]				1,430	
G. Moveable Assets					
1. Donald weighing scale	No.	1	1,100.00	1,100	1,100
2. Furniture	No.	1	100.00	100	
3. Cleaning equipment	No.	1	100.00	100	
4. Subtotal (1to3)				1,300	1,100
H. TOTAL (AtoG)				6,827	1,897
I. Contingencies (10%)				683	
J. Total + Contingencies (H+I)				7,510	1,897

1) includes transport cost

2) 30% of fixed assets

Cooperative Union

Table 5 - Livestock Market - Recurrent costs - E$

	Unit	Cost	Project Years: Year 2 No.	Year 2 Total	Yr.3-20 No.	Yr.3-20 Total
1. Maintenance[1]	-	380	-	-	-	380
2. Stationery	yr.	200	.5	100	1	200
3. Total recurrent costs[2]	-	-	-	100	-	580

1) 5% of capital cost

2) Staffing provided by Marketing Dept. of Coop. Union and Veterinary Department of TAHADU.

Cooperative Union

Table 6 - Primary Livestock Market - Costs & Revenues - E$

I. COSTS

	Cost Per Annum
1. Recurrent Cost [1]	580
2. Depreciation (over 15 years)	500
3. Interest on Capital (10%)	751
4. TOTAL	1,831

1) does not include staff supplied periodically by the Marketing Division and TAHADU.

II. REVENUE

Project Years

Item	Unit	Unit Revenue	2		3		4		5		6		7	
			No.	Total	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
I. Cattle	head	$1.50	2,700	4,050	4,180	6,270	7,100	10,650	10,100	15,150	12,700	19,050	14,800	22,200

continued below -

8 - 20	
19,180	28,770

Market throughput based on purchases and sales from primary cooperatives and villages not yet incorporated into cooperatives. A percentage of potential sales has been taken to represent real sales through the market, rising from 10% to 75%.

Annex III
Table 6

Cooperative Union

Table 7 - Engineering Department - Development Cost - E$

Project Years

Items	Unit	Unit Cost	Year 1			Year 2			Total		
			No.	Total Cost	F.E.	No.	Total Cost	F.E.	No.	Total Cost	F.E.
I. Staff House	no.	22,000	1	22,000	8,000	-	-	-	1	22,000	8,000
II. Drilling Equipment [1]	no.	97,000	1	97,000	88,000	-	-	-	1	97,000	88,000
III. Access Road Construction											
A. Lorry [2]	no.	35,000	1	35,000	21,000	-	-	-	-	-	-
B. Hand Tools	set	3,000	1	3,000	2,000	-	-	-	-	-	-
C. Subtotal (A+B)	-	-	-	38,000	23,000	-	-	-	-	38,000	23,000
IV. Tractor & Harrow [3]	no.	15,000	1	15,000	9,000	-	-	-	1	15,000	9,000
V. Office Equipment											
A. Desk/chair set	set	250	-	-	-	2	500	200	-	-	-
B. Typist desk set	set	200	-	-	-	1	200	80	-	-	-
C. Filing Cabinet	no.	250	-	-	-	1	250	150	-	-	-
D. Cupboards	no.	150	-	-	-	1	150	90	-	-	-
E. Chairs & tables	set	500	-	-	-	1	500	200	-	-	-
F. Typewriter	no.	750	-	-	-	1	750	525	-	-	-
G. Subtotal (A-F)	-	-	-	-	-	-	2,350	1,245	-	2,350	1,245

Continued on next page -

Continued from previous page -

Items	Unit	Unit Cost	Project years: Year 1 No.	Year 1 Total Cost	Year 1 F.E.	Year 2 No.	Year 2 Total Cost	Year 2 F.E.	Total No.	Total Total Cost	Total F.E.
VI. Maintenance Shop											
A. Buildings [4]	set	9,000	1	9,000	2,700	-	-	-	-	-	-
B. Tools, equipment [5]	set	17,500	-	-	-	1	17,000	10,500	-	-	-
C. Subtotal (A + B)	-	-	-	9,000	2,700	-	17,500	10,500	-	26,500	13,200
VII. Mobile Maintenance											
A. Vehicle, heavy duty [2]	no.	20,000	1	20,000	12,000	-	-	-	-	-	-
B. Tools, equipment [6]	set	5,000	1	5,000	3,500	-	-	-	-	-	-
C. Subtotal (A+B)	-	-	-	25,000	15,500	-	-	-	-	25,000	15,500
VII. Vehicles 4 x 4 Pickup	no.	16,000	2	32,000	19,200					32,000	19,200
IX. Timber Impregnation Eq	no.	15,700	1	15,700	12,100	-	-	-	-	15,700	12,100
X. Total (I to IX)	-	-	-	253,700	177,500	-	19,850	11,745	-	273,550	189,245
XI. Contingencies - 10%	-	-	-	25,370	17,750	-	1,985	1,175	-	27,355	18,925
XII. TOTAL Development Cost	-	-	-	279,070	195,250	-	21,835	12,920	-	300,905	208,170

1) Includes trailer mounted percussion rig, with tools and spares, oil field trailer and test pump equipment.
2) replaced every 5 years
3) for maintaining fire breaks
4) Shop, parts store, office, heavy tools shed, tools shed, grease pit, petrol pump
5) Generator, welder, grinder, hand tools, compressor, injector tester, chargers, jacks
6) Hand tools, hoist, jack, compressor, 200 amp. welder, lighting equipment, shop manuels.

Cooperative Union

Table 8 - Engineering Department - Identified Recurrent Costs - E$

Items	Unit	Unit Cost	Project Years							
			Yr. 1		Yr. 2		Yr. 3		Yr. 4	
			No.	Total Cost	No.	Total Cost	No.	Total Cost	No.	Total Cost
I. Maintenance Repairs										
A. Housing [1]	yr.	2,200	-	-	1	2,200	1	2,200	1	2,200
B. Office Equipment [1]	yr.	200	-	-	-	-	1	200	-	200
C. Shop [1]	yr.	2,650	-	-	1	900	1	2,650	1	2,650
D. Mobile Unit [1]	yr.	2,500	-	-	1	2,500	1	2,500	1	2,500
E. Subtotal (A - D)	-	-	-	-	-	5,600	-	7,550	-	7,550
II. Staff										
A. Chief Engineer [2]	yr.	12,000	1	-	1	-	1	-	1	
B. Chief Mechanic	yr.	5,400	-	-	1	5,400	1	5,400	1	5,400
C. Chief Mason	yr.	5,400	1	5,400	1	5,400	1	5,300	1	5,400
D. Chief Carpenter	yr.	5,400	1	5,400	1	5,400	1	5,400	1	5,400
E. Mobile Unit Foreman	yr.	4,800	1	4,800	1	4,800	1	4,800	1	4,800
F. Driver	yr.	1,200	1	1,200	1	1,200	1	1,200	1	1,200
G. Guard	yr.	360	1	360	1	360	1	360	1	360
H. Helpers	yr.	600	2	1,200	5	3,000	5	3,000	5	3,000
I. Subtotal (A-H)	-	-	8	18,360	12	25,560	12	25,560	12	25,560
III. Stationery & Office Supplies	yr.	600	1	600	1	600	1	600	1	600
IV. Total Recurrent Cost [3]	-	-	-	18,960	-	31,760	-	33,710	-	33,710

Continued on next page -

Annex III
Table 8

Continued from previous page -

Items	Yr. 5		Yrs. 6-20	
	No.	Total Cost	No.	Total Cost
I.				
A.	1	2,200	1	2,200
B.	1	200	1	200
C.	1	2,650	1	2,650
D.	1	2,500	1	2,500
E.	-	7,550	-	7,550
II.				
A.	1	-	12	12,000
B.	1	5,400	1	5,400
C.	1	5,400	1	5,400
D.	1	5,400	1	5,400
E.	1	4,800	1	4,800
F.	1	1,200	1	1,200
G.	1	360	1	360
H.	5	3,000	5	3,000
I.	12	25,560	12	37,560
III.	1	600	1	600
IV.	-	33,710	-	45,710

1) at 10% p.a.

2) Provided as a gift by Government under Cooperative Proclamation of 1966. Art. 32 (2). For first 5 years and costed into project in Annex VII Table 1. After year 5 a local engineer is hired at $1,000/month and paid by TAHECU.

3) The recurrent costs in this table are those which are relatively fixed whatever the particular years work load on the unit. For this reason operation of vehicles is <u>not</u> costed in this table. Variable recurrent costs are shown in Table 9 (II C)

Cooperative Union

Table 9 - Engineering Department - Revenues and Expenses - E$ '000(rounded)

Catagories	Unit	Unit Value (rounded)	Yr. 1		Yr. 2	
			No.	Total	No.	Total
I. REVENUE - by Source						
A. Primary Cooperative						
1.Grazing Reserve [2]						
a. Capital 1)	no.	37.7	-	-	3	113.0
b.maintenance(phased)	no.	3.0	-	-	-	-
2. Village Facilities [3]						
a. capital 1)	no.	21.2	-	-	3	63.6
b. maintenance	no.	3.0	-	-	-	-
3. Subtotal (1&2)	-	-	-	-	-	176.6
B. Cooperative Union						
1. Grain Store [4]						
a. capital 1)	no.	135.8	-	-	-	-
b. maintenance	no.	7.5	-	-	-	-
2. Livestock Markets [5]						
a. capital 1)	no.	5.5	-	-	1	5.5
b. maintenance	no.	.4	-	-	-	-
3. Subtotal (1&2)	-	-	-	-	-	5.5
C. TAHADU [6]						
1. Capital [1]	-	-	-	631.6	-	127.4
2. Maintenance	-	-	-	47.4	-	67.7
3. Subtotal (1&2)	-	-	-	679.0	-	195.1
D. Cooperative Ranch [7]						
1. Capital	-	-	-	-	-	131.0
2. Maintenance	-	-	-	-	-	16.6
3. Subtotal (1+2)	-	-	-	-	-	147.6
E. TOTAL REVENUE (A to D)	-	-	-	679.0	-	524.8
II. ANALYSIS OF EXPENDITURE						
A. Equated capital charges in respect of engineering units development costs	-	-	-	70.8	-	77.5
B. Identified Recurrent costs [9]	-	-	-	19.0	-	31.8
C. Unidentified & Variable costs 10)	-	-	-	589.2	-	415.5
D. Total (1+2+3)	-	-	-	679.0	-	524.3

Continued on next page -

Continued from previous page -

Catagories	Yr. 3		Yr. 4		Yr. 5		Yr. 6		Yr.7-20	
	No.	Total	No.	Total	No.	Total	No.	Total	No.	Total
I.										
A.										
1.										
a.	6	226.0	6	226.0	5	118.4	-	-	-	-
b.	3	8.9	9	26.7	15	44.6	20	59.4	20	59.4
2.										
a.	6	127.2	6	127.2	5	106.0	-	-	-	-
b.	3	9.0	9	27.0	15	45.0	20	60.0	20	60.0
3.	-	371.1	-	406.9	-	314.0	-	119.4	-	119.4
B.										
1.										
a.	1	135.8	-	-	1	135.8	-	-	-	-
b.	-	-	1	15.0	1	15.0	2	30.0	2	30.0
2.										
a.	-	-	-	-	-	-	-	-	-	-
b.	1	.4	1	.4	1	.4	1	.4	1	.4
3.	-	136.2	-	15.4	-	151.2	-	30.4	-	30.4
C.										
1.	-	52.6	-	-	-	-	-	-	-	-
2.	-	75.5	-	81.0	-	66.0	-	38.6	-	23.0
3.	-	128.1	-	81.0	-	66.0	-	38.6	-	23.0
D.										
1.	-	-	-	-	-	-	-	-	-	-
2.	-	16.6	-	16.6	-	16.6	-	16.6	-	16.6
3.	-	16.6	-	16.6	-	16.6	-	16.6	-	16.6
E.	-	652.0	-	519.9	-	547.8	-	205.0	-	189.4
II.										
A.	-	77.5	-	77.5	-	77.5	-	18.0	-	18.0
B.	-	33.7	-	33.7	-	33.7	-	45.7	-	45.7
C.	-	540.8	-	408.7	-	436.6	-	141.3	-	125.7
D.	-	652.0	-	519.9	-	547.8	-	205.0	-	189.4

Footnotes

1) excludes equipment whereever possible

2) Annex II, tables 2,3.

3) Annex II, tables 5,6.

4) Annex III, tables 1,2.

5) Annex III, tables 4,5;

6) Annex VII. See notes to Annex III, table 9.

7) From Annex IV, tables 2 and 3.

8) Equated interest (8½%) and amortisation payments over 5 years on the development costs of Annex III, table 7.

10) This is the residual between the identified costs (lines IIA & IIB) and the total cost as represented by the charges made to the Union's customers (i.e. the revenues of IE)

Cooperative Union

Table 10 - H.Q. Unit - Development Cost - Eth $

Item	Unit	Unit Cost	Project Years 1			2		
			No.	Total	FE	No.	Total	FE
I. H.Q. Department								
A. Office Block [2]	m^2	75	50	3.750	1,100	150	11,250	3,400
B. Office Equipment								
1. Desk and chair	set	250	1	250	-			
2. Typist Desk and chair	set	200	1	200	-			
3. Filing Cabinet	no.	250	2	500	-			
4. Cupboards	no.	150	2	300	-			
5. Chairs	no.	50	6	300	-			
6. Tables	no.	100	1	100	-			
7. Typewriter	no.	750	1	750	-			
8. Radio/Base Set [3]	no.	2,500	1	2,500	-			
9. Radio/Mobile [4]	no.	3,100	1	3,100	-			
10. Subtotal (1to9)	-	-	-	8,000	5,670	-	-	-
C. Housing	no.	12,000	1	12,000	3,600			
D. Vehicles - 4 WD	no.	18,000	1	18,000	10,800			
E. Power - Generator [5]	no.	9,000	1	9,000	6,750			
F. H.Q. Subtotal (A to E)	-	-	-	50,750	27,920	-	11,250	3,400

Continued on next page -

Continued from previous page -

Item	Project Years 3			4			Total Years 1-6 [1]		
	No.	Total	FE	No.	Total	FE	No.	Total	FE
I.									
A.	-	-	-	-	-	-	200	15,000	4,500
B.									
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.	-	-	-	-	-	-	-	8,000	5,670
C.							1	12,000	3,600
D.							1	18,000	10,800
E.							1	9,000	6,750
F.	-	-	-	-	-	-	-	62,000	31,320

Continued from Annex III, Table 10, Page 1.

Item	Unit	Unit Cost	Project Years 1			2		
			No.	Total	FE	No.	Total	FE
II. Finance Department								
A. Office Equipment								
1. Desk and chair	set	250	1	250		1	250	
2. Typist desk and chair	set	200	1	200		-	-	
3. Filing cabinets	no.	250	-	-		1	200	
4. Cupboards	no.	150	-	-		1	150	
5. Chairs	no.	50	-	-		3	150	
6. Table	no.	100	-	-		1	100	
7. Typewriter	no.	750	1	750		-	-	
8. Adding machine	no.	600	1	600		-	-	
9. Safe	no.	500	1	500		-	-	
10. Subtotal (1to9)	-	-	-	2,350	1,660	-	850	
B. Housing	no.	12,000	-	-	-	1	12,000	3,600
C. Subtotal (A+B)	-	-	-	2,350	1,660	-	12,850	4,025
III. Marketing, Transport and Supply.								
A. Supply Store ($90m^2$)								
1. Floor [6]	m^2	6.50	-	-	-	90	585	
2. Roof	m^2	3.50				100	350	
3. Walls [7]	m^2	5.00				150	750	
4. Doors	set	32.				2	64	

Continued from previous page -

Item	Project Years 3			4			Total years 1-6 [1]		
	No.	Total	FE	No.	Total	FE	No.	Total	FE
II.									
A.									
1.	2	500		2	500		-	-	-
2.	1	200							
3.	1	200							
4.	2	300							
5.	7	350							
6.	1	100							
7.	1	750							
8.	2	1,200							
9.									
10.	-	3,600	2,125	-	500	200	-	7,300	4,410
B.	-	-	-	-	-	-	1	12,000	3,600
C.	-	3,600	2,125	-	500	200	-	19,300	8,010
III.									
A.									
1.									
2.									
3.									
4.									

Continued from Page 3.

Item	Unit	Unit Cost	Project Years 1 No.	1 Total	1 FE	2 No.	2 Total	2 FE
III. A. 5. Other [8]	-	165				-	165	
6. Subtotal (1-5)	-	-	-	-	-	-	1,914	570
B. Office Equipment								
1. Desk and chair	set	250						
2. Filing Cabinet	no.	250						
3. Cupboard	no.	150						
4. Chairs	no.	50						
5. Table	no.	100						
6. Adding Machine	no.	460 [9]						
7. Safe	no.	500						
8. Subtotal (1-7)	-	-	-	-	-	-	-	-
C. Lorry	no.	42,000	1	42,000	25,200	-	-	-
D. Subtotal (A - C)	-	-	-	42,000	25,200	-	1,914	570
IV. TOTAL (I - III)	-	-	-	95,100	54,780	-	26,014	7,014
V. Contingencies [10]	-	-	-	9,500	5,470	-	2,586	805
VI. TOTAL Development Cost	-	-	-	104,600	60,250	-	28,600	8,800

Continued from previous page -

Item	Project years								
	3			4			Total years 1-6 [1]		
	No.	Total	FE	No.	Total	FE	No.	Total	FE
III. A.									
5.									
6.	-	-	-	-	-	-	-	1,914	650
B.									
1.	1	230							
2.	1	250							
3.	1	150							
4.	3	150							
5.	1	100							
6.	1	460							
7.	1	500							
8.	-	1,860	1,200	-	-	-	-	1,860	1,200
C.				1	42,000	25,200		84,000	50,400
D.	-	1,860	1,200	-	42,000	25,200	-	87,774	52,170
IV.	-	5,460	3,325	-	42,500	25,400	-	169,074	91,500
V.	-	540	335	-	4,250	2,540	-	16,876	9,150
VI.	-	6,000	3,660	-	46,750	27,940	-	185,950	100,650

Footnotes

1) No development expenditure in Year 5 or year 6.
2) For all departments in the HQ Unit
3) 50 watt base station. S.S.B. Includes crystals, mic, antenna.
4) 50 watt SSB mobile. Includes crystals, mic, whip antenna, brackets.
5) 8 to 10 KW unit. For office, radios, housing, garage
6) concrete
7) Chika, measured in wall surface area
8) Office wall, office door, windows
9) Hand operated, 2 operations
10) Approximately 10%.

Cooperative Union

Table 11 - H.Q. Unit - Recurrent Costs - Eth $

Item	Unit	Unit Cost	Project years							
			Yr. 1		Yr. 2		Yr. 3		Yr. 4	
			No.	Total	No.	Total	No.	Total	No.	Total
I. HQ Department										
A. Office Block Maintenance [1]	yr.	750	-	-	-	200	1	750	1	750
B. Office Equipment Maintenance [2]	yr.	800	-	-	1	800	1	800	1	800
C. Housing Maintenance [1]	yr.	600	-	-	1	600	1	600	1	600
D. Power Generation										
1. Maintenance [2]	yr.	900	.5	450	1	900	1	900	1	900
2. Fuel, oil etc. [3]	yr.	750	.5	375	1	750	1	750	1	750
E. Vehicle Operating Costs	'000Km	250	15	3,750	25	6,250	25	6,250	25	6,250
F. Stationery & Sundries	mth	350	6	2,100	12	4,200	12	4,200	12	4,200
G. Subtotal (A-F)	-	-	-	6,675	-	13,700	-	14,250	-	14,250
H. Staff										
1. General Manager [4]	yr	12,000	1	-	1	-	1	12,000	1	12,000
2, Secretary	yr	4,800	1	4,800	1	4,800	1	4,800	1	4,800
3. Guard	yr	360	1	360	1	360	1	360	1	360
4. Subtotal (1-3)	-	-	3	5,160	3	5,160	3	17,160	3	17,160
I. H.Q. Dept. Subtotal	-	-	-	11,835	-	18,860	-	31,410	-	31,410
II. Finance Department										
A. Staff										
1. Department Head	man yr.	10,800	-	-	-	-	1	10,800	1	10,800
2. Section Heads	"	7,200	1	7,200	1	7,200	1	7,200	1	7,200

Continued -

Continued from previous page -

Item	Yr. 5		Yr. 6 - 20	
	No.	Total	No.	Total
I.				
A.	1	750	1	750
B.	1	800	1	800
C.	1	600	1	600
D.				
1.	1	900	1	900
2.	1	750	1	750
E.	25	6,250	15	3,750
F.	12	4,200	12	4,200
G.	-	14,250	-	14,250
H.				
1.	1	12,000	1	12,000
2.	1	4,800	1	4,800
3.	1	360	1	360
4.	3	17,160	3	17,160
I.	-	31,410	-	31,410
II.				
A.				
1.	1	10,800	1	10,800
2.	1	7,200	1	7,200

Continued from Page 1 -

Item	Unit	Unit Cost	Project years Yr. 1 No.	Yr. 1 Total	Yr. 2 No.	Yr. 2 Total	Yr. 3 No.	Yr. 3 Total	Yr. 4 No.	Yr. 4 Total
II. A. 3. Clerks	man yr.	3,600	1	3,600	1	3,600	2	7,200	4	14,400
4. Secretaries	"	4,800	1	4,800	1	4,800	1	4,800	1	4,800
5. Staff Subtotal	-	-	3	15,600	3	15,600	5	30,000	7	37,200
B. Office Equip. Maintenance [2]	yr.	730	-	-	-	240	-	325	-	680
C. Stationery & Sundries	staff yr.	350	3	1,050	3	1,050	5	1,750	7	2,450
D. Housing Maintenance [2]	yr.	1,200	-	-	-	-	1	1,200	1	1,200
E. Finance Subtotal (A-D)	-	-	-	16,650	-	16,890	-	33,275	-	41,530
III. Marketing, Supply, Transport										
A. Staff										
1. Supply storekeeper	man yr.	1,800	-	-	.5	1,800	1	3,600	1	3,600
2. Marketing Section Head	"	7,200	-	-	-	-	.5	3,600	1	7,200
3. Supply store guard	"	360	-	-	.5	180	.1	360	1	360
4.*Staff Subtotal(1-3)	-	-	1	2,400	2	4,380	3.5	9,960	5	15,960
B. Supply store maintenance [2]	yr.	200	-	-	-	-	-	-	1	200
C. Office Equip. maintenance [2]	yr.	200	-	-	-	-	-	-	1	200
D. Vehicle Operating Costs	'000Km	350	12	4,200	12	4,200	12	4,200	27	9,450
E. Stationery & Sundries	staff yr.	350	-	-	1	350	2	700	3	1,050
F. Department Subtotal (A-F)	-	-	-	6,600	-	8,930	-	14,860	-	26,860
IV. TOTAL Recurrent Costs (I-III)	-	-	-	35,085	-	44,680	-	79,545	-	99,800

* Staff subtotal includes driver costs as follows: One driver at $2,400 per year, yr.1-3
Two drivers at $2,400 per year, yrs. 4-20

Continued from previous page -

Item	Project years			
	Yr.5		Yr. 6-20	
	No.	Total	No.	Total
II.A. 3.	6	21,600	7	25,200
4.	1	4,800	1	4,800
5.	9	44,400	10	48,000
B.	1	730	1	730
C.	9	3,150	10	3,500
D.	1	1,200	1	1,200
E.	-	49,480	-	53,430
III.				
A.				
1.	1	3,600	1	3,600
2.	1	7,200	1	7,200
3.	1	360	1	360
4.	5	15,960	5	15,960
B.	1	200	1	200
C.	1	200	1	200
D.	30	10,500	30	10,500
E.	3	1,050	3	1,050
F.	-	27,910	-	27,910
IV.	-	108,800	-	112,750

Footnotes

1) at 5% p.a. Full maintenance cost after year 2

2) at 10% p.a.

3) 10 KW per hour of operation. 1lt/hr.(full operation) Serves office and staff housing

4) Provided by Government for first two years.

TAHECU Cooperative Union

Table 12 - Credit Cash Flow [9] - Eth $'000

Items	Project Years						
	1	2	3	4	5	6	7
LOAN FUNDS INFLOW							
I. From Aidbank A long term loan for TAHECU HQ [1]	95.1	32.8	306.1	42.4	299.5	299.5	-
B. Long term loan for TAHECU Eng. Unit [2]	235.7	19.8	-	-	-	-	-
C. Funds to on-lend to P.C.S. [3]							
1. Long term	-	370.1	1,028.5	1,617.0	2,317.9	2,129.2	1,548.5
2. Short term	-	4.8	23.7	86.4	187.4	349.3	550.8
3. Subtotal (1+2)	-	374.9	1,052.7	1,703.4	2,505.3	2,478.5	2,099.3
D. Total from Aidbank (A+B+C)	348.8	427.5	1,358.8	1,745.8	2,804.8	2,778.0	2,099.3
II. Repayments by farmers and P.C.s [4]							
A.P.C. Long term loans	-	-	21.5	64.8	108.6	145.2	170.1
B. P.C. Short term loans	-	-	5.4	26.4	42.0	40.2	9.0
C. Farmer loans	-	-	11.7	114.3	329.1	714.3	1,240.8
D. Total repayments (A+B+C)	-	-	38.6	205.5	479.7	899.7	1,419.9
III. TOTAL loan funds inflow	348.8	427.5	1,397.4	1,951.3	3,284.5	3,677.7	3,519.2
IV. LOAN FUNDS OUTFLOW							
A. Debt Service TAHECU's own debt 1.HQ [5]	-	8.1	10.9	36.9	40.5	75.4	103.3
2.Eng. Unit [6]	-	64.4	70.4	70.4	70.4	70.4	-
B.Transmit repayments to Aidbank by farmers and PCs 1. Long term loans	-	-	31.5	118.9	256.3	474.3	767.5
2. Short term loans	-	-	5.3	79.2	207.0	396.4	628.9
3. Subtotal (1+2)	-	-	36.8	198.1	463.3	870.7	1,396.4
C. Total debt service payments to Aidbank(A+B)	-	72.5	118.1	305.4	574.2	1,016.5	1,499.7
D. On lend to Primary Coops [7]	-	374.9	1,052.7	1,703.4	2,505.3	2,478.5	2,099.3
TOTAL LOAN FUNDS OUTFLOW (C+D)	-	447.4	1,170.8	2,008.8	3,079.5	3,495.0	3,599.0

Continued -

Continued from previous page -

Items	Project Years									
	8	9	10	11	12	13	14	15	16	17
I. A.	-	-	-	-	-	-	-	-	-	-
B.	-	-	-	-	-	-	-	-	-	-
C.										
1.	873.7	-	-	-	-	-	-	-	-	-
2.	693.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
3.	1,566.7	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
D.	1,566.7	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
II. A.	216.5	258.5	288.1	273.5	258.9	244.6	230.3	215.8	201.1	161.8
B.	-	-	-	-	-	-	-	-	-	-
C.	1,713.4	2,203.3	2,500.9	2,673.4	2,692.4	2,486.2	2,186.9	1,768.7	1,342.0	1,044.0
D.	1,020.0	2,461.8	2,789.0	2,046.9	2,951.3	2,730.8	2,417.2	1,984.5	1,543.1	1,205.8
III.	3,496.6	3,265.8	3,593.0	3,750.9	3,755.3	3,534.8	3,221.2	2,788.5	2,347.1	2,009.8
IV.										
A. 1.	132.8	133.4	159.3	182.6	173.5	164.3	155.2	146.3	127.7	116.2
2.	-	-	-	-	-	-	-	-	-	-
B.										
1.	1.123.0	1,530.3	1,861.0	2,024.7	2,036.2	1,823.0	1,516.2	1,089.6	653.2	391.2
2.	758.8	880.4	880.4	880.4	880.4	880.4	880.4	880.4	880.4	880.4
3.	1,881.8	2,410.7	2,741.4	2,905.1	2,916.6	2,703.4	2,396.6	1,970.0	1,533.6	1,199.6
C.	2,014.6	1,544.1	2,900.7	3,087.7	3,090.1	2,867.7	2,551.8	2,116.3	1,661.3	1,315.8
D.	1,566.7	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
V.	3,581.3	3,348.1	3,704.7	3,891.7	3,894.1	3,671.7	3,355.8	2,920.3	2,465.3	2,119.8

Continued -

Continued from previous page.

Items		Project Years		
		18	19	20
I.				
A.		-	-	-
B.		-	-	-
C.	1.	-	-	-
	2.	804.0	804.0	804.0
	3.	804.0	804.0	804.0
D.		804.0	804.0	804.0
II.	A.	100.8	44.1	-
B.		-	-	-
C.		884.0	884.0	884.0
D.		984.8	928.1	884.0
III.		1,788.8	1,732.1	1,688.0
IV.				
A.	1.	77.4	67.6	32.6
	2.	-	-	-
B.	1.	100.1	43.9	-
	2.	880.4	880.4	880.4
	3.	980.5	924.3	880.4
C.		1,057.9	991.9	913.0
D.		804.0	804.0	804.0
V.		1,861.9	1,795.9	1,717.0

Footnotes

1) excludes Engineering Unit. Credit inflow from AID Bank finance $10 in $11 of development expenditures (Table 13)
2) Loan from Aidbank finances $10 in $11 of development expenditure (Table 7)
3) Onflow from AID Bank for funds to be on tent to Primary Cooperatives and farmers.
4) By Primary Coop. to Coop. Union (interest & Principal)
5) On long term loan. Section IA. to AID Bank at 8½%. 5 years grace on principal, total of 15 years repayment per borrowing (principal & interest)
6) On long term loan. Section IB. 1st and 2nd disbursement are repaid in 5 and 4 years respectively in equated principal and interest charges.
7) On lending of funds listed in Section I. C.
8) Repaid from TAHECU to AID Bank (principal and interest)
   a) Long Term Loans: Repaid at 8½%, payment schedule on principal is as they are received from the farmer and the primary coop.
   b) Short Term Loans:
      i) Farmer short term - repaid at 9½% in same year
      ii) Frim. Coop. - repaid at 9½% in following year
9) Money borrowed by TAHECU to make down payments to farmers before the crop is sold is not included in the Credit Cash Flow.

TAHECU Co-Operative Union

Table 13 - Cooperative Union - Consolidated Development Cost-E$'000

Component	Project years 1		2		3		4		5	
	Total	FE	Total	FE	Total	FE	Total	FE	Total	FE
I. Crop Store [1]	-	-	-	-	330.7	59.8	-	-	329.5	59.4
II. Livestock Market [2]	-	-	7.5	1.9	-	-	-	-	-	-
III. Engineering Unit [3]	-	-	-	-	-	-	-	-	-	-
IV. Union HQ. [4]	104.6	60.3	28.6	8.8	6.0	3.7	46.7	27.9	-	-
V. TOTAL Dev.Cost for DFC [5] (ItoIV)	104.6	60.3	36.1	10.7	336.7	63.5	46.7	27.9	329.5	59.4
VI. Engineering Unit [3]	279.1	195.3	21.8	12.9	-	-	-	-	-	-
VII. TOTAL Dev. Cost for flow of funds (V+VI)	383.7	255.6	57.9	23.6	336.7	63.5	46.7	27.9	329.5	59.4

Continued below -

	Yr. 6		Total 1-6	
	Total	FE	Total	FE
I.	329.5	59.4	989.7	178.6
II.	-	-	7.5	1.9
III.	-	-	-	-
IV.	-	-	185.9	100.7
V.	329.5	59.4	1,183.1	281.2
VI	-	-	300.9	208.2
VII.	329.5	59.4	1,484.0	489.4

1) Annex III, Table 1

2) Annex III, Table 4

3) Annex III Table 7. All development costs of the engineering Unit are charged to the ranching & primary coops or to TAHADU. To avoid double counting, they are not added to TAHECU Development costs.

4) Annex III Table 10

5) DCF = Discounted Cash Flow

TAHECU Co-operative Union

Table 14 - Cooperative Union - Consolidated Recurrent Cost - Eth $ '000

Component	Project years								
	1	2	3	4	5	6	7	8	9-20
I. Crop Store (Table 2)	-	-	3.8	179.2	335.8	648.3	621.7	889.5	1,167.4
II. Livestock Market(Table 5)	-	.1	.6	.6	.6	.6	.6	.6	.6
III. Union H.Q. (Table 11)	35.1	44.7	79.5	99.8	108.8	112.7	112.7	112.7	112.7
IV. TOTAL Recurrent Costs for DCF [1] (I-III)	35.1	44.8	83.9	379.6	445.2	761.6	735.0	1,002.8	1,280.7
V. Engineering Unit (Table 8)[2]									
a) Identified	19.0	31.8	33.7	33.7	33.7	45.7	45.7	45.7	45.7
b) Other	589.2	415.5	540.8	408.1	436.6	141.3	125.7	125.7	125.7
VI TOTAL recurrent Cost for Flow of Funds (IV+V)	643.3	492.1	658.4	821.4	915.5	948.6	906.4	1,174.2	1,452.1

1) DCF= Discounted Cash Flow

2) Annex III Table 9. All the recurrent costs of the Engineering Unit are to be charged to the ranch and primary cooperatives or to TAHADU and in the discounted cash flow calculations are not added to TAHECU recurrent costs in order to avoid double counting.

Annex III
Table 14

TAHECU Co-Operative Union

Table 15 - Cooperative Union - Consolidated Cost Accounting Analysis [1]

- Eth $

Union H.Q.	Project Years 6-20			
	Item	Total Levy	Levy per Prim. Coop	Levy per Farmer
I. H.Q. Department				
A. Recurrent Cost (Table 11,I,1)	31,410			
B. Depreciation on Capital (over 15 yrs)[2]	4,547			
C. Interest on Capital (10%)	6,800			
D. Subtotal (A to C)		42,757	2,138	3.56
II. Finance Department				
A. Recurrent Cost (Table 11,II,F)	53,430			
B. Depreciation on capital (over 15 yrs)	1,415			
C. Interest on Capital (10%)	2,123			
D. Subtotal (A to C)		56,968	2,848	4.75
III. Marketing Transport, Supply Dept.				
A. Recurrent Cost (Table 11,III,G)	27,910			
B. Depreciation on Capital (over 15 yrs)	6,437			
C. Interest on capital (10%)	9,655			
D. Subtotal (Ato C)		44,002	2,200	3.67
IV. TOTAL		143,727	7,186	11.98

Annex III
Table 15

Footnotes

1) Refers to the overhead expenses of the finance , credit, pr procurement and marketing activities of the Union, for which a levy is charged to members, and not to the activities of the Engineering Unit or of the Crop Store which are costed and charged separately.

2) The figure is arrived at by dividing the figure at I,F of Table 10 (increased by 10% for contingencies) by 15. Mutatis Mutandis this applies to other capital charges in this table.

TAHECU - Co-Operative Union

Table 16 - Consolidated Revenue - Eth $ '000

Items	Project Years							
	1	2	3	4	5	6	7	8
I. Crop Store (Table 3E)	-	-	-	353.0	567.6	748.6	897.4	1,025.8
II. Livestock Marketing (Table6, II)	-	4.0	6.3	10.6	15.2	19.1	22.2	28.8
III. Union HQ. (Table 15 and Annex II. Table 7 phased)	-	5.4	21.5	53.9	95.3	125.7	143.7	143.7
IV. TOTAL REVENUE 1)	-	9.4	27.8	417.5	678.1	893.4	1,063.3	1,198.3
V. Engineering Unit (Table 9)	679.0	524.8	652.0	519.9	547.8	205.0	189.4	189.4
VI. TOTAL Revenue for Flow of Funds	679.0	534.2	679.8	937.4	1,225.9	1,098.4	1,257.7	1,387.7

Continued below -

	9	10	11-20
I.	1,363.3	1,363.3	1,363.3
II.	28.8	28.8	28.8
III.	143.7	143.7	143.7
IV.	1,535.8	1,535.8	1,535.8
V.	189.4	189.4	189.4
VI.	1,725.2	1,725.2	1,725.2

1) In calculating economic benefits of the project only the livestock market revenue and "cost of bag" and "transport" elements of revenue of the Crop Store (Annex III Table 3) will be included among the benefits since they represent elements of the value of the final product not taken into account elsewhere.

TAHECU Cooperative Union

Table 17 - Consolidated Flow of Funds

Items	Project Years							
	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr.8
I. CASH INFLOW								
A. Working Capital B.F. 1)	-	52.6	91.8	129.7	198.3	200.0	200.0	200.0
B. Share Subscription	51.8	79.5	143.0	90.1	-	-	-	-
C. Loans for TAHECU (Table12,I,A+B)	348.3	52.6	306.1	42.4	299.5	299.5	-	-
D. Loans for on-lending(Tb112,I,C,3)	-	374.9	1052.7	1703.4	2505.3	2478.5	2099.3	1566.7
E. Loan Repayments(Table12,IID)	-	-	38.6	205.5	479.7	899.7	1419.9	1929.9
F. Revenue (Table 16,VI)	679.0	534.2	679.8	937.4	1225.9	1098.4	1257.7	1387.7
G. Short term loan AIDB						79.8		
TOTAL INFLOWS	1079.6	1093.8	2312.0	3108.5	4708.7	5055.9	4976.9	5084.3
II. CASH OUTFLOWS								
A. Development Costs(Table13,VII)	383.7	57.9	336.7	46.7	329.5	329.5	-	-
B. Recurrent Costs (Table14,VI)	643.3	492.4	658.4	821.4	915.5	948.6	906.4	1174.2
C. Funds on-lent(Table12,IV,D)	-	374.9	1052.7	1703.4	2505.3	2478.5	2099.3	1566.7
D. Transmission of repayments (Table 12,IV,B5)	-	-	36.8	198.1	463.3	870.7	1396.4	1881.8
E. Own Debt Service(Tables12 IVA,1+2)	-	72.5	81.3	107.3	110.9	145.8	103.3	132.8
F. Interest on Overdraft 3)	-	4.6	16.4	33.3	53.9	82.8	81.9	103.2
G. Working Capital CF 1)	52.6	91.8	129.7	198.3	200.0	200.0	200.0	200.0
H. Payment of short term loan toAIDB							87.8	
TOTAL OUTFLOWS ABOVE	1079.6	1093.8	2312.0	3108.5	4578.4	5055.9	4875.1	5058.6
III. BALANCE	-	-	-	-	130.3	-	101.8	25.7
IV. LESS PAYMENT TO RESERVES 4)					32.6		25.4	6.4
V. NET BALANCE PAID OUT TO MEMBERS 5)					97.7		76.4	19.1

Continued from previous page -

Items	Project Years								
	Yr. 9	Yr. 10	Yr. 11	Yr. 12	Yr. 13	Yr. 14	Yr. 15	Yr. 16	Yr. 17
I.									
A.	200.0	250.0	250.0	240.0	200.0	200.0	200.0	200.0	200.0
B.									
C.									
D.	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
E.	2461.8	2789.0	2946.9	2951.3	2730.8	2417.2	1984.5	1543.1	1205.8
F.	1725.2	1725.2	1725.2	1725.2	1725.2	1725.2	1725.2	1725.2	1725.2
G.									
TOTAL INFLOWS	5197.3	5568.2	5726.1	5720.5	5460.0	5146.4	4713.7	4272.3	3935.0
II.									
A.									
B.	1452.1	1452.1	1452.1	1452.1	1452.1	1452.1	1452.1	1452.1	1452.1
C.	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
D.	2410.7	2741.4	2905.1	2916.6	2703.4	2396.6	1970.0	1533.6	1199.6
E.	133.4	159.3	182.6	173.5	164.0	155.2	146.3	127.7	116.2
F.	135.2	135.2	135.2	135.2	135.2	135.2	135.2	135.2	135.2
G.	250.0	250.0	240.0	200.0	200.0	200.0	200.0	200.0	200.0
H.									
TOTAL OUTFLOWS	5185.4	5542.0	5719.0	5681.4	5458.7	5143.1	4707.6	4252.6	3907.1
III.	11.9	26.2	7.1	39.1	1.3	3.3	6.1	19.7	27.9
IV.	3.0	3.3	-	-	-	-	-	-	-
V.	8.9	22.9	7.1	39.1	1.3	3.3	6.1	19.7	27.9

Continued from previous page -

Items	Project Years		
	Yr. 18	Yr. 19	Yr. 20
I.			
A.	200.0	200.0	200.0
B.			
C.			
D.	804.0	804.0	804.0
E.	984.8	928.1	884.0
F.	1725.2	1725.2	1725.2
G.			
TOTAL INFLOWS	3714.0	3657.3	3613.2
II.			
A.			
B.	1452.1	1452.1	1452.1
C.	804.0	804.0	804.0
D.	980.5	924.3	880.4
E.	77.4	67.6	32.6
F.	135.2	135.2	135.2
G.	200.0	200.0	200.0
H.			
TOTAL OUTFLOWS	3649.2	3583.2	3504.3
III.	64.8	74.1	108.9
IV.	-	-	-
V.	64.8	74.1	108.9

Footnotes

1) Working capital requirements for each year (i.e. BF at the beginning of the year and CF at the end of the previous year) for the 1st five years are calculated on the basis of 100% of the year's recurrent costs of the HQ Unit and the Crop Store (excluding the element for transporting the crop in the latter) and 25% (i.e. 3months-worth) of the identified recurrent cost of the Engineering Unit. After year 5 the working capital requirement is froze at $200,000 given by then the Union should be well enough established to borrow any excess (which excess rises to $481,000 by year 9) on an unsecurred overdraft at a Commercial Bank. The cost of such overdraft is included in the figures in line IIG of the table. The requirements for working capital to make down payments to farmers prior to final sale of the crop is <u>not</u> included in <u>this</u> table since finance to hold a crop once it is in store should be easily available. See also note 3).

3) Interest on the overdraft is calculated as follows: (always at 10% p.a.)

i) On working capital for operating expenses. For 6 months of any annual requirement in excess of $200,000 (See note 1)

ii) On advance payments to farmers before final sale of the crop
For sesame 60% of the value of the crop for 3 mths.
For sorghum 50% of the value of the crop for 5 mths. (av.)

4) 25% of any net profit goes to reserves until these reach 100% of outstanding value or $150,000 whichever is greater.

5) Any surplus is paid out to Primary Cooperatives and so to farmers.

COOPERATIVE RANCH

Table 1 - Herd Projection

Items	Cooperative Ranch Years 1	2	3	4	5	6	7	8	9	10	11	12-20
I. Herd Numbers (end-year)												
1. Cows	2501	1826	1573	1554	1942	1476						
2. Heifers 3-4 years												
3. Heifers 2-3 years												
4. Heifer Calves	795	700	595	660	814	699						
5. Steers 2-3 years			695	625	542	1181	1873	1902	1991	1991	1991	1991
6. Steers 1-2 years		739	658	565	1230	1951	2415	2074	2074	2074	2074	2074
7. Bull Calves	795	700	595	660	814	699						
8. Bulls	92	86	81	77	74	71						
9. Total Animals	4183	4051	4197	4134	5416	6077	4288	3976	4065	4065	4065	4065
1/ 10. Total Livestock Units	2593	2651	3007	2814	3788	4679	4288	3976	4065	4065	4065	4065
II. Births												
1. Heifer Calves	1190	875	744	777	958	777						
2. Bull Calves	1190	875	744	777	958	777						
3. Total	2380	1750	1488	1554	1916	1554						
III. Purchases												
1. Cows	1700	-	300	500	100							
2. Heifers 3-4 years	1700	-	-	-	-							
3. Steers 1-2 years					621	1218	2063	2160	2160	2160	2160	2160
4. Bulls	100											
IV. Mortality												
1. Cows	136	175	128	104	102	78						
2. Heifers 3-4 years	136											
3. Heifers 2-3 years												
4. Heifers 1-2 years												
5. Calves	790	350	298	234	287	155						
6. Steers 2-3 years			44	33	23	49	78	97	79	83	83	83
7. Steers 1-2 years		58	42	30	51	81	101	82	86	86	86	86
8. Bulls	8	6	5	4	3	3						

1/ A livestock unit is any bovine over the age of 1 year. This is a different definition to that in Annex II, Table 1.

(Continued on next page)

COOPERATIVE RANCH

Table 1 - Herd Projection

Items	Cooperative Ranch Years 1	2	3	4	5	6	7	8	9	10	11	12-20
V. Sales												
1. Cull Cows	627	500	425	415	510	388	1476					
2. Barren Heifers												
3. Steers 3 years				695	625	542	1181	1873	1902	1991	1991	1991
4. Heifers 1-2 years		795	700	595	660	814	699					
5. Bulls	8	6	5				71					
VI. Production Data												
1. Mortality - Adults	8	7	6	5	4	4	4	4	4	4	4	4
- Calves	33	20	20	15	15	10						
2. Culling Rate - Barren Heifers, Cows, Bulls	20	20	20	20	20	20						
3. Conception Rate	70	70	70	75	75	80						
4. Stocking Rate Ha/Lu (Mex.)	8	7	6	5	4	4	4	4	4	4	4	4

(Continued from previous page)

COOPERATIVE RANCH

Table 2 - Development Cost

Eth. $

	Item	Unit	Unit Cost	Cooperative Ranch Years: Year 1 No.	Year 1 Total	Year 1 FE	Year 2 No.	Year 2 Total	Year 2 FE	Year 3 No.	Year 3 Total	Year 3 FE
I.	Fencing Perimeter(4 strand)	km	800	60	48000	28800						
II.	Boreholes											
	A. Set Up	hole	350	3	1050							
	B. Drilling-6" I.D.	m	175	150	26250							
	C. Casing-6"	m	40	75	3000							
	D. Pump Test (24 hrs.)	hole	1000	3	3000							
	E. Submersible Pump-6"	no	850	3	2550							
	F. Diesel Generator 2kw unit	no	1500	3	4500							
	G. Pump Shed	no	500	3	1500							
	H. Troughs & Pipes	set	1000	3	3000							
	I. Storage Tank 45000 lt.	no	2000	6	12000							
	J. Sub-Total (A to I)				56850	42638						
III.	Facilities											
	A. Firebreaks	km	120	120	14400	-						
	B. Access Road	km	833	15	12500	-						
	C. Gates Rustic	no	20	20	400	-						
	D. Crushes	no	1600	3	4800	1920						
	E. Loading Ramp	no	300	1	300	90						
	F. Night Paddocks	no	100	10	1000	-						
	G. Sub-Total (A to F)				33400	2010						
IV.	Buildings											
	A. Senior House	no	12000	1	12000	3600						
	B. Junior House	no	5000	1	5000	1500						
	C. Subordinate House	no	600	3	1800	540						
	D. Store, Machinery Shed, Office	m^2	60	66	3960	1188						
	E. Dips	no	6000	3	18000	7200						
	F. Sub-Total (A to E)				40760	14028						

(Continued on next page)

COOPERATIVE RANCH

Table 2 - Development Cost

Eth. $

	Item	Unit	Unit Cost	Cooperative Ranch Years: Year 1 No.	Year 1 Total	Year 1 FE	Year 2 No.	Year 2 Total	Year 2 FE	Year 3 No.	Year 3 Total	Year 3 FE
V.	Vehicles & Equipment											
	A. 4 W.O. Pick Up	no	16000	1	16000	9600						
	B. Tractor 60 HP	no	13400	1	13400	8040						
	C. Scales (Donald)	no	1700	2	3400	2550						
	D. Radios	no	2800	2	5600	3920						
	E. Miscellaneous Equipment	-	10050	-	10050	7035						
	F. Sub-Total (A to E)				48450	31145						
VI.	Livestock											
	A. Cows	head	90	1700	153000					300	27000	
	B. Bulls	head	150	100	15000							
	C. In-Calf Heifers	head	90	1700	153000							
	D. Mules	head	200	5	1000							
	E. Sub-Total (A to D)				322000						27000	
VII.	Compensation for Cultivation Displaced	ha	30	400	12000							
VIII.	Total (I to VII)				561460	118621					27000	
IX.	Contingencies at 10%				56146	11862					2700	
X.	TOTAL (VIII + IX)				617606	130483					29700	

(Continued from previous page)

(Continued on next page)

COOPERATIVE RANCH

Table 2 - Development Cost

Eth. $

Item	Unit	Unit Cost	Cooperative Ranch Years: Year 4 No.	Year 4 Total	Year 4 FE	Year 5 No.	Year 5 Total	Year 5 FE	Total Years 1 - 5 No.	Total Years 1 - 5 Total	Total Years 1 - 5 FE
I.	km	800							60	48000	28800
II.											
A.	hole	350							3	1050	
B.	m	175							150	26275	
C.	m	40							75	3000	
D.	hole	1000							3	3000	
E.	no	850							3	2550	
F.	no	1500							3	4500	
G.	no	500							3	1500	
H.	set	1000							3	3000	
I.	no	2000							6	12000	
J.									-	56850	42638
III.										-	
A.	km	120							120	14400	
B.	km	833							20	12500	
C.	no	20							20	400	
D.	no	1600							3	4800	
E.	no	300							1	300	
F.	no	100							10	1000	
G.									-	33400	2010
IV.											
A.	no	12000							1	12000	
B.	no	5000							1	5000	
C.	no	600							3	1800	
D.	m^2	60							100	6000	
E.	no	6000							3	18000	
F.									-	40760	14028

(Continued from previous page)

(Continued on next page)

COOPERATIVE RANCH

Table 2 - Development Cost

Eth. $

	Item	Unit	Unit Cost	Cooperative Ranch Years: Year 4 No.	Year 4 Total	Year 4 FE	Year 5 No.	Year 5 Total	Year 5 FE	Total Years 1 - 5 No.	Total Years 1 - 5 Total	Total Years 1 - 5 FE
V.												
	A.	no	16000							1	16000	
	B.	no	13400							1	13400	
	C.	no	1700							2	3400	
	D.	no	2800							2	5600	
	E.	-	10050							-	10050	
	F.									-	48450	31145
VI.												
	A.	head	90	500	45000		1000	90000		3500	315000	
	B.	head	150							100	15000	
	C.	head	90							1700	153000	
	D.	head	200							5	1000	
	E.				45000			90000			484000	
VII.	Compensation for Cultivation Displaced	ha	30								12000	
VIII.	Total (I to VII)				45000			90000			723460	118621
IX.	Contingencies at 10%				4500			9000			72340	11862
X.	TOTAL (VIII + IX)				49500			99000			795800	130483

(Continued from previous page)

COOPERATIVE RANCH

Table 3 - Recurrent Cost

Eth. $

Item	Unit	Unit Cost	Cooperative Ranch Years: Year 1 No.	Year 1 Total	Year 2 No.	Year 2 Total	Year 3 No.	Year 3 Total	Year 4 No.	Year 4 Total
I. Staff										
A. Ranch Manager 1/	m/yr	9600	-	-	-	-	1	9600	1	9600
B. Ast. Ranch Manager	"	4800	1	4800	1	4800	1	4800	1	4800
C. Clerk/Accountant	"	3600	1	3600	1	3600	1	3600	1	3600
D. Driver	"	2400	1	2400	1	2400	1	2400	1	2400
E. Headmen	"	720	2	1440	2	1440	3	2160	3	2160
F. Borehole & Dip Operators	"	1200	2	2400	2	2400	2	2400	2	2400
G. Other Permanent Staff	"	480	42	20200	43	20600	49	23500	45	21600
H. Temporary Staff	"	300	5	1500	5	1500	5	1500	5	1500
I. Allowances	Year	1000	1	1000	1	1000	1	1000	1	1000
J. Sub-Total - Staff (A to I)				37340		37740		50960		49060
II. Maintenance										
A. Fencing (at 10% of original)	Year	5280	-	-	1	5280	1	5280	1	5280
B. Borehole	"	2840	-	-	1	2840	1	2840	1	2840
C. Buildings (at 5 %)	"	1490	-	-	1	1490	1	1490	1	1490
D. Access Road (at 5 %)	"	1000	-	-	1	1000	1	1000	1	1000
E. Night Paddocks	"	1000	-	-	1	1000	-	-	-	-
F. Firebreaks (at 5 %)	"	720	-	-	1	720	1	720	1	720
G. Other (at 10%)	"	3800	-	-	1	3800	1	3800	1	3800
H. Sub-Total - Maintenance (A to G)						16130		15130		15130
III. Operating Cost										
A. Borehole 2/	LU	1.27	2593	3300	2651	3400	3007	3800	2814	3570
B. Dip Chemicals	Head	.90	4183	3800	4051	3600	4197	3800	4134	3720
C. Veterinary	Head	2.50	4183	10500	4051	10000	4197	10500	4134	10335
D. Vehicle Running	'000 kms	250	20	5000	20	5000	20	5000	20	5000
E. Stationery	Year	300	1	300	1	300	1	300	1	300
F. Tractor Running	hr	3.50	1000	3500	1000	3500	1000	3500	1	3500
G. Replacement of Mules	no	200	1	200	1	200	1	200	1	200
H. Predator Control	Year	360	1	360	1	360	1	360	1	360
I. Sub-Total - Operating Cost (A to H)				26960		26360		27460		26985

(Continued on next page)

COOPERATIVE RANCH

Table 3 - Recurrent Cost

Eth. 1

Item		Unit	Unit Cost	Cooperative Ranch Years: Year 5 No.	Year 5 Total	Year 6 No.	Year 6 Total	Year 7 No.	Year 7 Total	Year 8 No.	Year 8 Total	Years 9-20 No.	Years 9-20 Total
I.													
A.	1/	m/yr	9600	1	9600	1	9600	1	9600	1	9600	1	9600
B.		"	4800	1	4800	1	4800	1	4800	1	4800	1	4800
C.		"	3600	1	3600	1	3600	1	3600	1	3600	1	3600
D.		"	2400	1	2400	1	2400	1	2400	1	2400	1	2400
E.		"	720	3	2160	4	2880	4	2880	3	2160	3	2160
F.		"	1200	2	2400	2	2400	2	2400	2	2400	2	2400
G.		"	480	61	29300	75	36000	69	33100	64	31000	65	31200
H.		"	300	5	1500	5	1500	5	1500	5	1500	5	1500
I.		Year	1000	1	1000	1	1000	1	1000	1	1000	1	1000
J.					56760		64180		61280		58460		58660
II.													
A.		Year	5280	1	5280	1	5280	1	5280	1	5280	1	5280
B.		"	2840	1	2840	1	2840	1	2840	1	2840	1	2840
C.		"	1490	1	1490	1	1490	1	1490	1	1490	1	1490
D.		"	1000	1	1000	1	1000	1	1000	1	1000	1	1000
E.		"	1000	-	-	-	-	-	-	-	-	-	-
F.		"	720	1	720	1	720	1	720	1	720	1	720
G.		"	3800	1	3800	1	3800	1	3800	1	3800	1	3800
H.					15130		15130		15130		15130		15130
III.													
A.	2/	LU	1.27	3788	4810	4679	5940	4288	5450	3976	5050	4065	5160
B.		Head	.90	5416	4870	6077	5470	4288	3860	3976	3580	4065	3660
C.		Head	2.50	5416	13540	6077	15195	4288	10720	3976	9940	4065	10165
D.		'000 kms	250	20	5000	20	5000	20	5000	20	5000	20	5000
E.		Year	300	1	300	1	300	1	300	1	300	1	300
F.		hr	3.50	1	3500	1	3500	1	3500	1	3500	1	3500
G.		no	200	1	200	1	200	1	200	1	200	1	200
H.		Year	360	1	360	1	360	1	360	1	360	1	360
I.					32580		35965		29370		27930		28345

(Continued from previous page)

(Continued on next page)

COOPERATIVE RANCH

Table 3 - Recurrent Cost

Eth. $

Item	Unit	Unit Cost	Year 1 No.	Year 1 Total	Year 2 No.	Year 2 Total	Year 3 No.	Year 3 Total	Year 4 No.	Year 4 Total
IV. Sundries	Year	5000	1	5000	1	5000	1	5000	1	5000
V. TOTAL (I to IV)				69300		55230		98550		96175

1/ Ranch Manager is provided free by IEG for two years and is costed into Annex VII, Table 1 for that period.

2/ Adult animals drinking 40 liters per day

(Continued from previous page)

(Continued on next page)

COOPERATIVE RANCH

Table 3 - Recurrent Cost

Eth. $

Item	Unit	Unit Cost	Cooperative Ranch Years: Year 5 No.	Year 5 Total	Year 6 No.	Year 6 Total	Year 7 No.	Year 7 Total	Year 8 No.	Year 8 Total	Years 9-20 No.	Years 9-20 Total
VI. Sundries	Year	5000	1	5000	1	5000	1	5000	1	5000	1	5000
V. TOTAL (I to IV)				109470		120275		110780		106520		107135

1/ Ranch manager is provided free by IEG for two years and is costed into Annex VII, Table 1 for that period.

2/ Adult animals drinking 40 liters per day.

(Continued from previous page)

COOPERATIVE RANCH

Table 4 - Revenue

Eth. $

Item	Unit	Unit Price 1/	Cooperative Ranch Years: Year 1 No.	Year 1 Total	Year 2 No.	Year 2 Total	Year 3 No.	Year 3 Total	Year 4 No.	Year 4 Total	Year 5 No.	Year 5 Total
I. Sale of Animals												
A. Cull Cows	head	83-106	627	52041	500	41500	425	35275	415	34445	510	42330
B. Bulls		106										
C. Heifers 1-2 yrs.		50			795	39750	700	35000	595	29750	660	33000
D. Steers 3-4 yrs.		176-200							695	122320	625	110000
Sub-Total Sale of Animals				52041		81250		70275		186515		185330
II. Sale of Hides 2/	car-case	5	140	700	118	590	109	545	85	425	89	445
III. Total I + II				52741		81840		70820		186940		185775
IV. Less Purchase of Steers 1-2 years		50-60									621	31050
V. Net Revenue				52741		81840		70820		186940		154725

1/ When two prices are given, the first applies up to and including cooperative ranch year 5 and the second applies thereafter. See appendix R.

2/ 50% of adult animals dying at $5 each.

(Continued on next page)

COOPERATIVE RANCH

Table 4 - Revenue

Eth. $

Item	Unit	Unit Price 1/	Cooperative Ranch Years: Year 6 No.	Year 6 Total	Year 7 No.	Year 7 Total	Year 8 No.	Year 8 Total	Year 9 No.	Year 9 Total	Year 10 No.	Year 10 Total	Years 11-20 No.	Years 11-20 Total
I.														
A.	head	83-106	388	41128	1476	156456								
B.		106			71	7526								
C.		50	814	40700	700	35000								
D.		176-200	542	108400	1181	236200	1873	374600	1902	380400	1991	398200	1991	398200
				190228		435182		374600		380400		398200		398200
II. 2/	car-case	5	105	525	89	445	89	445	82	410	84	420	84	420
III.				190753		435672		348045		380810		398620		398620
IV.		50-60	1218	73080	1817	109020	2063	123780	2160	129600	2160	129600	2160	129600
V.				117673		326652		224265		251210		269020		269020

1/ When two prices are given, the first applies up to and including cooperative ranch year 5 and the second applies thereafter. See appendix e.

2/ 50% of adult animals dying at $5 each.

(Continued from previous page)

COOPERATIVE RANCH

Table 5 - Sources and Uses of Funds and Cash Flow

Eth.$'000

Item	Cooperative Ranch Years 1	2	3	4	5	6	7	8	9	10
I. Sources of Funds										
A. Balance (working capital) B.F. 1/	-	95.6	99.9	98.2	127.4	171.3	110.9	106.5	107.1	107.1
B. Development Loan 2/	443.0	-	17.8	29.7	59.4	-	-	-	-	
C. Share Capital										
From a) LMB	324.4	45.4	77.0	-	84.9	-	-	-	-	-
b) Farmers or primary coops	-			-	-	50.0	-	50.0	-	-
c) Sub-Total (a + b)	324.4	45.4	77.0	-	84.9	50.0	-	50.0	-	-
D. Revenue (Gross) 3/	52.7	81.8	70.8	186.9	185.8	190.8	435.7	343.0	380.8	398.6
E. Short Term Loan from Bank (Overdraft)	-	-	-	-	-	45.0				
Total Sources (A to E)	820.1	222.8	265.6	314.8	457.5	457.1	546.6	499.5	487.9	505.7
II. Uses of Funds										
A. Ranch Development 4/	617.6	-	29.7	49.5	99.0	-	-	-	-	-
B. Recurrent and Replacement Costs 5/	69.3	85.2	98.6	96.2	109.5	171.3	110.8	106.5	107.1	107.1
C. Purchase of Steers 6/	-	-	-	-	31.1	73.1	109.0	123.8	129.6	129.6
D. Interest on Dev. Loan 7/	37.7	37.7	39.2	41.7	46.7	46.7	42.1	37.4	32.7	28.0
E. Repay. Dev. Loan 7/	-	-	-	-	-	55.0	55.0	55.0	55.0	55.0
F. Interest on Overdraft 8/	-	-	-	-	-	-	4.5	-	-	-
G. Repay. Overdraft	-	-	-	-	-	-	45.0	-	-	-
H. Payments to Reserves & Members	-	-	-	-	-	-	23.7	19.7	6.4	28.9
I. Retirement of LMB Shares	-	-	-	-	-	-	50.0	50.0	50.0	50.0
J. Sub-Total	734.2	132.5	167.5	187.4	286.3	346.1	440.1	392.4	380.8	445.0
K. Balance CF as working capital for next year 1/	95.5	99.9	98.1	127.4	171.2	111.0	106.5	107.1	107.1	107.1
L. Total Uses (A to K)	820.1	222.8	265.6	314.8	457.5	457.1	546.6	499.5	487.9	552.2

(Continued on next page)

COOPERATIVE RANCH

Table 5 - Sources and Uses of Funds and Cash Flow — Eth.$'000

Item	Cooperative Ranch Years 11	12	13	14	15	16	17	18	19	20
I. Sources of Funds										
A. 1/	107.1	117.7	117.8	117.8	117.8	117.8	117.8	117.8	117.8	117.8
B. 2/	-	-	-	-	-	-	-	-	-	-
C.										
a)	-	-	-	-	-	-	-	-	-	-
b)	50.0	-	50.0	-	-	-	-	-	-	-
c)	50.0	-	50.0	-	-	-	-	-	-	-
D. 3/	398.6	398.6	398.6	398.6	398.6	398.6	398.6	398.6	398.6	398.6
E.										
Total Sources (A to E)	555.7	516.3	586.0	516.4	516.4	516.4	516.4	516.4	516.4	516.4
II. Uses of Funds										
A. 4/	-	-	-	-	-	-	-	-	-	-
B.										
5/	162.4	117.7	117.8	117.8	117.8	117.8	117.8	117.8	117.8	117.8
C. 6/	129.6	129.6	129.6	129.6	129.6	129.6	129.6	129.6	129.6	129.6
D. 7/	23.4	18.7	14.0	9.3	4.7	-	-	-	-	-
E. 7/	55.0	55.0	55.0	55.0	55.0	-	-	-	-	-
F. 8/	-	-	-	-	-	-	-	-	-	-
G.	-	-	-	-	-	-	-	-	-	-
H.	17.6	27.5	97.1	36.9	41.5	101.2	119.5	151.2	151.2	151.2
I.	50.0	50.0	50.0	50.0	50.0	50.0	31.7	-	-	-
J.	438.0	398.5	468.2	398.6	398.6	398.6	398.6	398.6	398.6	398.6
K.										
1/	117.7	117.8	117.8	117.8	117.8	117.8	117.8	117.8	117.8	117.8
L. Total Uses (A to K)	555.7	516.3	586.0	516.4	516.4	516.4	516.4	516.4	516.4	516.4

(Continued from previous page)

Footnotes for Table 5

1/ Working capital is carried foreward each year at least equal to the sum of operating and replacement costs in the following year.

2/ The start-up capital is financed approximately in the ratio of debt 3:2 equity, and this ratio is maintained in financing subsequent additions to the breeding herd.

3/ From Table 4, III.

4/ From Table 2, X.

5/ From Table 3, V, and Table 6, III.

6/ From Table 4, IV.

7/ At 8.5% p.a., grace period of 5 years and repayment over the next 10.

8/ At 10%

COOPERATIVE RANCH

Table 6 - Financial Rate of Return

Eth.$'000

		Cooperative Ranch Years												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Years 12-19	Year 20
INFLOW														
I.	Revenue 1/	52.7	81.8	70.8	186.9	154.7	117.7	326.6	224.3	251.2	269.0	269.0	269.0	269.0
II.	Stock Valuation 2/													647.1
III.	Total Inflow I + II	52.7	81.8	70.8	186.9	154.7	117.7	326.6	224.3	251.2	269.0	269.0	269.0	916.0
OUTFLOW														
IV.	Development Cost 3/	617.6	-	29.7	49.5	99.0	-	-	-	-	-	-	-	-
V.	Recurrent Cost 4/	69.3	85.2	98.5	96.2	109.5	120.3	110.8	106.5	107.1	107.1	107.1	107.1	107.1
VI.	Replacement of Vehicles & Equipment 5/						51.0					55.5	10.7 6/	10.7
VII.	Total Outflow IV to VI	686.9	85.2	128.2	145.7	208.5	171.3	110.8	106.5	107.1	107.1	162.6	117.8	117.8
VIII.	Balance III minus VII	(634.2)	(3.4)	(57.4)	41.3	(53.8)	(53.6)	215.8	117.8	144.1	161.9	106.4	151.2	798.3

Internal Rate of Return is 11%

( ) = Negative

1/ From Annex IV, Table 4

2/ From Annex IV, Table 1

a)	1991	3-yr. olds	at $200	= 398200
b)	2074	2-yr. olds	at $120	= 248880
c)	Total			= 647080

3/ From Annex IV, Table 2

4/ From Annex IV, Table 3

5/ Replacements are:

a)	Diesel generator	every 10 years
b)	Submersible pump	every 5 years
c)	Pick Up	every 5 years
d)	Tractor	every 5 years
e)	Scales	every 5 years
f)	Radio	every 5 years
g)	Miscellaneous	every 5 years

6/ Averaged

Table 6

AID BANK'S CASH FLOW

Project Years Eth. $'000

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13
I. INFLOW													
A. Balance BF	-	-	50.8	75.4	143.4	262.6	475.4	-	171.8	1777.3	1139.1	1640.5	1895.0
B. Project account 4/	348.8	865.6	1334.7	1677.2	2647.1	2488.1	-	-	-	-	-	-	-
C. Debt Service: TAHECUS 6/ own debt													
1. H. Q.	-	8.1	10.9	36.9	40.5	75.4	103.3	132.8	133.4	159.3	182.6	173.5	164.3
2. Eng. Unit	-	64.4	70.4	70.4	70.4	70.4	-	-	-	-	-	-	-
3. Short term	-	-	-	-	-	-	87.8	-	-	-	-	-	-
D. Receive debt Service from farmers and PCS via TAHECU													
1. Long term loans	-	-	31.5	118.9	256.3	474.3	767.5	1123.0	1530.3	1861.0	2024.7	2036.2	1823.0
2. Short term loans1/	-	-	5.3	79.2	207.0	396.4	628.9	758.8	880.4	880.4	880.4	880.4	880.4
3. Subtotal (1&2)	-	-	36.8	198.1	463.3	870.7	1396.4	1881.8	2410.7	2741.4	2905.1	2916.6	2703.4
E. Debt service from ranhc5/	-	37.7	37.7	39.2	41.7	46.7	101.7	146.6	82.4	87.7	82.0	88.4	73.7
F. Transfer from AIDB'S own resources2/	-	-	-	-	-	-	401.0	-	-	-	-	-	-
TOTAL inflow(A-F)	348.8	975.8	1541.3	2097.2	3406.4	3813.9	2565.6	2161.2	2798.3	3766.0	4308.8	4819.0	4836.4

ITEM	14	15	16	17	18	19	20
I. INFLOW							
A. Balance BF	1051.5	218.5	1595.1	3374.4	3886.2	4140.1	4328.0
B. Project account 4/	-	-	-	-	-	-	-
C. Debt Servcie : TAHECU'S 6/ own debt							
1. H. Q.	155.2	146.3	127.7	116.2	77.4	67.6	32.6
2. Eng. Unit	-	-	-	-	-	-	-
3. Short term	-	-	-	-	-	-	-
D. Receive debt service from farmers and PCS via TAHECU.							
1. Long term loans	1516.2	1089.6	1516.2	319.2	100.1	43.9	-
2. Short term loans 1/	880.4	880.4	880.4	880.4	880.4	880.4	880.4
3. Sub-total(1&2)	2396.6	1970.0	2396.6	1199.6	980.5	924.3	880.4
E. Debt service from ranch	69.0	64.3	59.0	-	-	-	-
F. Transfer from AIDB's own resources 2/	-	-	-	-	-	-	-
TOTAL in flow (A-F)	3672.3	2399.1	4178.4	4690.2	4944.1	5132.0	5241.0

ITEM	1	2	3	4	5	6	7	8	9	10	11	12
II. OUTFLOW												
A. Long Term loan to TAHECU H. Q.	95.1	232.8	306.1	42.4	299.5	299.5	-	-	-	-	-	-
Long term loan & Eng. Unit	253.7	19.8	-	-	-	-	-	-	-	-	-	-
B. Short Term loan to TAHECU	-	-	-	-	79.8	-	-	-	-	-	-	-
C. Funds on lent to or the PCS												
1. Longterm to PCS	-	238.8	481.8	486.0	406.4	7.0	-	-	-	-	-	-
2. Long term to farmers	-	131.2	546.8	1131.0	1911.5	2122.2	1548.5	873.7	-	-	-	-
3. Short term to farmers & PCS	-	4.8	23.7	86.4	187.4	349.3	550.8	693.0	804.0	804.0	804.0	804.0
4. Subtotal (1+2+3)	-	374.8	1052.3	1703.4	2505.3	2478.5	2099.3	1566.7	804.0	804.0	804.0	804.0
D. Loan to Ranch 5/	-	443.0	-	17.8	29.7	59.4	45.0	-	-	-	-	-
E. Project account 3/4/	-	54.6	114.7	190.2	309.3	421.3	421.3	422.7	1217.0	1822.9	1864.3	2116.0
F. Balance CF	-	50.8	75.4	143.4	262.6	475.4	-	171.8	777.3	1139.1	1640.5	1895.0
TOTAL Outflow (A to F)	348.8	975.8	1541.3	2097.2	3406.4	3813.9	2565.6	2161.2	2798.3	3766.0	4308.8	4819.0

PC = Primary Cooperative

1/ Repayment of primary cooperative on lending funds, for short term loans is at 9%. The farmer short term loans are repaid in the year of borrow, the primary cooperative short term loans are repaid in the year after they are borrowed. See Annexe III table 12.

2/ This represents the only contribution, either to short or long term lending, which AID Bank has to make from its own resources.

ITEM	13	14	15	16	17	18	19	20
II OUTFLOW								
A. Long term loan to TAHECU H.Q.	-	-	-	-	-	-	-	-
Long term loan & Eng. Unit	-	-	-	-	-	-	-	-
B. Short term loan to TAHECU	-	-	-	-	-	-	-	-
C. Funds on lent to or the PCS								
1. Long term to PCS	-	-	-	-	-	-	-	-
2. Long term to farmers	-	-	-	-	-	-	-	-
3. Short term to farmers & PCS	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
4. Subtotal (1+2+3)	804.0	804.0	804.0	804.0	804.0	804.0	804.0	804.0
D. Loan to Ranhc 5/	-	-	-	-	-	-	-	-
E. Project account 3/4/	2980.9	2649.8	-	-	-	-	-	-
F. Balance C F	1051.5	218.5	1595.1	3374.4	3886.2	4140.1	4328.0	4437.0
Total Outflow (A to F)	4836.4	3672.3	2399.1	4178.4	4690.2	4944.1	5132.0	5241.0

3/ The figures in the project account from year 2 upto and including year 7 are interest on the outstanding loan at 4½ %. In year 8's figure interest on the first year's loan at 6½% interest at an additional 2% from year 2 upto and including year 8, are entered. Starting year 9 repayment of principal begins, and it ends in year 14. In years 9-14 interest on the outstanding Balance at 6½ % is also paid.

4/ The Project Account is the account Aidbank keeps with IEG. in respect of IDA funds channelled through it .
5/ Annexe IV Table 5 6/ Annexe III Table 12 7/Debt service by Ranch on short term loan.

Cooperative Development Department

Table 1 - Development Cost - Eth.$

Item	No.	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. CAPITAL COSTS											
A. Vehicles											
1. 4x4 Station W. Audio Vis. Equiped	No.	30,000	1	30,000	-	-	-	-	-	-	-
2. 4x4 Station Wagon	No.	18,000	1	18,000	-	-	-	-	-	-	-
3. Motor Cycle	No.	2,135	3	6,405		2	4,270	-	-	-	-
4. 1 personnel carrying lorry 1/ (30 persons)	No.	19,000	1	19,000	-	-	-	-	-	-	-
5. Subtotal - Vehicles	-	-	-	73,405	44,040	-	4,270	2,562	-	-	-
B. Housing											
1. Head of Department	No.	22,000	1	22,000	-	-	-	-	-	-	-
2. Senior Staff	No.	12,000	2	24,000	-	-	-	-	-	-	-
3. Junior Staff	No.	5,000	5	25,000	-	-	-	-	-	-	-
4. Subtotal - Housing	-	-	-	71,000	21,300	-	-	-	-	-	-
C. SUBTOTAL CAPITAL COSTS	-	-	-	144,405	65,340		4,270	2,562			

(Continued on next page)

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	-	-	-	1	30,000	
-	-	-	-	-	-	-	-	-	1	18,000	
1	2,135	-	-	-	-	-	-	-	6	12,810	
-	-	-	-	-	-	-	-	-	1	19,000	
-	2,135	1,281	-	-	-	-	-	-	-	79,810	47,883
-	-	-	-	-	-	-	-	-	1	22,000	
-	-	-	-	-	-	-	-	-	2	24,000	
-	-	-	-	-	-	-	-	-	5	25,000	
-	-	-	-	-	-	-	-	-	-	71,000	21,300
-	2,135	1,281	-	-	-	-	-	-	-	150,810	69,183

(Continued from previous page)

Cooperative Development Department

Table 1 - Development Cost - Eth.$ (Continued)

Item	No.	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
II. RECURRENT DEVELOPMENT COST											
A. Staff & Training 3/											
1. TAHECU Manager	M/Year		1	12,000	-	1	12,000	-	-	-	-
2. TAHECU Engineer	"	100,000	1	100,000	80,000	1	100,000	80,000	1	100,000	80,000
3. Coop. Ranch Manager	"	9,600	1	9,600	-	1	9,600	-	-	-	-
4. Coop. Secretaries on training	"	1,800	1.5	2,700	-	3	5,400	-	3	5,400	-
5. Coop. Secretaries assigned to form Cooperatives	"	1,800	-	-	-	3	5,400	-	9	16,200	
6. Educational trips (Farmers to see CADU/WADU etc.)	Per/trip	9,750	4	39,000	-	4	39,000	-	4	39,000	
7. Subtotal - Staff	-	-	-	163,300	80,000	-	171,400	80,000	-	160,600	80,000
III. TOTAL COST (I + II)	-	-	-	307,705	145,340	-	175,670	82,562	-	160,600	80,000
IV. CONTINGENCIES (10%)	-	-	-	30,770	14,534	-	17,567	8,256	-	16,060	8,000
V. TOTAL DEVELOPMENT COST	-	-	-	338,475	159,874	-	193,237	90,818	-	176,660	88,000

(Continued on next page)

1/ Serves also as transport for training centre.

2/ Housing scales are:-

For a head of department - $22,000 house.
Others earning $600 or more per month - a $12,000 house.
Others earning $350 or more per month - a $5,000 house.
Others stationed outside Sheraro, earning $200 or more per month - a $600 house.
All others - no house is provided.

2/ TAHECU and Ranch managers and cooperative secretaries are "gifts" to their societies for 1st 2 years according to usual IEG practice. TAHECU engineer is "gift" for 5 years.

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E .	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	-	-	-	2	24,000	
1	100,000	80,000	1	100,000	80,000	-	-	-	5	500,000	400,000
-	-	-	-	-	-	-	-	-	2	19,200	-
25	4,500	-	-	-	-	-	-	-	10	18,000	-
12	21,600	-	11	19,800	-	5	9,000	-	40	72,000	-
4	39,000	-	-	-	-	-	-	-	16	156,000	
-	165,100	80,000	-	119,800	80,000	-	9,000	-	-	789,200	400,000
	167,235	81,281	-	119,800	80,000	-	9,000	-	-	940,010	469,183
	16,723	8,128	-	11,980	8,000	-	900	-	-	94,000	46,918
-	183,958	89,409	-	131,780	88,000	-	9,900	-	-	1,034,010	516,101

(Continued from previous page)

Cooperative Development Department

Table 2 - Recurrent Cost - Eth.$

Item	Unit	Unit Cost	Project Years													
			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7-20	
			No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
I. STAFF																
A. Head of Department	M/Year	9,600	1	9,600	1	9,600	1	9,600	1	9,600	1	9,600	1	9,600	-	-
B. Coop. Education Officer	"	7,920	1	7,920	1	7,920	1	7,920	1	7,920	-	-	-	-	-	-
C. Coop. Supervisor	"	7,920	.5	3,960	1	7,920	1	7,920	1	7,920	1	7,920	1	7,920	1	7,920
D. Assistant Coop. Education Officer	"	4,800	3	14,400	4	19,200	4	19,200	3	14,400	-	-	-	-	-	-
E. Cooperative Inspector	"	4,800	-	-	1	4,800	1	4,800	2	9,600	2	9,600	2	9,600	2	9,600
F. SUBTOTAL - Staff (A-E)	-	-	-	35,880	-	49,440	-	49,440	-	49,440	-	27,120	-	27,120	-	17,520
II. MAINTENANCE OF HOUSING		5%		3,550		3,550		3,550		3,550		3,550		3,550		3,550
III. OTHER																
A. Vehicle running (Incl. personnel carrier)	Km'000	250	23	5,750	27	6,750	27	6,750	27	6,750	18	4,500	18	4,500	18	4,500
B. Motor Cycles	Km'000	50	36	1,800	60	3,000	60	3,000	72	3,600	72	3,600	72	3,600	24	1,200
C. SUBTOTAL - Other (A+B)	-	-	-	7,550	-	9,750	-	9,750	-	10,350	-	8,100	-	8,100	-	5,700
IV. TOTAL - RECURRENT COST	-	-	-	46,980	-	62,740	-	62,740	-	63,340	-	38,770	-	38,770	-	26,770

Extension Service

Table 3 - Develpment Cost - Eth.$

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. CAPITAL COSTS											
A. Vehicles											
1. 4x4 longwheel pick-up	No.	16,000	2	32,000	19,200	-	-	-	1	16,000	9,600
2. Motor Cycles	No.	2,175	6	13,050	7,830	-	-	-	12	26,100	15,700
3. Bicycles	No.	180	-	-	-	18	3,240	1,940	36	6,480	3,900
4. Subtotal (1-3)	-	-	-	45,050	27,030	-	3,240	1,940	-	48,580	29,200
B. Equipment											
1. Farm Equipment (Supervisor's)	Per Super	3,200	-	-	-	1	3,200	2,240	1	3,200	2,240
2. Farm Equipment (Ext. Agent)	Per Agent	1,200	-	-	--	6	7,200	4,320	12	14,400	8,660
3. Office Equipment	Set	250	2	500	350	1	250	175	1	250	175
4. Subtotal (1-3)	-	-	-	500	350	-	10,650	6,735	-	17,850	11,075
C. Housing 1/											
1. Head of Dep.	No.	22,000	1	22,000	6,600	-	-	-	-	-	-
2. Senior	No.	12,000	2	24,000	7,200	1	12,000	3,600	-	-	-
3. Junior	No.	5,000	6	30,000	9,000	12	60,000	18,000	7	35,000	10,500
4. Subordinate	No.	600	18	10,800	3,240	36	21,600	6,480	21	12,600	3,780
5. Subtotal (1-4)	-	-	-	86,800	19,440	-	93,600	28,080	-	47,600	14,280
D. SUBTOTAL Capital Costs (A-C)	-	-	-	132,350	46,820	-	107,490	36,755	-	114,030	54,555

(Continued on next page)

1/ For housing scale see Annex VII Table 1 Footnote 1.

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
1	16,000	9,600	-	-	-	-	-	-	4	64,000	38,400
7	15,225	9,140	-	-	-	-	-	-	25	54,375	32,670
21	3,780	2,270	-	-	-	-	-	-	75	13,500	8,110
-	35,005	21,010	-	-	-	-	-	-	-	131,875	79,180
1	3,200	2,240	-	-	-	-	-	-	3	9,600	6,720
7	8,400	5,040	-	-	-	-	-	-	25	30,000	18,020
1	250	175	-	-	-	-	-	-	5	1,250	875
-	11,850	7,455	-	-	-	-	-	-	-	40,850	25,615
-	-	-	-	-	-	-	-	-	1	22,000	6,600
-	-	-	-	-	-	-	-	-	3	36,000	10,800
-	-	-	-	-	-	-	-	-	25	125,000	37,500
-	-	-	-	-	-	-	-	-	75	45,000	13,500
-	-	-	-	-	-	-	-	-	-	228,000	61,800
-	46,855	28,465	-	-	-	-	-	-	-	400,725	166,595

(Continued from previous page)

Table 3 - Development Cost (Continued) - Eth.$

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
II. RECURRENT DEVELOPMENT COST											
A. Staff 2/											
1. Extension Agents	Man Year	4,800	3	14,400	-	6	28,800	-	18	86,400	-
2. Ass. Extension Agents	" "										
a) In training	" "	3,000	18	54,000	-	36	108,000	-	21	63,000	-
b) On the job	" "	3,000	-	-	-	18	54,000		54	162,000	-
3. Subtotal		-	-	68,400	-	-	190,800	-	-	311,400	-
B. Other											
1. Farm Supplies per	Ext. Ag.	375	-	-	-	6	2,250	225	18	6,750	675
2. Farm Supplies per Ass.	Ext. Ag.	25	-	-	-	18	450	45	54	1,350	135
3. Motor cycle running	'000 km.	50	36	1,800	900	72	3,600	1,800	216	10,800	5,400
4. Travelling Cost	Ext. Ag.	125	3	375		6	750	-	18	2,250	-
5. Subtotal	-	-	-	2,175	900	-	7,050	2,070	-	21,150	6,210
C. SUBTOTAL = RECURRENT DEVELOPMENT COSTS (A + B)	-	-	-	70,575	900	-	197,850	2,070	-	332,550	6,210
III. TOTAL (I,II)	-	-	-	202,925	47,720	-	305,340	38,825	-	446,580	60,765
IV. CONTINGENCIES	-	@ 10%	-	20,295	4,780	-	30,530	3,875	-	44,660	6,080
V. TOTAL DEVELOPMENT COSTS (I-IV)	-	-	-	223,220	52,500	-	335,870	42,700	-	491,240	66,845

(Continued on next page)

attached to that village

2/ For 1st two years after each village's incorporation in the programme, extension and assistant extension agents, and associated costs are counted as "development" costs.

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
24	115,200	-	22	105,600	-	10	48,000	-	83	398,400	-
-	-	-	-	-	-	-	-	-	75	225,000	-
72	216,000	-	66	198,000	-	30	90,000	-	240	720,000	-
-	331,200	-	-	303,600	-	-	138,000	-	-	1,343,400	-
24,	9,000	900	22	8,250	825	10	3,750	375	80	30,000	3,000
72	1,800	180	66	1,650	165	30	750	75	240	6,000	600
288	14,400	7,200	264	13,200	6,600	120	6,000	3,000	996	49,800	24,900
24	3,000	-	22	2,750	-	10	1,250	-	83	10,375	-
-	28,200	8,280	-	25,850	7,590	-	11,750	3,450	-	96,175	28,500
-	359,400	8,280	-	329,450	7,590	-	149,750	3,450	-	1,439,575	28,500
-	406,255	36,745	-	329,450	7,590	-	149,750	3,450	-	1,840,300	195,095
-	40,630	3,655	-	32,950	760	-	14,980	350	-	184,045	19,500
-	446,885	40,400	-	362,400	8,350	-	164,730	3,800	-	2,024,345	214,595

(Continued from previous page)

Extension Service

Table 4 - Recurrent Cost - Eth.$

Item	Unit	Unit Cost	Project Years													
			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7-20	
			No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
A. STAFF																
1. Head of Dept. (Exp.)	M/Year	100000	1	100,000	1	100,000	1	100,000	-	-	-	-	-	-	-	-
2. Head of Dept (Local)	"	9,600	-	-	-	-	-	-	1	9,600	1	9,600	1	9,600	1	9,60
3. Deputy Head of Dept.	"	9,000	1	9,000	1	9,000	1	9,000	-	-	-	-	-	-	-	-
4. Supervisors	"	7,200	1	7,200	1	7,200	2	14,400	3	21,600	3	21,600	3	21,600	1	7,20
5. Extension Agents 1/	"	4,800	-	-	-	-	-	-	1	4,800	2	9,600	3	14,400	4	19,20
6. Ass. Ext. Agents 1/	"	3,000	-	-	-	-	-	-	3	9,000	9	27,000	15	45,000	20	60,00
7. SUBTOTAL - Staff	-	-	-	116,200	-	116,200	-	123,400	-	45,000	-	67,800	-	90,600	-	96,00
B. OPERATING COSTS																
1. Vehicle Cost	Km'000	250	18	4,500	18	4,500	27	6,750	36	9,000	36	9,000	36	9,000	18	4,50
2. Motor Cycle running 1/	"	50	-	-	-	-	-	-	12	600	24	1,200	36	1,800	40	2,00
3. Travelling Cost (Sup.)	M/Year	250	-	-	1	250	2	500	3	750	3	750	3	750	1	25
4. Travelling Cost (Ext. Ag.)	"	125	-	-	-	-	-	-	1	125	2	250	3	375	4	50
5. Farm Supplies	P/Agent	375	-	-	-	-	-	-	1	375	2	750	3	1,125	4	1,50
6. " " Per Ass.	Agent	25	-	-	-	-	-	-	3	75	9	225	15	375	20	50
7. SUBTOTAL (1-6)	-	-	-	4,500	-	4,750	-	7,250	-	10,925	-	12,175	-	13,425	-	9,25
C. MAINTENANCE																
1. House Maintenance		@ 5%														
a. Head of Dept.	No.	1,100	-	-	1	1,100	1	1,100	1	1,100	-	-	-	-	-	-
b. Senior	No.	600	-	-	2	1,200	3	1,800	3	1,800	3	1,800	3	1,800	1	60
c. Junior	No.	250	-	-	6	1,500	18	4,500	25	6,250	22	5,500	10	2,500	10	2,50
d. Subordinates	No.	30	-	-	18	540	54	1,620	75	2,250	66	1,980	30	900	30	90
e. SUBTOTAL	-	-	-	-	-	4,340	-	9,020	-	11,400	-	9,280	-	5,200	-	4,00
D. TOTAL RECURRENT COST	-	-	-	120,700	-	125,290	-	139,670	-	67,325	-	89,255	-	109,225	-	109,25

1/ See footnote 2 to Annex VII Table 3.

Crop and Animal Trials

Table 5 - Development Cost[17] Eth.$

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. STAFF											
A. Senior technician	M/Year	7,200	1	7,200		1	7,200		1	7,200	
B. Junior Technicians 2/	"	3,600	1	3,600		3,	10,800		3,	10,800	
C. Clerk/Storekeeper	"	3,600	1	3,600		1	3,600		1	3,600	
D. Guards/Herdsmen	"	360	4	1,440		10	3,600		10	3,600	
E. Driver	"	2,400	1	2,400		1	2,400		1	2,400	
F. Allowances	Month	100	12	1,200		12	1,200		12	1,200	
G. Contingencies on above		10%		1,944		-	2,880		-	2,880	
H. Subtotal (A-G)	-	-	-	21,384		-	31,680		-	31,680	
II. VEHICLES & EQUIPMENT											
A. 4x4 LWB Pick-up	No.	16,000	1	16,000	9,600	-	-	-	-	-	-
B. Meterological Equipment 3/	Set	11,500	1	11,500	8,050	-	-	-	-	-	-
C. Tractor	No.	11,500	1	11,500	6,900	-	-	-	-	-	-
D. Equipment for tractor 4/	Set	5,000	1	5,000	3,000	-	-	-	-	-	-
E. Improved Tools 5/	Yearly	2,000	1	2,000	1,200	1	2,000	1,200	1	2,000	1,200
F. Animal Watering Troughs	No.	200	1	200	60	3	600	180	-	-	-
G. Spray race and crush	No.	1,300	1	1,300	520	3	3,900	1,560			
H. Contingencies on above		10%		4,750	2,900		650	295		200	120
I. Subtotal (A-H)				52,250	32,230		7,150	3,235		2,200	1,320
III. CONSTRUCTIONS											
A. Office/Store	m^2	125	240	30,000	9,000	-	-	-	-	-	-
B. Houses - Senior Staff	No.	12,000	1	12,000	3,600	-	-	-	-	-	-
C. Houses - Subordinate Staff	No.	600	1	600	180	2	1,200	360	-	-	-
D. Fencing of crop trials	Km.	1,500	3.4	5,100	3,060	-	-	-	-	-	-
E. Fencing of grazing trials	Km.	1,500	-	-	-	19.2	28,800	17,300	-	-	-
F. Water points - wells	No.	250	-	-	-	3	750	225	-	-	-
G. Borehole	No.	16,950	1	16,950	12,700	-	-	-	-	-	-
H. Contingencies on above	-	10%	-	6,465	2,850	-	3,080	1,800	-	-	-
I. Subtotal (A -H)	-	-	-	71,115	31,390	-	33,830	19,685	-	-	-

(Continued on next page)

Year 4			Year 5			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
1	7,200	-	1	7,200	-	5	36,000	-
3	10,800	-	3	10,800	-	13	46,000	-
1	3,600	-	1	3,600	-	5	18,000	-
10	3,600	-	10	3,600	-	44	15,840	-
1	2,400	-	1	2,400	-	5	12,000	-
12	1,200	-	12	1,200	-	60	6,000	-
-	2,880	-	-	2,880	-	-	13,464	-
-	31,680	-	-	31,680	-	-	148,104	-
-	-	-	-	-	-	1	16,000	9,600
-	-	-	-	-	-	1	11,500	8,050
-	-	-	-	-	-	1	11,500	6,900
-	-	-	-	-	-	1	5,000	3,000
1	2,000	1,200	1	2,000	1,200	5	10,000	6,000
-	-	-	-	-	-	4	800	240
-	-	-	-	-	-	4	5,200	2,080
-	200	120	-	200	120	-	6,000	3,555
-	2,200	1,320	-	2,200	1,320	-	66,000	39,425
-	-	-	-	-	-	240	30,000	9,000
-	-	-	-	-	-	1	12,000	3,600
-	-	-	-	-	-	3	1,800	540
-	-	-	-	-	-	3.4	5,100	3,060
-	-	-	-	-	-	19.2	28,800	17,300
-	-	-	-	-	-	3	750	225
-	-	-	-	-	-	1	16,950	12,700
-	-	-	-	-	-	-	9,545	4,650
-	-	-	-	-	-	-	104,945	51,075

(Continued from previous page)

Table 5 - Development Cost (Continued) - Eth.$

Item	Unit	Unit Cost	Project Years: Year 1 No.	Year 1 Cost	Year 1 F.E.	Year 2 No.	Year 2 Cost	Year 2 F.E.	Year 3 No.	Year 3 Cost	Year 3 F.E.
IV. ANIMALS											
A. Boran Bulls - purchase	No.	700	-	-	-	5	3,500	-	-	-	-
B. Plough oxen - purchase	No.	130	20	2,600	-	1	130	-	1	130	-
C. Cattle for grazing & Crossing Trials	No.	100	-	-	-	120	12,000	-	-	-	-
D. Medicines/dipping material	Animal/yr	4	20	80	48	145	580	350	145	580	350
E. Purchased Feed	" "	150	20	3,000	-	25	3,750	-	25	3,750	-
F. Watering of Animals - recurrent	" "	2	20	40	-	145	290	-	145	290	-
G. Contingencies on above	-	10%	-	570	5	-	20.25	35	-	475	35
H. Subtotal (A-G)	-	-	-	6,290	53	-	22,275	385	-	5,225	385
V. OTHER COSTS											
A. Field costs of crop trials 6/	ha./trial	400	15	6,000	-	30	12,000	-	30	12,000	-
B. Visits from Agric. Research Inst.	Visit	300	3	900	-	3	900	-	3	900	-
C. Farm Economic Study	No.	18,400	-	-	-	-	-	-	1	18,400	-
D. Stationery & Sundries	Month	325	12	3,900	210	12	3,900	210	12	3,900	210
E. Maintenance of Office/Store		At 5%		1,500	450		1,500	450		1,500	450
F. Maintenance of Fencing		At 10%		510	300		3,390	2,000		3,390	2,000
G. Maintenance of Waterpoints		At 5%		850	510		885	530		885	530
H. Maintenance of Housing		At 5%		-	-		630	-		690	-
I. Vehicle Operation	'000 km.	250	9	2,250	1,175	9	2,250	1,175	9	2,250	1,175
J! Subtotal (A-I)				15,910	2,645		25,455	4,365		43,915	4,365
VI. TOTAL - DEVELOPMENT COST (I-V)				166,949	66,318		120,390	27,670		83,020	6,070

1/ Since the trials create a permanent asset, agricultural knowledge, while the trials last for only 5 years, all the costs are counted as development costs.
2/ One for crop trials, 2 for animal husbandry.
3/ Rain gauges, max-min temperature, wet and dry bulbs, anemometer, evaporation pan.
4/ Includes trailer, plow and harrow.
5/ Ox-ploughs, harrows, carts, threshers, etc. on testing.
6/ The cost is for visits by Ethiopian personnel. Visits by expatriates will be borne on donor's budgets.

(Continued on next page)

Year 4			Year 5			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	5	3,500	-
1	130	-	1	130	-	24	3,120	-
-	-	-	-	-	-	120	12,000	-
145	580	350	145	580	350	600	2,400	1,448
25	3,750	-	25	3,750	-	120	18,000	-
145	290	-	145	290	-	600	1,200	-
-	475	35	-	475	35	-	4,020	145
-	5,225	385	-	5,225	385	-	44,240	1,593
30	12,000	-	30	12,000	-	135	54,000	-
3	900	-	3	900	-	15	4,500	-
-	-	-	-	-	-	1	18,400	-
12	3,900	210	12	3,900	210	60	19,500	1,050
-	1,500	450	-	1,500	450	-	7,500	2,250
-	3,390	2,000	-	3,390	2,000	-	14,070	8,300
-	885	530	-	885	530	-	4,390	2,630
-	690	-	-	690	-	-	2,700	-
9	2,250	1,175	9	2,250	1,175	-	11,250	5,875
-	25,515	4,365	-	25,515	4,365	-	136,310	20,105
-	64,620	6,070	-	64,620	6,070	-	499,599	112,198

(Continued from previous page)

Training Centre

Table 6 - Development Cost - Eth.$ 1/

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. CAPITAL COSTS											
A. Buildings											
1. Teaching & Recreation	m^2	130	60	7,800	-	-	-	-	-	-	-
2. Dormitory	m^2	130	70	9,100	-	-	-	-	-	-	-
3. Kitchen & Store	m^2	130	25	3,250	-	-	-	-	-	-	-
4. Toilets & Showers	m^2	130	12	1,560	-	-	-	-	-	-	-
5. Office	m^2	130	8	1,040	-	-	-	-	-	-	-
6. Storeroom	m^2	130	12	1,560	-	-	-	-	-	-	-
7. Instructor's house	No.	12,000	1	12,000	-	-	-	-	-	-	-
8. Tuckuls	No.	500	4	2,000	-	-	-	-	-	-	-
9. Assistant's Quarters	No.	1,000	1	1,000	-	-	-	-	-	-	-
10. Subtotal (1-9)	-	-	-	39,310	11,793	-	-	-	-	-	-
B. Farm Buildings											
1. Cattle Shed	m^2	25	25	625	-	-	-	-	-	-	-
2. Milking Stand	No.	1,250	1	1,250	-	-	-	-	-	-	-
3. Implement Shed	No.	1,200	1	1,200	-	-	-	-	-	-	-
4. Store room (crop & fert.)	No.	1,500	1	1,500	-	-	-	-	-	-	-
5. Subtotal (1-4)	-	-	-	4,575	1,373	-	-	-	-	-	-
C. Equipment											
1. Classroom, office & store furniture	Set	1,200	1	1,200	-	-	-	-	-	-	-
2. Dining & Kitchen Equip.	Set	1,280	1	1,280	-	-	-	-	-	-	-
3. Dormitory & Residential Equip.	Set	3,400	1	3,400	-	-	-	-	-	-	-
4. Subtotal (1-3)	-	-	-	5,880	4,116	-	-	-	-	-	-

(Continued on next page)

1/ All figures provided by Educ. and Information Department of Min. of Ag.

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	-	-	-	60	7,800	-
-	-	-	-	-	-	-	-	-	70	9,100	-
-	-	-	-	-	-	-	-	-	25	3,250	-
-	-	-	-	-	-	-	-	-	12	1,560	-
-	-	-	-	-	-	-	-	-	8	1,040	-
-	-	-	-	-	-	-	-	-	12	1,560	-
-	-	-	-	-	-	-	-	-	1	12,000	-
-	-	-	-	-	-	-	-	-	4	2,000	-
-	-	-	-	-	-	-	-	-	1	1,000	-
-	-	-	-	-	-	-	-	-	-	39,310	11,793
-	-	-	-	-	-	-	-	-	25	625	-
-	-	-	-	-	-	-	-	-	1	1,250	-
-	-	-	-	-	-	-	-	-	1	1,200	-
-	-	-	-	-	-	-	-	-	1	1,500	-
-	-	-	-	-	-	-	-	-	-	4,575	1,373
-	-	-	-	-	-	-	-	-	1	1,200	-
-	-	-	-	-	-	-	-	-	1	1,280	-
-	-	-	-	-	-	-	-	-	1	3,400	-
-	-	-	-	-	-	-	-	-	-	5,880	4,116

(Continued from previous page)

Training Centre

Table 6 - Development Cost - Eth.$ (Continued)

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
D. Farm Equipment											
1. Threshers, Castrators, Ploughs Hand tools	Set	10,500	1	10,500	-	-	-	-	-	-	-
2. Fencing	m	1.60	1,875	3,000	-	-	-	-	-	-	-
3. Water piping (2" pipe)	m	4.00	500	2,000	-	-	-	-	-	-	-
4. Plough Oxen - purchase	No.	130	10	1,300	-	-	-	-	-	-	-
5. Subtotal (1-4)	-	-	-	16,800	11,760	-	-	-	-	-	-
SUBTOTAL - CAPITAL COSTS	-	-	-	66,565	29,042	-	-	-	-	-	-
II. EDUCATION TRIPS TO CADU/WADU 2/	No.	9,750	1	9,750	-	1	9,750	-	1	9,750	-
III. TOTAL (I and II)		-	-	76,315	29,042	-	9,750	-	-	9,750	-
IV. CONTINGENCIES		10%	-	7,630	2,903	-	975	-	-	975	-
V. TOTAL DEVELOPMENT COST (III + IV)	-	-	-	83,945	31,945	-	10,725	-	-	10,725	-

(Continued on next page)

2/ Trips for Asst. Ext. Agents in training and so counted as a development cost. Similar trips for farmers are costed under Cooperative Development Dept. See Annex VII Table 1.

Year 4			Year 5			Year 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	-	-	-	1	10,500	-
-	-	-	-	-	-	-	-	-	1875	3,000	-
-	-	-	-	-	-	-	-	-	500	2,000	-
-	-	-	-	-	-	-	-	-	10	1,300	-
-	-	-	-	-	-	-	-	-	-	16,800	11,760
-	-	-	-	-	-	-	-	-	-	66,565	29,042
-	-	-	-	-	-	-	-	-	3	29,250	-
-	-	-	-	-	-	-	-	-	-	95,815	29,042
-	-	-	-	-	-	-	-	-	-	9,580	2,903
-	-	-	-	-	-	-	-	-	-	105,395	31,945

(Continued from previous page)

Training Centre

Table 7 - Recurrent Cost - Eth.$

Item	Unit	Unit Cost	Project Years Year 1		Year 2		Year 3	
			No.	Cost	No.	Cost	No.	Cost
I. STAFF								
A. Instructor	M.Y.	7,200	½	3,600	1	7,200	1	7,200
B. Assistant Instructor	M.Y.	1,800	½	900	1	1,800	1	1,800
C. Driver	M.Y.	2,400	½	1,200	1	2,400	1	2,400
D. Labourers	M.Y.	500	2 x ½	500	2	1,000	2	1,000
E. Cook	M.Y.	720	½	360	1	720	1	720
F. Stewards	M.Y.	360	2 x ½	360	2	720	2	720
G. Guards	M.Y.	360	1	360	1	360	1	360
H. Subtotal (A-G)	-	-	-	7,280	-	14,200	-	14,200
II. OTHER								
A. Food & Maintenance for Trainees 1/	Year	9,000	-	-	1	9,000	1	9,000
B. Farm recurrent Costs	Ha.	200	20	4,000	20	4,000	20	4,000
C. Purchase of replacement oxen	Per Head	130	2	260	2	260	2	260
D. Contingencies	Year	3,400	1	3,400	1	3,400	1	3,400
E. Maintenance of Buildings & Houses	-	@ 5%	-	2,200	-	2,200	-	2,200
F. Subtotal (A-E)	-	-	-	9,860	-	18,860	-	18,860
III. TOTAL (I + II)	-	-	-	17,140	-	33,060	-	33,060

(Continued on next page)

1/ $450 per trainee/year.

Year 4		Year 5		Year 6		Year 7-20	
No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	7,200	1	7,200	1	7,200	1	7,200
1	1,800	1	1,800	1	1,800	1	1,800
1	2,400	1	2,400	1	2,400	1	2,400
2	1,000	2	1,000	2	1,000	2	1,000
1	720	1	720	1	720	1	720
2	720	2	720	2	720	2	720
1	360	1	360	1	360	1	360
-	14,200	-	14,200	-	14,200	-	14,200
1	9,000	1	9,000	1	9,000	1	9,000
20	4,000	20	4,000	20	4,000	20	4,000
2	260	2	260	2	260	2	260
1	3,400	1	3,400	1	3,400	1	3,400
	2,200		2,200		2,200		2,200
	18,860		18,860		18,860		18,860
	33,060		33,060		33,060		33,060

(Continued from previous page)

Veterinary Department

Table 8 - Development Cost - Eth.$

Item	Unit	Unit Cost	Project Years											
			Year 1			Year 3			Year 4			Total Years 1-6		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. VEHICLES														
A. 4x4 Station Wagon	No.	18,000	1	18,000	10,800	-	-	-	1	18,000	10,800	2	36,000	21,600
B. Bicycles	No.	180	3	540	-	1	180	-	2	360	-	6	1,080	-
C. Laboratory Equip.	Set	10,000	1	10,000	7,000	-	-	-	-	-	-	1	10,000	7,000
D. SUBTOTAL (A-C)	-	-	-	28,540	17,800	-	180	-	-	18,360	10,800	-	47,080	28,600
II. CONSTRUCTIONS														
A. Head of Department House 1/	No.	22,000	1	22,000	6,600	-	-	-	-	-	-	1	22,000	6,600
B. Junior Staff House	No.	5,000	1	5,000	1,500	1	5,000	1,500	-	-	-	2	10,000	3,000
C. Laboratory/Office 2/	No.	30,000	1	30,000	9,000	-	-	-	-	-	-	1	30,000	9,000
D. SUBTOTAL (A-C)	-	-	-	57,000	17,100	-	5,000	1,500	-	-	-	-	62,000	18,600
III. TOTAL (I + II)	-	-	-	85,540	34,900	-	5,180	1,500	-	18,360	10,800	-	109,080	47,200
IV. CONTINGENCIES	-	10%		8,555	3,490	-	520	150	-	1,835	1,080	-	10,910	4,720
V. TOTAL DEVELOPMENT COSTS	-	-	-	94,095	38,390	-	5,700	1,650	-	20,195	11,880	-	119,990	51,920

1/ For housing scale see Annex VII Table 1. Footnote 1.

2/ Standard nation-wide design.

Veterinary Department

Table 9 - Recurrent Cost - Eth.$

Item	Unit	Unit Cost	Project Years											
			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6-20	
			No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
I. STAFF														
A. Head of Department	Man Y.	10,200	1	10,200	1	10,200	1	10,200	1	10,200	1	10,200	1	10,200
B. Animal Health Assistant	"	4,800	1	4,800	1	4,800	1	4,800	2	9,600	2	9,600	2	9,600
C. Vaccinators	"	1,500	3	4,500	3	4,500	4	6,000	6	9,000	6	9,000	6	9,000
D. Drivers	"	2,400	1	2,400	1	2,400	1	2,400	2	4,800	2	4,800	2	4,800
E. SUBTOTAL (A-D)	-	-	-	21,900	-	21,900	-	23,400	-	33,600	-	33,600	-	33,600
II. OTHER														
A. Vehicle running	Kms'000	250	9	2,250	9	2,250	9	2,250	18	4,500	18	4,500	18	4,500
B. Laboratory Requirements	Per Year	5,000	1	5,000	1	5,000	1	5,000	1	5,000	1	5,000	1	5,000
C. Syringes etc.	Per Vaccinator	200	3	600	3	600	4	800	6	1,200	6	1,200	6	1,200
D. SUBTOTAL (A-C)	-	-	-	7,850	-	7,850	-	8,050	-	10,700	-	10,700	-	10,700
III. TOTAL RECURRENT COST (I + II)	-	-	-	29,480	-	29,750	-	31,450	-	44,300	-	44,300	-	44,300

Annex VII
Table 9

Roads Section

Table 10 - Development Cost[1/] - Eth.$

Item	Unit	Unit Cost	Project Years											
			Year 1			Year 2			Year 3-5			Total Years 1-6		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. STAFF														
A. Road Supervisor	M/Year	7,800	1	7,800		1	7,800		1	7,800		5	39,000	
B. Mechanic	"	4,200	1	4,200		1	4,200		1	4,200		5	21,000	
C. Operator	"	4,200	4	16,800		4	16,800		3	12,600		17	71,400	
D. Operator's Assistant	"	720	4	2,880		4	2,880		3	2,160		17	12,240	
E. Driver	"	2,400	4	9,600		4	9,600		4	9,600		20	48,000	
F. Time-keeper	"	900	1	900		1	900		1	900		5	4,500	
G. Allowance @ 50% of A to F	Year		1	21,190		1	21,190		1	18,630		5	98,270	
H. Contingencies		@ 10%		6,337			6,337			5,589			29,441	
I. SUBTOTAL - Staff (A-H)				69,707			69,707			61,479			323,851	
II. EQUIPMENT														
A. D7 Caterpillar Bulldozer	No.	158,000	1	158,000	110,600							1	158,000	110,600
B. Motor Grader Cat. 120	No.	75,300	1	75,300	52,700							1	75,300	52,700
C. Front-end loader Cat. 920	No.	57,000	1	57,000	39,900							1	57,000	39,900
D. Dump Truck 3m^3	No.	29,600	3	88,800	53,300							3	88,800	53,300
E. Water or Fuel Trailer (2,000 litre)	No.	3,000	6	18,000	10,800							6	18,000	10,800
F. 4x4 LWB Pick-up	No.	16,000	1	16,000	9,600							1	16,000	9,600
G. Spares for above	@ 5%	19,905	-	19,905	13,900								19,905	13,900
H. Camping Equipment	Per Man	400	15	6,000	4,200				4	1,600	1,120	27	10,800	7,560
I. Office Equipment	Set	250	1	250	175							1	250	175
J. Hand Tools	Year	1,400	1	1,400	980	1	1,400	980	1	1,400	980	5	7,000	4,900
K. Contingencies	@ 10%			44,065	26,880		140	85		300	180		45,105	27,505
L. SUBTOTAL - Equipment (A-K)				484,720	323,035		1,540	1,065		3,300	2,280		496,169	330,940
III. OTHER														
A. Purchased materials 2/				32,000	16,000		32,000	16,000		32,000	16,000		160,000	80,000
B. Skilled Labour				12,400			12,400			12,400			62,000	
C. Unskilled Labour				14,000			14,000			14,000			70,000	
D. Operating Costs of Equipment				46,200	23,100		46,200	23,100		21,700	10,850		157,500	78,750
E. Operating Costs of Dump Trucks				49,000	24,500		49,000	24,500		49,000	24,500		245,000	122,500
F. Operating Cost of Pick-up	'000 Km	250	20	5,000	2,500	20	5,000	2,500	20	5,000	2,500	100	25,000	12,500
G. Contingencies	@ 10%			15,860	6,660		15,860	6,660		13,410	5,630		71,950	30,2[illegible]
H. SUBTOTAL - Other (A-G)				174,460	72,760		174,460	72,760		147,510	59,480		791,450	323,[illegible]

Roads Section

Table 10 - Development Cost (Continued) = Eth.$

Item	Unit	Unit Cost	Project Years										
			Year 1			Year 2			Year 3-5			Total Years 1-6	
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.		F.E.
IV. HOUSING 3/													
A. Construction of Senior Staff	No.	12,000	1	12,000	3,600							12,000	3,600
B. Construction of Junior Staff	No.	5,000	4	20,000	6,000							20,000	6,000
C. Maintenance (A+B)	Year	@ 5%		1,600	480	1	1,600		1	1,600		8,000	480
D. Contingencies		10%	1	3,360	1,010		160	50		160	50	4,000	1,210
E. SUBTOTAL - Housing (A-D)				36,960	11,090		1,760	50		1,760	50	44,000	11,290
V. TOTAL - DEVELOPMENT COSTS (I - IV)				765,847	406,885		247,467	73,875		214,049	61,810	1,655,461	666,190

1/ For roads to be improved, see Appendix P.

2/ Items III A-E are based on Table P.4 in Appendix P, evenly spread over 5 years, except for bulldozer operating costs which are spread over 2 years.

3/ For housing scales see Annex VII, Table 1, Footnote 1.

Roads Section

Table 11 - Recurrent Costs - Eth.$

Item	Project Years 7-20
I. Maintenance of Project Roads 1/	81,800
II. TOTAL RECURRENT COST	81,800

1/ Calculated at 5% of development costs of the road. For Years 1-5 maintenance costs are covered by development costs. In years 7-20 the maintenance work will be contracted out, e.g. to T.D.C.

Land Planning Department

Table 12 - Development Cost - Eth.$

(Continued on next page)

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. STAFF											
A. Head of Department - Expatriate	M/Year	100,000	1	100,000	80,000	1	100,000	80,000	-	-	-
B. Head of Department - Local	"	9,600	-	-	-	-	-	-	1	9,600	-
C. Section Heads	"	7,200	3	21,600	-	3	21,600	-	3	21,600	-
D. Surveyors	"	2,400	6	14,400	-	6	14,400	-	6	14,400	-
E. Chainmen	"	960	12	11,520	-	12	11,520	-	12	11,520	-
F. Drivers	"	2,400	3	7,200	-	3	7,200	-	3	7,200	-
G. Draughtsmen	"	3,600	1	3,600	-	1	3,600	-	1	3,600	-
H. Labourers	"	200	18	3,600	-	18	3,600	-	18	3,600	-
I. Allowances				25,800	-		25,800	-		25,800	-
J Contingencies				18,770	8,000		18,770	8,000		9,730	-
K. SUBTOTAL - Staff (A-J)				206,490	88,000		206,490	88,000		107,050	-
II. EQUIPMENT											
A. Theodolite	No.	4,700	1	4,700	-	-	-	-	-	-	-
B. Dumpy Level	No.	850	9	7,650	-	-	-	-	-	-	-
C. Pocket Stereoscope	No.	240	3	720	-	-	-	-	-	-	-
D. Plane table plus alidade	No.	2,500	3	7,500	-	--	-	-	-	-	-
E. Prismatic compass	No.	200	9	1,800	-	-	-	-	-	-	-
F. Range Finder	No.	840	3	2,520	-	-	-	-	-	-	-
G. Altimeter (Barometric)	No.	400	3	1,200	-	-	-	-	-	-	-
H. Survey Staff	No.	280	9	2,520	-	-	-	-	-	-	-
I. Ranging Rod	No.	20	18	360	-	-	-	-	-	-	-
J. Chain	No.	100	9	900	-	-	-	-	-	-	-
K. Mirror Stereoscope	No.	2,200	1	2,200	-	-	-	-	-	-	-
L. Plan printer	No.	200	1	200	-	-	-	-	-	-	-
M. Drawing Table	No.	450	3	1,350	-	-	-	-	-	-	-
N. Light Table	No.	200	1	200	-	-	-	-	-	-	-
O. Drawing Instruments	Set	200	3	600	-	-	-	-	-	-	-
P. Planimeter	No.	200	1	200	-	-	-	-	-	-	-
Q. Desk Chair	No.	220	5	1,100	-	-	-	-	-	-	-
R. Calculator	No.	1,100	2	2,200	-	-	-	-	-	-	-
S. Aerial Photographs (Copies)	Set	-		2,600	-	-	-	-	-	2,600	-
T. Camping Equipment	P/Man	400	24	9,600	-	-	-	-	-	-	-
U. Contingencies		10%	-	5,010	-	-	-	-	-	-	-
V. SUBTOTAL = Equipment (A-U)	-	-	-	55,130	38,590	-	-	-	-	2,600	1,8?

Year 4			Years 5 & 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	2	200,000	160,000
1	9,600	-	-	-	-	2	19,200	-
3	21,600	-	-	-	-	12	86,400	-
6	14,400	-	-	-	-	24	57,600	-
12	11,520	-	-	-	-	48	46,080	-
3	7,200	-	-	-	-	12	28,800	-
1	3,600	-	-	-	-	4	14,400	-
18	3,600	-	-	-	-	72	14,400	-
-	25,800	-	-	-	-	-	103,200	-
-	9,730	-	-	-	-	-	57,000	16,000
-	107,050	-	-	-	-	-	627,080	176,000
-	-	-	-	-	-	1	4,700	-
-	-	-	-	-	-	9	7,650	-
-	-	-	-	-	-	3	720	-
-	-	-	-	-	-	3	7,500	-
-	-	-	-	-	-	9	1,800	-
-	-	-	-	-	-	3	2,520	-
-	-	-	-	-	-	3	1,200	-
-	-	-	-	-	-	9	2,520	-
-	-	-	-	-	-	18	360	-
-	-	-	-	-	-	9	900	-
-	-	-	-	-	-	1	2,200	-
-	-	-	-	-	-	1	200	-
-	-	-	-	-	-	3	1,350	-
-	-	-	-	-	-	1	200	-
-	-	-	-	-	-	3	600	-
-	-	-	-	-	-	1	200	-
-	-	-	-	-	-	-	1,100	-
-	-	-	-	-	-	-	2,200	-
-	-	-	-	-	-	-	5,200	-
-	-	-	-	-	-	24	9,600	-
-	-	-	-	-	-	-	5,010	-
-	-	-	-	-	-	-	57,730	40,410

(Continued from previous page)

Land Planning Department

Table 12 - Development Cost - Eth.$ (Continued)

Item	Unit	Unit Cost	Project Years Year 1 No.	Year 1 Cost	Year 1 F.E.	Year 2 No.	Year 2 Cost	Year 2 F.E.	Year 3 No.	Year 3 Cost	Year 3 F.E.
III VEHICLES											
A. Purchase of	No.	16,000	4	64,000	-	-	-	-	-	-	-
B. Contingencies		10%		6,400	-	-	-	-	-	-	-
C. SUBTOTAL - Vehicles (A+B)				70,400	42,240						
IV. HOUSES 2/											
A. Head of Dept.	No.	22,000	1	22,000	-	-	-	-	-	-	-
B. Senior Staff	No.	12,000	3	36,000	-	-	-	-	-	-	-
C. Contingencies		10%	-	5,800	-	-	-	-	-	-	-
D. SUBTOTAL - Housing (A-C)				63,800	19,140	-	-	-	-	-	-
V. OTHER COSTS 1/											
A. Maintenance of equipment	Month	@ 10%	-	-	-	-	5,513	3,850	-	5,513	3,850
B. Maintenance of housing		@ 5%	-	-	-	-	3,190	960	-	3,190	960
C. Running of Vehicles	Km'000	250	120	30,000	15,000	120	30,000	15,000	120	30,000	15,000
D. Stationery & Sundries	Month	600	12	7,200	840	12	7,200	840	12	7,200	840
E. Contingencies		10%		3,720	1,580		4,587	1,950		4,587	1,950
F. SUBTOTAL - Other Costs				40,920	17,420		50,490	22,600		50,490	22,600
VI. TOTAL DEVELOPMENT COST (I-V)				436,740	205,390		256,980	110,600		160,140	24,420

(Continued on next page)

1/ Since this service is provided for 5 years only and creates a permanent asset - well planned land - all the costs of the service are treated as development cost.

2/ For housing scales see Annex VII Table 1, footnote 1.

Year 4			Year 5 & 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	4	64,000	-
-	-	-	-	-	-	-	6,400	-
-	-	-	-	-	-	-	70,400	42,240
-	-	-	-	-	-	1	22,000	-
-	-	-	-	-	-	3	36,000	-
-	-	-	-	-	-	-	5,800	-
-	-	-	-	-	-	-	63,800	19,140
-	5,773	4,040	-	-	-	-	16,799	11,740
-	3,190	960	-	-	-	-	9,570	2,880
120	30,000	15,000	-	-	-	480	120,000	60,000
12	7,200	840	-	-	-	48	28,800	3,360
-	4,617	1,960	-	-	-	-	17,511	7,440
-	50,780	22,800	-	-	-	-	192,680	85,420
-	157,830	22,800	-	-	-	-	1,011,690	363,210

(Continued from previous page)

Land Adjudication Department

Table 13 - Development Costs - Eth.$

Item	Unit	Unit Cost	Project Years								
			Year 1			Year 2 & 3			Year 4		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. STAFF											
A. Land Adjudication Officer	M/Year	9,600	1	9,600	-	1	9,600	-	1	9,600	
B. Assistant Land Adjudication Off.	"	7,200	1	7,200	-	3	21,600	-	3	21,600	-
C. Driver	"	2,400	1	2,400	-	1	2,400	-	1	2,400	
D. Allowances for Staff	Year		1	3,500	-	1	6,300	-	1	6,300	-
II. HOUSING E. SUBTOTAL (A-D)				22,700	-	-	39,900	-	-	39,900	
A. Construction - Head of Dept.	No.	22,000	1	22,000	-	-	-	-	-	-	-
B. Construction - Senior Staff	No.	12,000	3	36,000	-	-	-	-	-	-	-
C. Maintenance of housing	Year	2,900		-	-	-	2,900	-	-	2,900	-
D. SUBTOTAL (A-C)				58,000	17,400		2,900			2,900	
III VEHICLES											
A. Purchase of 4x4 S/Wagon	No.	18,000	1	18,000	10,800	-	-	-	-	-	-
B. Running of Vehicle	'000 Km	250	15	3,750	1,875	9	2,250	1,125	9	2,250	1,125
C. SUBTOTAL (A+B)				21,750	12,675		2,250	1,125		2,250	1,125
IV. OTHER											
Allowances for committees of elders	'00's of m/days	100	10	1,000	-	20	2,000	-	20	2,000	-
V. CONTINGENCIES		10%		10,345	3,005		4,705	115		4,705	115
VI. TOTAL DEVELOPMENT COSTS (I-V)				113,795	33,080		51,755	1,240		51,755	1,240

(Continued on next page)

Year 5			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.
1	9,600	-	5	48,000	-
1	7,200	-	11	79,200	-
1	2,400	-	5	12,000	-
1	3,500	-		25,900	-
	22,700	-		165,100	-
-	-	-	1	22,000	-
-	-	-	3	36,000	-
	2,900	-		11,600	-
	2,900	-	-	69,600	17,400
				18,000	10,800
9	2,250	1,125	51	12,750	6,375
	2,250	1,125		30,750	17,175
20	2,000	-	90	9,000	-
	2,985	115		27,445	3,465
	32,835	1,240		301,895	38,040

(Continued from previous page)

Land Administration Department

Table 14 - Development Cost - Eth.$

Item	Unit	Unit Cost	Project Years Year 1 No.	Year 1 Cost	Year 1 F.E.	Year 2 No.	Year 2 Cost	Year 2 F.E.	Year 3 No.	Year 3 Cost	Year 3 F.E.
A. Vehicle (4x4 LWB S/Wagon)	No.	18,000	1	18,000	10,800	-	-	-	-	-	-
B. House - Head of Department	No.	22,000	1	22,000	6,600	-	-	-	-	-	-
C. House - Junior Staff	No.	5,000	1	5,000	1,500	-	-	-	-	-	-
D. Equipment -											
1. Stationery Cupboard	No.	300	1	300	-	-	-	-	-	-	-
2. Filing Cabinet	No.	200	2	400	-	-	-	-	-	-	-
3. Desk/Chair	Set	220	1	220	-	-	-	-	-	-	-
4. Tables	No.	40	1	40	-	-	-	-	-	-	-
5. Chairs	No.	25	1	25	-	-	-	-	-	-	-
6. Equipment Subtotal				985	690	-	-	-	-	-	-
E. TOTAL (A-D)				45,985	19,590	-	-	-	-	-	-
F. Contingencies (10%)1/				4,615	1,960	-	-	-	-	-	-
G. TOTAL DEVELOPMENT COST				50,600	21,550	-	-	-	-	-	-

(Continued on next page)

1/ Approximately.

Year 4			Years 5 & 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
-	-	-	-	-	-	1	18,000	10,800
-	-	-	-	-	-	1	22,000	6,600
-	-	-	-	-	-	1	5,000	1,500
1	300	-	-	-	-	2	600	-
2	400	-	-	-	-	4	800	-
-	-	-	-	-	-	1	220	-
1	40	-	-	-	-	2	80	-
1	25	-	-	-	-	2	50	-
-	765	540	-	-	-	-	1,750	1,230
-	765	540	-	-	-	-	46,750	20,130
-	75	50	-	-	-	-	4,690	2,010
-	840	590	-	-	-	-	51,440	22,140

(Continued from previous page)

Land Administration Department

Table 15 - Recurrent Cost - Eth.$

Item	Unit	Unit Cost	Project Years											
			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6-20	
			No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
I. STAFF														
A. Head of Department	M/Year	9,600	0.5	4,800	1	9,600	1	9,600	1	9,600	1	9,600	1	9,600
B. Senior Clerk	"	4,800	0.5	2,400	1	4,800	1	4,800	1	4,800	1	4,800	1	4,800
C. Clerk	"	3,600	-	-	-	-	-	-	1	3,600	1	3,600	1	3,600
D. Driver	"	2,400	0.5	1,200	1	2,400	1	2,400	1	2,400	1	2,400	1	2,400
E. Allowances	Year	1,200	0.5	600	1	1,200	1	1,200	1	1,200	1	1,200	1	1,200
F. SUBTOTAL - Staff (A-E)	-	-	-	9,000	-	18,000	-	18,000	-	21,600	-	21,600	-	21,600
II. OTHER														
A. Vehicle running	Km'000	250	4	1,000	10	2,500	14	3,500	18	4,500	20	5,000	20	5,000
B. Stationery Staff	Year	500	1	500	2	1,000	2	1,000	3	1,500	3	1,500	3	1,500
C. Other @ 30% of above				500		1,050		1,350		1,800		1,950		1,950
D. Housing Maintenance (5%)	Year	1,350	-	-	1	1,350	1	1,350	1	1,350	1	1,350	1	1,350
E. Equipment Maintenance (10%)	"	175	-	-	-	100	-	100	-	100	-	175	-	175
F. SUBTOTAL - Other (A-E)	-	-	-	2,000	-	6,000	-	7,300	-	9,250	-	9,975	-	9,975
III. TOTAL RECURRENT COST (I+II)	-	-	-	11,000	-	24,000	-	25,300	-	30,850	-	31,575	-	31,575

Finance and Administration Service

Table 16 - Development Cost - Eth.$

Item	Unit	Unit Cost	Project Years Year 1			Year 2			Year 3		
			No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
I. VEHICLES											
LWB 4x4 Station Wagon	No.	18,000	1	18,000	10,800	-	-	-	-	-	-
II. HOUSING											
A. Head of Dept.	No.	22,000	2	44,000	-	-	-	-	-	-	-
B. Senior	No.	12,000	1	12,000	-	-	-	-	-	-	-
C. Junior	No.	5,000	1	5,000	-	-	-	-	-	-	-
D. SUBTOTAL Housing (A-C)	-	-	-	61,000	11,700	-	-	-	-	-	-
III. OFFICE											
Main Office	m^2	100	400	40,000	12,000	-	-	-	-	-	-
IV. EQUIPMENT											
A. Desk/Chair	Set	220	6	1,320	-	1	220	-	-	-	-
B. Filing Cabinet	No.	200	2	400	-	1	200	-	1	200	-
C. Stationery Cupboards	No.	300	2	600	-	1	300	-	1	300	-
D. Calculator	No.	1,600	1	1,600	-	-	-	-	-	-	-
E. Typewriter	No.	720	6	4,320	-	-	-	-	-	-	-
F. Safe & Cashbox	No.	1,600	1	1,600	-	-	-	-	-	-	-
G. Radio telephone	No.	2,700	1	2,700	-	-	-	-	-	-	-
H. SUBTOTAL Equipment (A-G)	-	-	-	12,540	8,100	-	720	300	-	500	200
V. PLANT & FACILITIES											
A. Borehole and Water Supply	No.	17,000	1	17,000	-	-	-	-	-	-	-
B. Electricity Generator	No.	9,000	1	9,000	-	-	-	-	-	-	-
C. SUBTOTAL Plant & Facilities (A+B)		-	-	26,000	19,500	-	-	-	-	-	-
VI. TOTAL (I-V)	-	-	-	157,540	62,100	-	720	300	-	500	200
VII. CONTINGENCIES (Approx 10%)	-	-	-	15,750	6,200	-	80	30	-	50	20
VIII. TOTAL - DEVELOPMENT COST	-	--	-	173,290	68,300	-	800	330	-	550	220

(Continued on next page)

Year 4			Years 5 & 6			Total Years 1-6		
No.	Cost	F.E.	No.	Cost	F.E.	No.	Cost	F.E.
1	18,000	10,800	-	-	-	2	36,000	21,600
-	-	-	-	-	-	2	44,000	-
-	-	-	-	-	-	1	12,000	-
-	-	-	-	-	-	1	5,000	-
-	-	-	-	-	-	-	61,000	11,700
-	-	-	-	-	-	400	40,000	12,000
-	-	-	-	-	-	7	1,540	-
1	200	-	-	-	-	5	1,000	-
1	300	-	-	-	-	5	1,500	-
-	-	-	-	-	-	1	1,600	-
-	-	-	-	-	-	6	4,320	-
-	-	-	-	-	-	1	1,600	-
-	-	-	-	-	-	1	2,700	-
-	-500	200	-	-	-	-	14,260	8,800
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	26,000	19,500
-	18,500	11,000	-	-	-	-	177,260	73,600
-	1,900	1,100	-	-	-	-	17,780	7,350
-	20,400	12,100	-	-	-	-	195,040	80,950

(Continued from previous page)

Finance and Administration Service

Table 17 - Recurrent Cost - Eth.$

	Item	Unit	Unit Cost	Project Years									
				Year 1		Year 2		Year 3		Year 4-6		Year 7-20 1/	
				No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
I.	STAFF												
A.	Project Director (Ethiopian)	Man/Year	14,400	1	14,400	1	14,400	1	14,400	1	14,400	-	-
B.	Finance & Administration Off.	"	9,600	1	9,600	1	9,600	1	9,600	1	9,600	-	-
C.	Cashier	"	4,800	1	4,800	1	4,800	1	4,800	1	4,800	-	-
D.	Accounts Clerks	"	3,600	1	3,600	2	7,200	2	7,200	2	7,200	2	7,200
E.	Personal Secretary	"	7,200	1	7,200	1	7,200	1	7,200	1	7,200	-	-
F.	Typist	"	3,600	2	7,200	2	7,200	2	7,200	2	7,200	2	7,200
G.	Messengers	"	600	4	2,400	4	2,400	4	2,400	4	2,400	4	2,400
H.	Guards	"	360	3	1,080	3	1,080	3	1,080	3	1,080	3	1,080
I.	Cleaners	"	300	3	900	3	900	3	900	3	900	3	900
J.	Drivers	"	2,400	1	2,400	1	2,400	1	2,400	1	2,400	1	2,400
K.	Water Point Attendant	"	1,200	1	1,200	1	1,200	1	1,200	1	1,200	1	1,200
L.	Allowances	Month	250	12	3,000	12	3,000	12	3,000	12	3,000	-	-
M.	SUBTOTAL = Staff (A-L)	-	-	-	57,780	-	61,380	-	61,380	-	61,380	-	22,380
II.	OTHER RECURRENT COSTS												
A.	Vehicle Operating Cost	'000 Kms	250	50	12,500	50	12,500	50	12,500	50	12,500	-	-
B.	Office Maintenance (5%)	Year	2,000	-	-	1	2,000	1	2,000	1	2,000	1	2,000
C.	Housing Maintenance (5%)	"	3,050	-	-	1	3,050	1	3,050	1	3,050	1	3,050
D.	Stationery & Office Supplies	Month	390	12	4,700	12	4,700	12	4,700	12	4,700	12	4,700
E.	Electricity Generation	Year	750	.5	375	1	750	1	750	1	750	1	750
F.	Water Pumping Costs	"	750	.5	375	1	750	1	750	1	750	1	750
G.	Equipment Maintenance (10%)	"	1,430	-	-	1	1,250	1	1,330	1	1,380	1	1,430
H.	Plant & Utilities Maintenance	"	2,600	-	-	1	2,600	1	2,600	1	2,600	1	2,600
I.	Sundries	Month	1,000	12	12,000	12	12,000	12	12,000	12	12,000	-	-
J.	SUBTOTAL - Other (A-I)	-	-	-	26,400	-	39,600	-	39,680	-	39,730	-	15,280
III.	TOTAL RECURRENT COSTS (I+II)	-	-	-	84,180		100,980		101,060	-	101,110	-	37,660

1/ The Development Unit is expected to close down in year 7 and its functions to revert to individual Ministries. The continuing recurrent costs forecast after year 7 are those required to support the field offices of these Ministries in the project area, and which have not been covered in other tables.

TAHADU Development Unit

Table 18 - Consolidated Development Cost - Eth.$'000

Item	Project Years													
	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Total Yr.1-6	
	Total	F.E.	Total	F.E.	Total	F.E.	Total	F.E.	Total	F.E.	Total	F.E.	Total*	F.E
A. Cooperative Development Department 1/	338.5	159.9	193.2	90.8	176.7	88.0	183.9	89.4	131.7	88.0	9.9	-	1034.0	516
B. Extension Services 2/	223.2	52.5	335.9	42.7	491.2	66.8	446.8	40.4	362.4	8.3	164.7	3.8	2024.3	214
C. Crop and Animal Trials 3/	166.9	66.3	120.3	27.6	83.0	6.0	64.6	6.0	64.6	6.0	-	-	449.6	111.
D. Training Centre 4/	83.9	31.9	10.7	-	10.7	-	-	-	-	-	-	-	105.4	31.
E. Veterinary Department 5/	94.1	38.3	5.7	1.6	20.2	11.9	-	-	-	-	-	-	120.0	51.
F. Roads Section 6/	765.8	406.9	247.5	73.9	214.0	61.8	214.0	61.8	214.0	61.8	-	-	1655.5	666.
G. Land Planning Department 7/	436.7	205.3	256.9	110.6	160.1	24.4	157.8	22.8	-	-	-	-	1011.7	363
H. Land Adjudication Department 8/	113.7	33.0	51.7	1.2	51.7	1.2	51.7	1.2	32.8	1.2	-	-	301.9	38.
I. Land Administration Department 9/	50.6	21.6	-	-	-	-	0.8	0.6	-	-	-	-	50.6	21
J. Finance and Administration Service 10/	173.3	68.3	0.8	0.3	0.6	0.2	20.4	12.1	-	-	-	-	195.0	80.
K. TOTAL - TAHADU Development Cost (A-J)	2446.7	1084.0	1222.7	348.7	1208.2	260.3	1139.0	234.3	805.5	165.3	174.6	3.8	6996.7	2096.

1/ Annex VII Table 1
2/ Annex VII Table 3
3/ Annex VII Table 5
4/ Annex VII Table 6
5/ Annex VII Table 8
6/ Annex VII Table 10
7/ Annex VII Table 12
8/ Annex VII Table 13
9/ Annex VII Table 14
10/ Annex VII Table 16.

*Totals may not sum correctly due to rounding.

TAHADU Development Unit

Table 19 - Consolidated Recurrent Cost - Eth.$

Item	Project Years									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Years 10
A. Cooperative Development Department 1/	46,980	62,740	62,740	63,340	38,770	38,770	26,770	26,770	26,770	26,77
B. Extension Services 2/	120,700	125,290	139,670	67,325	89,255	109,225	109,250	109,250	109,250	109,25
C. Training Centre 3/	17,140	33,060	33,060	33,060	33,060	33,060	33,060	33,060	33,060	33,06
D. Veterinary Department 4/	29,480	29,750	31,450	44,300	44,300	44,300	44,300	44,300	44,300	44,30
E. Road Section 5/	-	-	-	-	-	-	81,800	81,800	81,800	81,80
F. Land Administration Department 6/	11,000	24,000	25,300	30,850	31,575	31,575	31,575	31,575	31,575	31,575
G. Finance and Administration Services 7/	84,180	100,980	101,060	101,110	101,110	101,110	37,660	37,660	37,660	37,66
H. TOTAL - TAHADU Recurrent Cost (A-G)	309,480	375,820	393,280	339,985	338,040	358,040	364,415	364,415	364,415	364,41
TOTAL - ROUNDED Eth.$'000	309.5	375.8	393.3	340.0	338.0	358.0	364.4	364.4	364.4	364.4

1/ Annex VII Table 2
2/ Annex VII Table 4
3/ Annex VII Table 7
4/ Annex VII Table 9
5/ Annex VII Table 11
6/ Annex VII Table 15
7/ Annex VII Table 17

TAHADU Development Unit

Table 20 - Consolidated Cash Flow - Eth.$'000

Items	Project Years									
	1	2	3	4	5	6	7	8	9	10-20
I. CASH INFLOW										
A. Revenue - Land Rent 1/	-	-	-	-	-	19.8	59.4	99.0	132.0	132.0
B. Sale of Bulldozer (At 50% of original cost	-	-	79.0	-	-	-	-	-	-	-
C. TOTAL - INFLOWS (A+B)			79.0	-	-	19.8	59.4	99.0	132.0	132.0
II. CASH OUTFLOW										
A. Development Cost 2/	2,446.7	1,222.7	1,208.2	1,139.0	805.5	174.6	-	-	-	-
B. Recurrent Cost 3/	309.5	375.8	393.3	340.0	338.0	358.0	364.4	364.4	364.4	364.4
C. Replacement of vehicles & Equipment 4/	-	-	-	-	-	103.7	3.8	24.9	35.5	36.1
D. TOTAL - OUTFLOW	2,756.2	1,598.5	1,601.5	1,479.0	1,143.5	636.3	368.2	389.3	399.9	400.5
III. BALANCE (Outflow exceeds inflow)	2,756.2	1,598.5	1,522.5	1,479.0	1,143.5	616.5	348.4	290.3	267.9	268.5

1/ Annex I Table III - phased. Land tax is not counted as project revenue, since, in theory, it is paid in any case.

2/ Annex VII Table 18

3/ Annex VII Table 19

4/ Vehicles replaced every 5 years, but motor cycles every 4, bicycles every 3. Special rates for laboratory and training centre equipment and utilities.

Project Consolidated Budget

Table 1 - Summary of Development Costs - Eth.$'000

	Project Years													
	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		TOTAL 1 - 6	
	Total	F.E.	Total	F.E.	Total	F.E.	Total	F.E	Total	F.E.	Total	F.E	Total	F.E.
I Farmers 1/ 6/	-	-	147.0	24.3	611.1	95.1	1258.4	190.3	2124.9	316.7	2359.7	346.9	6501.1	973.3
II Primary Cooperatives 2/	-	-	256.8	165.8	517.8	334.0	522.0	336.5	436.4	281.2	7.0	4.1	1740.0	1121.6
III TAHECU Coop. Union 3/	104.6	60.3	36.1	10.7	336.7	63.5	46.7	27.9	329.5	59.4	329.5	59.1	1183.1	281.2
IV Cooperative Ranch 4/	-	-	617.6	130.4	-	-	29.7	-	49.5	-	99.0	-	795.8	130.5
V TAHADU 5/	2446.7	1084.0	1222.7	348.7	1208.2	260.3	1139.0	234.3	805.5	165.3	174.6	3.8	6996.7	2096.1
VI TOTAL (I to V)	2551.3	1144.3	2280.2	679.9	2673.8	752.9	2995.8	789.0	3745.8	822.6	2969.8	414.2	17216.7	4602.7

1/ Annexe I, Tables 1 and 8. Phased for all farmers but excludes farmers share subscription to Primary Cooperatives in order to avoid double counting.

2/ Annexe II, Table 9, phased.

3/ Annexe III, Table 13. Excludes Development cost of engineering unit to avoid double counting of investments installed by TAHECU on behalf of others.

4/ Annexe IV, Table 2.

5/ Annexe VII, Table 19.

6/ Not all the 12,000 farmers to be incorporated in the project will have completed their farms' investment programme before the end of the "development phase" of the project (i.e. in the first six years) and these extra development phase investments are not shown in this table. Further on-farm investments will take place to the extent of Eth.$ 1,721 million in the 7th year and Eth.$ .976 million in the 8th year. These on-farm investments are shown in Annexe VIII, Table 3.

Project Consolidated Budget

Table 2 - Summary of Incremental Recurrent Costs

	Project Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I Farmers 1/	-	5.3	30.3	140.1	334.5	615.0	884.4	900.8	889.6	718.0	510.0	510.0	510.0	510.0
II Primary Cooperatives 2/	-	7.1	61.4	161.4	271.8	364.4	388.4	400.7	400.7	400.7	400.7	400.7	400.7	400.7
III Cooperative Union 3/	35.1	44.8	83.9	379.6	445.2	761.6	735.0	1002.8	1280.7	1280.7	1280.7	1280.7	1280.7	1280.7
IV Cooperative Ranch 4/	-	69.3	55.2	98.6	96.2	109.5	120.3	110.8	106.5	107.1	107.1	107.1	107.1	107.1
V TAHADU 5/	309.5	375.8	393.3	340.0	338.0	358.0	364.4	364.4	364.4	364.4	364.4	364.4	364.4	364.4
VI TOTAL (I to V)	344.6	502.3	624.1	1119.7	1485.7	2208.5	2492.5	2779.5	3041.9	2870.9	2662.9	2662.9	2662.9	2662.9

1/ Annexe I, Tables 3, 6 and 7, but excludes payments of crop storage levy, village grazing fees, village dipping cost and water, and all other costs in section C of the Table 3 (Annexe I), so as to avoid double counting of costs included elsewhere in the calculations.

2/ Annexe II, Table 10 (Phased for inception of primary cooperatives) but excludes payment of Cooperative Union Levy so as to avoid double counting.

3/ Annexe III, Table 14. Excludes recurrent costs of Engineering Unit to avoid double counting, since these are already taken into account in the calculations of recurrent and development costs of other organisations.

4/ Annexe IV, Table 3.

5/ Annexe VII, Table 19.

Project Consolidated Budget

Table 3 - Summary of Replacement and Other Investment and Costs (Eth.$000s)

	Project Years													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I NEW INVESTMENTS							1/							
On farm	-	-	-	-	-	-	1721.0	976.0	-	-	-	-	-	-
II REPLACEMENTS														
A Farmers 2/	-	-	-	-	-	-	54.0	243.0	378.0	1450.8	896.4	891.0	1017.0	732.0
B Primary Coops.	-	-	-	-	-	-	-	-	-	-	41.0	82.0	150.5	-
C Coop. Union 4/	-	-	-	-	-	65.6	-	-	54.0	-	78.5	26.0	56.0	29.6
D Coop. Ranch 5/	-	-	-	-	-	-	51.0	-	-	-	-	55.5	10.7	10.7
E TAHADU 6/	-	-	-	-	-	103.7	3.8	24.9	35.5	36.1	36.1	36.1	36.1	36.1
F Subtotal (A to E)	-	-	-	-	-	169.3	108.8	267.9	467.5	1486.9	1052.0	1090.6	1270.3	808.4
III TOTAL (I and II)	-	-	-	-	-	169.3	1829.8	1243.9	467.1	1486.9	1052.0	1090.6	1270.3	808.4

1/ New on-farm investments not completed in "development stage". See Note 6/ to Table 1.

2/ Annexe I, Tables 6 and 7 (II A).

3/ Due to error this replacement of Primary Cooperative equipment was not taken into account in Annexe II, Table 12. The error only effects the 11th year of the Cooperative when, as a consequence, farmers' incomes are overstated by about $25 per farmer.

4/ Due to error these replacement costs of the Cooperative Union were not taken into account in its Flow of Funds Table (Annexe III, Table 17). There will be no financing problem but the "Balance paid out to Members" is, therefore, somewhat overstated, and consequently so is the farmers' income of Annexe I Tables 4, 5, 6, and 7. But the overstatement only amounts to an average of $2.70 per farmer per year after year 5, and is not, therefore, very significant. The replacement costs shown here exclude those of the Engineering Unit to avoid double counting.

5/ Annexe IV, Table 6 (and esp. note 5/ thereto).

6/ Annexe VII, Table 20 (II C and footnote IV thereto).

Project Consolidated Budget

Table 4 - Summary of Incremental Gross Benefits. (Eth.$000)

Items	Project Years 1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I FARMERS BENEFITS 1/														
A. Sales (Incremental)														
1. Sorghum sales	-	-	126.0	403.2	783.7	1248.2	1181.3	1422.5	1603.4	1769.0	1941.0	2093.9	2195.6	2242.8
2. Sesame sales	-	-	14.8	171.3	539.3	1071.6	1646.9	2033.2	2301.1	2470.3	2639.5	2783.3	2876.4	2918.7
3. Animal sales	-	15.9	74.7	156.5	280.6	394.0	569.6	700.0	773.9	798.8	770.6	763.8	763.8	763.8
4. Subtotal Sales(1-3)	-	15.9	215.5	731.0	1603.6	2713.8	3397.8	4155.7	4678.4	5038.1	5651.1	5641.0	5835.8	5925.3
B. Subsistence 2/ (Incremental)														
1. Sorghum	-	-	-	(15.1)	(55.4)	(110.9)	(126.6)	(150.6)	(162.5)	(169.5)	(175.1)	(182.1)	(185.9)	(189.0)
2. Beans	-	-	-	46.8	244.8	550.8	852.0	829.8	1102.2	1153.8	1206.6	1251.0	1281.0	1296.0
3. Dairy	-	-	7.2	30.6	75.6	145.2	232.2	318.0	378.0	408.0	408.0	408.0	408.0	408.0
4. Water	-	12.6	59.4	162.0	294.6	399.0	456.0	456.0	456.0	456.0	456.0	456.0	456.0	456.0
5. Milling	-	1.8	7.2	18.0	31.8	42.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
6. Subtotal (1-5)	-	14.4	73.8	242.3	591.4	1026.1	1461.6	1501.2	1821.7	1896.3	1943.5	1980.9	2007.1	1992.0
C. TOTAL Farmers' Incremental Benefits (A&B)	-	30.3	288.9	973.3	2195.0	3739.9	4859.4	5656.9	6500.1	6934.4	7594.6	7621.9	7842.9	7917.0
II COOPERATIVE UNION BENEFITS														
A. Value added at crop store 3/	-	-	-	293.9	472.6	623.1	747.4	854.4	1134.3	1134.3	1134.3	1134.3	1134.3	1134.3
B. Value added at Livestock Market 4/	-	4.0	6.3	10.7	15.1	19.1	22.2	28.8	28.8	28.8	28.8	28.8	28.8	28.8
C. Storage benefits 5/	-	-	-	67.2	67.2	67.2	50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4
D. TOTAL (A&B&C)	-	4.0	6.3	371.8	554.9	709.4	820.0	933.6	1213.5	1213.5	1213.5	1213.5	1213.5	1213.5
III Coop. Ranch Sales (Net)6/	-	52.7	81.8	70.8	186.9	154.7	117.7	326.7	224.3	251.2	269.0	269.0	269.0	269.0
IV TAHADU BENEFITS														
A. Road benefits 7/	-	94.3	83.8	73.4	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7
B. Sale of bulldozer 8/	-	-	79.0	-	-	-	-	-	-	-	-	-	-	-
C. A and B	-	94.3	162.8	73.4	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7
V GRAND TOTAL INCR.BENEFITS (I-V)		181.3	539.8	1489.3	3001.5	4668.7	5861.8	6981.9	8002.6	8463.8	9141.8	9169.1	9390.1	9464.2

3/ Annexe III, Table 3, but excluding commission.
4/ Annexe III, Table 6.
5/ See Appendix B,
6/ Annexe IV, Table 4, Net of purchase of steers.
7/ See Appendix B
8/ Annexe VII, Table 20 (B)
1/, 2/ From Annexe I, lagged and with prices adjusted for changes in project year 6.

Annexe VIII
Table 4.

Consolidated Project Budget

Table 5 - Economic Cash Flow (Eth.$000)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
I BENEFITS														
Incremental Gross Benefits 1/	-	181.3	539.8	1489.3	3001.5	4668.7	5861.8	6981.9	8002.6	8463.8	9141.8	9169.1	9390.1	9464.2
II COSTS														
A Development 2/	2551.3	2280.2	2673.8	2995.8	3745.8	2969.8	-	-	-	-	-	-	-	-
B Incr. Recurrent 3/	344.6	502.3	624.1	1119.7	1485.7	2208.5	2492.5	2779.5	3041.9	2870.9	2662.9	2662.9	2662.9	2662.9
C Replacement etc. 4/	-	-	-	-	-	169.3	1829.8	1243.9	467.5	1486.9	1052.0	1090.6	1270.3	808.4
D TOTAL (A&B&C)	2895.9	2782.5	3297.9	4115.5	5231.5	5347.6	4322.3	4023.4	3509.4	4357.8	3714.9	3753.5	3933.2	3471.3
BALANCE = NET BENEFITS	(2895.9)	(2601.2)	(2758.1)	(2626.2)	(2230.0)	(678.9)	1539.5	2958.5	4493.2	4106.0	5426.9	5415.6	5456.9	5992.9

( ) = Negative

1/ Annexe VIII, Table 4
2/ " " " 1
3/ " " " 2
4/ " " " 3

INTERNAL RATE OF RETURN = 17.2%

NET PRESENT VALUE AT 10% = Eth.$ 8,913.2 million

Annexe VIII
Table 5.

PROJECT CONSOLIDATED BUDGET

Table 6 - Summary of Proposed Financing Over 8 Years

Eth.$'000

	Project Years Total Years 1-8							
	Requirements 1/		IDA			Sources		
	Total	FE	Total	FE	Local	IEG	Farmers	Other 2/
I. Development Costs								
A. Farmers Development Costs	6501.1	973.3	5842.7	973.3	4869.4	-	658.4	-
B. Primary Coops Dev.Costs	1740.0	1121.6	1620.0	1121.6	498.4	-	120.0	-
C. TAHECU Coop Union " "								
1. Engineering Unit 3/	300.9	208.2	273.5	208.2	65.3	27.4	-	-
2. Other	1183.1	281.2	1075.4	281.2	794.2	47.7	-	(60.0)
D. Cooperative Ranch " "	795.8	130.5	549.9	130.5	419.4	226.1	-	(19.8)
E. TAHADU	6996.7	2096.1	2800.2	1673.8	1186.4	4136.5	-	-
F. Sub-Total (A to E) 9/	17517.6	4810.9	12221.7	4388.6	7833.1	4437.7	778.4	-
II. Replacement 4/ and Other Investment Costs								
A. New On-Farm Investments	2697.0	x 5/	-	-	-	-	274.8	2422.2
B. TAHADU - Replacements	132.4	x	-	-	-	132.4	-	-
C. Sub-Total (A + B)	2829.4	x	-	-	-	132.4	274.8	2422.2
III. Working Capital 6/ and Recurrent								
A. Farmers Short Term Loans 7/	693.0	x	-	-	-	-	-	693.0
B. Primary Coop Short Term Loans 7/	37.8	x	-	-	-	-	-	37.8
C. TAHECU Incr.Working Capital 8/	369.1	x	-	-	-	289.3	-	79.8
D. Coop Ranch Incr Working Cap.	400.6	x	-	-	-	305.6	50.0	45.0
E. TAHADU Recur. Cost(Net of Revenue)	2586.2	240.0	300.0	240.0	60.0	2286.2	-	-
F. Sub-Total (A to E)	4086.7	240.0	300.0	240.0	60.0	2881.1	50.0	855.6
IV. 9/ Total Finance (I + II + III)	24433.7	5110.9	12521.7	4628.6	7893.1	7451.2	1103.2	3277.8

(Continued on next page)

Summary of Proposed Financing (Continued)

Eth.$'000

	Project Years														
	Year 1								Year 2						
	Requirements1/		Sources						Requirements1/		Sources				
			IDA								IDA				
	Total	FE	Total	FE	Local	IEG	Farmers	Other2/	Total	FE	Total	FE	Local	IEG	Farmers
I.															
A.	-	-	-	-	-	-	-	-	147.0	24.3	131.2	24.3	106.9	-	15.8
B.	-	-	-	-	-	-	-	-	256.8	165.8	238.8	165.8	73.0	-	18.0
C.3/															
1.	279.1	195.3	253.7	195.3	58.4	25.4	-	-	21.8	12.9	19.8	12.9	6.9	2.0	-
2.	104.6	60.3	95.1	60.3	34.8	9.5	-	-	36.1	10.7	32.8	10.7	22.1	3.3	-
D.	-	-	-	-	-	-	-	-	617.6	130.4	443.0	130.4	312.6	174.6	-
E.	2446.7	1084.0	1898.8	1036.5	862.3	547.9	-	-	1222.7	348.7	386.5	243.8	142.7	836.2	-
F.	2830.4	1339.6	2247.6	1292.1	955.5	582.8	-	-	2302.0	692.8	1252.1	587.9	664.2	1016.1	33.8
II. 4/															
A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III. 6/															
A.7/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.7/	-	-	-	-	-	-	-	-	4.8	x	-	-	-	-	-
C.8/	16.9	x 5/	-	-	-	16.9	-	-	74.2	x	-	-	-	74.2	-
D.	-	-	-	-	-	-	-	-	149.8	x	-	-	-	149.8	-
E.	309.5	80.0	100.0	80.0	20.0	209.5	-	-	375.8	80.0	100.0	80.0	20.0	275.8	-
F.	326.4	80.0	100.0	80.0	20.0	226.4	-	-	604.6	80.0	100.0	80.0	20.0	499.8	-
IV.	3156.8	1419.6	2347.6	1372.1	975.5	809.2	-	-	2906.6	772.8	1352.1	667.9	684.2	1515.9	33.8

(Continued on next page)

Summary of Proposed Financing (Continued)

Eth.$'000

	Project Years															
	Year 3								Year 4							
	Requirements1/		Sources						Requirements1/		Sources					
				IDA							IDA					
	Total	FE	Total	FE	Local	IEG	Farmers	Other2/	Total	FE	Total	FE	Local	IEG	Farmers	Ot
I.																
A.	611.1	95.1	546.8	95.1	451.7	-	64.3	-	1258.4	190.3	1131.0	190.3	940.7	-	127.4	
B.	517.8	334.0	481.8	334.0	147.8	-	36.0	-	522.0	336.5	486.0	336.5	149.5	-	36.0	
C. 3/																
1.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2.	336.7	63.5	306.1	63.5	242.6	30.6	-	-	46.7	27.9	42.4	27.9	14.5	4.3	-	
D.	-	-	-	-	-	-	-	-	29.7	-	17.8	-	17.8	11.9	-	
E.	1208.2	260.3	250.4	153.8	96.6	957.8	-	-	1139.0	234.3	211.2	149.2	62.0	927.8	-	
F.	2673.8	752.9	1585.1	646.4	938.7	988.4	100.3	-	2995.8	789.0	1888.4	703.9	1184.5	944.0	163.4	
II. 4/																
A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
III. 6/																
A.7/	-	-	-	-	-	-	-	-	48.6	-	-	-	-	-	-	
B.7/	18.9	x 5/	-	-	-	-	-	18.9	14.1	x	-	-	-	-	-	
C.8/	112.4	x	-	-	-	112.4	-	-	85.8	x	-	-	-	85.8	-	
D.	45.4	x	-	-	-	45.4	-	-	65.1	x	-	-	-	65.1	-	
E.	314.3	80.0	100.0	80.0	20.0	214.3	-	-	340.0	x	-	-	-	340.0	-	
F.	491.0	80.0	100.0	80.0	20.0	372.1	-	18.9	553.6	x	-	-	-	490.9	-	
IV.	3164.8	832.9	1685.1	726.4	958.7	1360.5	100.3	18.9	3549.4	789.0	1888.4	703.9	1184.5	1434.9	163.4	

(Continued on next page)

Summary of Proposed Financing (Continued)

Eth.$'000

	Project Years														
	Year 5								Year 6						
	Requirements1/		Sources						Requirements1/		Sources				
			IDA								IDA				
	Total	FE	Total	FE	Local	IEG	Farmers	Other2/	Total	FE	Total	FE	Local	IEG	Farmers
I.															
A.	2124.9	316.7	1911.5	316.7	1594.8	-	213.4	-	2359.7	346.9	2122.2	346.9	1775.3	-	237.5
B.	436.4	281.2	406.4	281.2	125.2	-	30.0	-	7.0	4.1	7.0	4.1	2.9	-	-
C.3/															
1.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	329.5	59.4	299.5	59.4	240.1	-	-	(30.0)	329.5	59.4	299.5	59.4	240.1	-	-
D.	49.5	-	29.7	-	29.7	-	-	(19.8)	99.0	-	59.4	-	59.4	39.6	-
E.	805.5	145.3	113.3	90.5	22.8	692.2	-	-	174.6	3.8	-	-	-	174.6	-
F.9/	3745.8	822.6	2760.4	747.8	2012.6	692.2	243.4	-	2969.8	414.2	2488.1	410.4	2077.7	214.2	237.5
II. 4/															
A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	-	-	-	-	-	-	-	-	103.7	x	-	-	-	103.7	-
C.	-	-	-	-	-	-	-	-	103.7	-	-	-	-	103.7	-
III.6/															
A.7/	102.6	x 5/	-	-	-	-	-	102.6	174.6	x	-	-	-	-	-
B.7/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.8/	-	-	-	-	-	-	-	-	79.8	x	-	-	-	-	-
D.	-	-	-	-	-	-	-	-	45.3	x	-	-	-	45.3	-
E.	338.0	x	-	-	-	338.0	-	-	338.2	x	-	-	-	338.2	-
F.	440.6	x	-	-	-	338.0	-	102.6	637.9	x	-	-	-	383.5	-
IV.9/	4186.4	822.6	2760.4	747.8	2012.6	1030.2	243.4	102.6	3711.4	414.2	2488.1	410.4	2077.7	701.4	237.5

(Continued on next page)

Summary of Proposed Financing (Continued)

Eth.$'000

Project Years

	Year 7								Year 8							
	Requirements1/		Sources						Requirements1/		Sources					
			IDA								IDA					
	Total	FE	Total	FE	Local	IEG	Farmers	Other2/	Total	FE	Total	FE	Local	IEG	Farmers	Other2/
I.																
A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.3/																
1.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II.4/																
A.	1721.0	x 5/	-	-	-	-	172.5	1548.5	976.0	x	-	-	-	-	102.3	873.7
B.	3.8	x	-	-	-	3.8	-	-	24.9	x	-	-	-	24.9	-	-
C.	1724.8	x	-	-	-	3.8	172.5	1548.5	1000.9	x	-	-	-	24.9	102.3	873.7
III.6/																
A.7/	225.0	x	-	-	-	-	-	225.0	142.2	x	-	-	-	-	-	142.2
B.7/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.8/	-	x	-	-	-	-	-	-	-	x	-	-	-	-	-	-
D.	95.0	-	-	-	-	-	50.0	45.0	-	x	-	-	-	-	-	-
E.	305.0	-	-	-	-	308.0	-	-	265.4	-	-	-	-	265.4	-	-
F.	625.0	x	-	-	-	305.0	50.0	270.0	407.6	x	-	-	-	265.4	-	142.2
IV.	2349.8	-	-	-	-	308.8	222.5	1818.5	1408.5	-	-	-	-	290.3	102.3	1015.9

(Continued on next page)

FOOTNOTES TO TABLE 6

1/ Requirements are those not met by cash surpluses generated by the organization itself. See also note 2/.

2/ "Other" means AID Bank unless otherwise stated. Figures in brackets in this column for I.C.2. and D. refer to development expenditure financed by cash surplus generated. Figures in brackets do not get included in subsequent totals in this table. Because of the financing method proposed, most of Aid-bank's contribution will come from interest earned on the IDA Credit.

3/ The list of development costs in this table include those of the Engineering Unit of TAHECU. Hence the total of development costs in this table is not the same as that in Annex VIII, Table 1.

4/ The replacement costs of all organizations except TAHADU are covered by the organizations' cash surplus.

5/ The symbol x indicates that the foreign exchange component has not been calculated because, except where IDA finance is concerned, this is not necessary. The symbol - indicates that the amount is zero or negligible.

6/ Requirements for working capital show incremental working capital.

7/ The figures in these two lines are net of repayments of principal from the previous year's short term borrowing.

8/ The figures in this line exclude TAHECU's recourse to the commercial banks for overdraft facilities to cover stock holding and incremental working capital after year 5. See also note 1/ to Annex III, Table 17.

9/ The elements in this line may not add up to the total because some development costs are financed from generated surplus. See note 2/.

PROJECT CONSOLIDATED BUDGET

Table 7 - Proposed IDA Financing Over Six Years

Eth.$'000

	Item	Project Years Year 1 Total	Year 1 FE	Year 2 Total	Year 2 FE	Year 3 Total	Year 3 FE	Year 4 Total	Year 4 FE
I.	Farmers Development Costs	-	-	131.2	24.3	546.8	95.1	1131.0	190.3
II.	Primary Coops Dev. Costs	-	- -	238.8	165.8	481.8	334.0	486.0	336.5
III.	TAHECU Coop Union " "								
	A. Engineering Unit	253.7	195.3	19.8	12.9	-	-	-	-
	B. Other	95.1	60.3	32.8	10.7	306.1	63.5	42.4	27.9
IV.	Cooperative Ranch " "	-	-	443.0	130.4	-	-	17.8	-
V.	TAHADU " "	1898.8	1036.5	386.5	243.8	250.4	153.8	211.2	149.2
VI.	TAHADU Recurrent Costs	100.0	80.0	100.0	80.0	100.0	80.0	-	-
	TOTAL (I to VI)	2347.6	1372.1	1352.1	667.9	1685.1	726.4	1888.4	703.9

	Item	Year 5 Total	Year 5 FE	Year 6 Total	Year 6 FE	Years 1 to 6 Total	Years 1 to 6 FE
I.	Farmers Development Costs	1911.5	316.7	2122.2	346.9	5842.7	973.3
II.	Primary Coops Dev. Costs	406.4	281.2	7.0	4.1	1620.0	1121.6
III.	TAHECU Coop Union " "						
	A. Engineering Unit	-	-	-	-	273.5	208.2
	B. Other	299.5	59.4	299.5	59.4	1075.4	281.2
IV.	Cooperative Ranch " "	29.7	-	59.4	-	549.9	130.4
V.	TAHADU	113.3	90.5	-	-	2860.2	1673.8
VI.	TAHADU Recurrent Costs	-	-	-	-	300.0	240.0
	TOTAL (I to VI)	2760.4	747.8	2488.1	410.4	12521.7	4628.2

PROJECT CONSOLIDATED BUDGET

Table 8 - Proposed IEG Financing Over Eight Years

Eth.$'000

		Project Years								
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Years 1 to 8
I.	TAHECU Coop Union Dev. Costs									
	A. Engineering Unit Dev.Costs	25.4	2.0	-	-	-	-	-	-	27.4
	B. Other " "	9.5	3.3	30.6	4.3	-	-	-	-	47.7
II.	Cooperative Ranch Dev. Costs	-	174.6	-	11.9	-	39.6	-	-	226.1
III.	TAHADU Development Costs	547.9	836.2	957.8	927.8	692.2	174.6	-	-	4136.5
IV.	TAHADU Replacement Costs	-	-	-	-	-	103.7	3.8	24.9	132.4
V.	TAHECU Incremental Working Capital	16.9	74.2	112.4	85.8	-	-	-	-	289.3
VI.	Coop. Ranch Incremental Working Capital	-	149.8	45.4	65.1	-	45.3	-	-	305.6
VII.	TAHADU Recurrent Costs (Net of Revenue)	209.5	275.8	214.5	340.0	338.0	338.2	305.0	265.4	2286.2
VIII.	TOTAL (I to VII)	809.2	1515.9	1360.7	1434.9	1030.2	701.4	308.8	290.3	7451.2

APPENDIX A

BIBLIOGRAPHY

Beyen, Daniel — Development of the Shire Lowlands Development Bank. March 1968

Bolton, M. — Report on an Investigation of the Wildlife of Shire Awraja in the Province of Tigre Wildlife Department. February 1971.

Central Statistics Office — Report on a Survey of Tigre Province 1967

Cossins, N. — A Study of People and Their Cattle in the Shire Lowlands LMB. May 1971.

Electroconsult — Water Resources Potential in the Barca, Marab-Gash, and Tekezzie - Setit Basins December 1971, Milan (Draft)

Ellman, A.O. — Report of a Survey of Land Use, Land Allocation And Project Administration, Shire Lowlands Development Project. LMB October 1971.

I.B.R.D. — Ethiopia: Development of the Livestock Indusrty. P.M.E.A. November 1970

Imperial Highway Authority — Engineers Inspection Report of Inda Sellassie - Sheraro Yirga Feeder Road IHA March 17, 1971. Ato Mekonnen Rumicho.

Livestock and Meat Board
(i) Provincial Livestock Development Study, Tigre 1970
(ii) Report of the Trip to Asmara Concerning Marketing for Shire Project. Eng. Tucovic. December 1970
(iii) A Study of the Eritrean Market for Cattle Eng. Tucovic. and Ato Woldu G/Mikael (Technical Agency) December 1970.
(iv) Household Survey of Tach Adiabo and Hedekti Weredas. 1970
(v) Land holding Systems in Tach Adiabo and Hedekti Weredas. 1970

Ministry of Agriculture — Agricultural Development in the Shire Awraja May 1970

Ministry of National Community Development — Prefeasibility Study of Shire Lowlands September 1968.

Ministry of Land Reform and Administration — Report on Land Tenure Survey in Tigre Province January 1969

Ministry of Mines (i) Hydrogeological Investigations in Sheraro [illegible] Areas.

(ii) Recommendations Following Visit to Sheraro
May 1971

Royal Veterinary College (i) Preliminary Report. A Veterinary Survey of Cattle in the Shire Lowlands, Tigre Province
LMB. September 1971.

(ii) Ethiopia Research Team. Volume Two. 1971

Stanford Research Institute Development of the Ethiopian Livestock Industry. Report No. 7
1969.

Watson, Dr. M. Land Use in the Shire Lowlands
March 1972.

A P P E N D I X B

Economic Benefits and Justification of the Project

B.1 Paragraph 3.01 of the text of this application sets out the objectives and targets for this project. Paragraph 5.01 of the text summarises the results of the calculations of economic benefits and their justification. This appendix examines some of the details and assumptions lying behind the objectives and the calculations in respect of three of these objectives or targets. The three are the economic rate of return to investment, the net farm income of participating farmers, and the establishment of a pattern for medium-cost resettlement (Paragraph 3.01 of the text, subparagraphs (3), (4) and (6) respectively).

B.2 The Goals of Government Economic Policy

Page 35 of the Third Five Year Development Plan (1968 - 1973) states the published goals of government economic policy, which in summary are:-

(i) the fastest possible growth of the economy and a steady improvement in the cultural and social welfare of the Ethiopian people.

(ii) a steady and perceptible rise in per capita incomes.

(iii) the building of strong foundations for rapid growth and development in the future.

(iv) Without sacrificing the foregoing, a gradual improvement in inter-personal and inter-regional distribution of income.

As can be seen, this statement of policy is highly growth-oriented, and it remains the official published government statement of economic policy. Nevertheless both in the speech from the Throne in which the Third Five Year Plan was introduced, and elsewhere in the plan document, employment-generation and a more equitable distribution of income were stressed as important aims of policy. Since the Third Five Year Plan was formulated and published, there appears to have been a significant shift in official opinion towards greater emphasis on employment-generation and income-distribution. The shift, however, has not yet resulted in a revised published or well-publicised statement of policy.

B.3 Economic rate of return calculations

The calculations of the overall economic rate of return are based on a number of assumptions or short cuts in the calculations, the most significant of which are as follows:-

(a) Prices of inputs (e.g. vehicles, machinery, etc.) used in the calculations are inclusive of taxes and duties. Most economists would agree that such taxes and duties should be excluded from the evaluation of economic costs to society as a whole. To that extent, therefore, real economic costs have been overstated and the net economic benefits of the project undervalued. But only in respect of vehicles (costing a total of Eth$613,000 out of total development costs of Eth$17,500,000) is the rate of

taxes/duties a really significant proportion of the final price) and for this reason, and in order to avoid the confusion that would arise if two different sets of figures were used for costs in the financial and economica analyses, with - tax prices have been used throughout.

(b) All labour, except that of participating farmers, is valued at its money wage. No adjustment is made for any possible divergence (downwards) between real-resource costs and financial costs in respect of unskilled labour or (upwards) in respect of skilled labour.

(c) The (real, social) opportunity cost of the labour of each participating farmer - and of the land in the project area which he used prior to the start of the project - is assumed to be equal to the value of the net income which he obtained, prior to the project, from farming in the project area. This net income drawn from the project area prior to the project is estimated at Eth$283 per farmer per year in the case of resident farmers, and Eth$257 in the case of migrant (Mofer Zemach) farmers. Note that net farm income is the return to both land and labour as factors of production. The implication is that the social opportunity cost of that part of the labour of Mofer Zemach which he now expends outside the project area in the highlands is zero. In the light of the current overcrowding and consequent erosion in the highlands this appears to be entirely reasonable. It is also assumed that the real marginal product and hence the social opportunity cost (subject to changes in the prices of sorghum and cattle) of labour and land in the project area remains constant throughout the life of the project. The project main economic benefits are, therefore, calculated on the basis not of the gross output from the project but of the incremental incomes of participating farmers.

(d) In forecasting the future price of sorghum, which is forecast to go down as a result of a general increase in production from this as well as from other projects, no attempt has been made to allow for any "consumers' surplus" arising from the downward effect on price exerted by expansion of sorghum output from this project.

(e) The cost of some of the animal vaccines, (e.g. rinderpest) whose consumption will increase as a result of the project, has not been costed to the project, since they are normally issued free by the government. Increased use of other vaccines which are not normally issued free has been costed to the project.

(f) Domestic consumption of water made available under the project (see text 3.95(g) paragraph and Annexe II, Table 5, 6, 7) has been valued at Eth$0.50 per m^3, although the consumers will pay for this water through a flat rate subscription to the Primary Cooperative. This price (of $0.50 per m^3) is the same as that charged to urban consumers in Ethiopia, among them people receiving the same levels of income as will be obtained by farmers participating in the project. Benefits arising from the installation of flour mills are more difficult to evaluate, since less is known about charges actually levied by private rural millers, and about seasonal fluctuations in these charges. The benefits of provid...

milling services to village members have, therefore, been valued at the cost of providing them, and this valuation is thought to be less than the charges actually levied by private millers in similar areas in Ethiopia, and therefore less than the consumers of such services are actually willing to pay (which is the real test of value). The valuation of milling services is, therefore, conservative.

(g) While the forecast of increases in the yields of crops grown by the model participating farmer is closely related and tied in to the forecast use by him of new inputs up to and including farmer's year 5, thereafter a flat rate 5% per annum increase in yield is forecast for the next 5 years without any corresponding increase in the forecast of identifiable purchased inputs by the farmer. The explanation and justification for this lies in the crop trials to be implemented in the first five years of the project, and in the continuation of the agricultural extension service and of access to credit facilities thereafter. The crop trials will almost certainly encourage some technical innovations involving no net increase (only changes in composition) in the inputs already costed into the project (e.g. improved seeds, new types of pesticides, better combinations of fertilisers). They will also encourage some innovations which do involve a net increase in inputs, but since we do not know what they are we cannot cost them. It is also extremely probable that there will be a switch in cropping pattern away from low-value sorghum to other higher-value crops which the trials show to be well - adapted to the project area. Therefore, the forecast increase in crop yields of 5% per annum from farmers' year 5 to farmers' year 10 is best regarded not as a costless improvement, but as the net residual between the cost of the increased use of inputs and the benefit of the increased value of output, where the prices, form and value of both the inputs and outputs are not known at this time. One of the most important effects of a project of this kind is to put a mass of previously traditional farmers into a continuing relationship with advances in agricultural marketing and technology and with the means (e.g. extension and credit) of incorporating this technology into farming operations. Not to "allow for" this effect in the calculations (e.g. by this 5% per annum increase in yields) would be to systematically down-grade this kind of technologically flexible project in relation to other projects (e.g. petro-chemical plants) whose level of technology is fixed at the point of ordering the equipment and before production even starts.

(h) The quantification of economic benefits in the internal-rate-of-return calculations includes certain "storage benefits" (Annex VIII Table 4, II, C) valued at between Eth$50,400 and $67,200 per year from year 4 of the project onwards. The basis of this is the assumption that 10% of the amount of sorghum sold at the farm gate in the years prior to the project is lost through poor storage in trade channels, and that this source of loss can be eliminated by the better storage facilities to be provided by the project. Prior to the project each farmer is estimated to sell 4 quintals of sorghum, making 48,000 quintals for all participating farmers.

10% of this, valued at Eth$14 per quintal, is Eth$67,200. The reduction in storage benefits from Eth$67,200 in project years 4-6 to Eth$50,400 thereafter is due to the prospective fall in the sorghum price from Eth$14 to Eth$10.50 per quintal.

(i) The quantification of economic benefits also includes certain "road benefits" (Annexe VIII Table 4, IV, A) ranging from Eth$94,300 per year to Eth$64,700. The justification for these benefits is the reduction in transport costs, brought about by the improvement of the Sheraro to Enda Selassie road to be constructed with project-finance, involved in transporting the marketed output of those farmers in the project area at any time who are not yet incorporated in the project, and of other farmers who farm near the road between the project area and Enda Selassie. The forecast decrease in road benefits from project year 2 to project year 5 is due to the successive incorporation of farmers farming within the project area into the project - and once they are incorporated, the effect of the improved road is already taken into account in calculating their incremental net incomes. Further details of the calculation of these road benefits can be obtained from the Project Office of the Livestock and Meat Board. Major assumptions in respect of road benefits accruing from farming between the project area and Enda Selassie are:

i) A decrease in transport cost of Eth$.005 per quintal/kilometer as a result of improvement to the road.

ii) 40% of the area within 20km of the road between the project area and Enda Selassie is cultivated.

iii) Cropped land within 10kms of the project area to Enda Selassie exports, on average, 2 quintals/ha along the road from the point on the road nearest to it, and cropped land between 10 and 20 kms similarly exports, on average, 1 quintal per ha.

(j) When the operations of the cooperative ranch are viewed in isolation, the internal-rate-of-return-to-investment in it is only 11%, (see Annexe IV Table 6), which is only marginally above the 10% cut-off rate suggested by the Planning Commission. Moreover, no dividends can be paid on capital invested until the 7th year of operations, and then only at a modest rate until the 16th year. Prima facie this might suggest that the ranch is a marginal investment that could be dispensed with. However, there are two facets of the ranch's operations which bring about external benefits not reflected in the ranch's own cash flow, and which make it a better-than-marginal investment. The first of these is that it is on this ranch that improved methods of range-management appropriate for the project area can be tried and elaborated.

Once appropriate range-management techniques have been established they can be applied also on the village grazing areas, thus greatly increasing the maximum sustainable stocking rates on these areas. It is unlikely that optimum range-management techniques can be established solely or directly from small-scale pilot plots run by the project's crop and animal trials element; and it is also unlikely that satisfactory large scale trials can be run on the village grazing areas. The second external effect arises from the fact that the commercial ranch will

young cattle bred and reared on village grazing areas, thereby facilitating the enforcement of stocking limits in these areas, and improving the net incomes of participating farmers.

(k) Some sensitivity analysis has been carried out in order to determine the project's net present value, and internal-rate-of-return-to investment, under alternative assumptions. The results for three alternative sets of assumptions are given below.

(the assumptions used elsewhere throughout this document are referred to as "the most probable" assumptions). The alternatives are:-

a) Alternative A. Identical in all respect to the most probable assumptions except that:-

i. The bean yield is estimated to remain constant at 9 quintals/ha (equivalent to a gross income per ha. for beans of Eth$200)

ii. The yields of all other crops do not rise above the level forecast under the most probable assumptions for farmer's year 5.

b) Alternative B. Identical in all respects to the most probable assumptions except that:-

i. The bean yield is estimated to remain constant at 5.5 quintals per ha. from farmer's year 4 onwards (equivalent to a gross income per ha for beans of Eth$120.

ii. The yields of all other crops do not rise above the level forecast under the most probable assumptions for farmer's year 5.

c) Alternative C. Identical in all respects to the most probable assumptions except that the bean yield is estimated to remain constant at 5.5. quintals per ha from farmer's year 4 onwards (equivalent to a gross income per ha for beans of Eth$120)

Assumption	Net present Value at 10% (Eth$ million)	Internal rate of return
The most probable assumptions	8.9	17.2%
Alternative A	2.5	13.2%
Alternative B	1.2	10.4%
Alternative C	7.2	15.0%

B.4 The net income of participating farmers

That part of the pre-project net income of farmers expected to participate in the project which they draw from their farming activities within the project area is estimated at about Eth$280 per annum in the case of residents and about Eth$260 in the case of migrants (Mofer Zemach). Of course both classes of farmers probably also derive some income from economic activities outside farming or outside the project area. It has not proved possible to estimate how much this outside income might amount to. It is unlikely to be substantial since activities within the project area would keep both residents and migrants busy at the time when labour opportunities outside (e.g. at Setit Humera) offer the best opportunities for wage-earning, and the highland farms of the Mofer Zemach are probably both tiny (45% of Tigre farmers have holdings of less than 0.5 ha) and unproductive. Annual average incomes of Ethiopian farmers as a whole, including subsistance, are thought to be about Eth$250 - 300 per annum.

B.5 The proposals are to allocate each farmer participating in the project a 5ha. plot of crop-land, from which, together with his livestock enterprises, it is expected that he will be able to obtain a net income of nearly Eth$400 by the 3rd year of his participation in the project, Eth$450 from the 4th - 8th years, over Eth$500 from the 10 to the 13th, and almost Eth$700 from the 14th year onwards. The overall annual rate of increase in his net income is about 7% per annum, and would put the participating farmer on the same level at the end of 14 years as the present day government or industrial worker earning Eth$58 per month (the value of money is assumed to remain constant over the whole period).

B.6 The net incomes of participating farmers would be reduced if smaller areas of crop-land were allocated to each. The figure of 5ha. of crop land per farmer has been chosen for both administrative and economic reasons. Whilst the major aim of the project is to settle as many farmers from the overcrowded highlands as possible, to aim at smaller holdings than 5ha. would involve dispossessing large numbers of small farmers of land they already occupy. This would pose major administrative problems. Moreover the forecast rate of growth and level of final income appears to be an appropriate target (there is no IEG policy on what target incomes are appropriate for agricultural projects). Such a target must be related both to what the government would like participating farmers to achieve, given the huge number of poor farming families and the meagreness of IEG's resources to help them, and what it is necessary to offer them in order to convince them of the desirability of the changes in land-tenure practices proposed. The length of time which it will take to achieve an annual net farm income of Eth$700 must also be considered.

B.7 Investment costs per participating farmer

The investment cost of the project amounts to Eth$1,430 (17.2million/12,000) per participating farmer, or Eth$2,040 (24.4million/12,000) if the somewhat arbitrary distinction between project investment cost and recurrent costs is ignored (both are financed out of the IEG's development budget). These figures are reasonable, and even low in comparison with typical figures for investment costs on similar schemes both in Ethiopia and elswhere. At the World-Bank financed WADU Project, costs per settler were forecast at Eth$3,330. In the Awash Valley Development Programme's draft master plan (FAO, March 1972) investment costs per settler of Eth$14,700 were proposed. In agricultural developments in Kenya in the early nineteen sixties, investment costs per settler on dry-land settlement schemes ranged from the equivalent of Eth$1,990 on the cheaper high-density sort of schemes, up to Eth$2,200 on the more expensive (low density). If Eth$2,000 per farm were invested in providing better economic opportunities for each of Ethiopia's approximately 5 million families who live at inadequate income levels, it would [illegible]

equivalent to the next 19 years of the IEG's development budget expenditure if this grows at a rate of 12% per annum from its present level (average 1969/70 - 1971/72) of Eth$150 million per annum. If the rate of growth of the development budget is 8% it is the equivalent of 23 years' expenditure, or of 31 years if it is only 5%. Whilst too many arguments can not be based on these calculations, which ignore both the role and effect of private investment and the inevitably non-social objectives of much of any government development expenditures, it does suggest that this project does not involve expenditure per participating farmer that is unrealistically extravagant in terms of IEG's planning horizons and social objectives. In fact this project may serve as a model for further developments in the eastern lowlands of Begemidir and the drier and lower areas of the Takazze basin in Tigre, Begemidir and Wollo.

APPENDIX C

PROJECT STAFFING REQUIREMENTS

INSTITUTION	P O S I T I O N'	LEVEL	ANNUAL WAGE ETH.$	P R O J E C T Y E A R S						
				1	2	3	4	5	6	7-20
I. TAHADU DEVELOPMENT UNIT										
A. Co-operative Development Department	Head of Department	LH	9,600	1	1	1	1	1	1	-
	Coop Ed. Officer	LH	7,920	1	1	1	1	-	-	-
	Coop Supervisor	LH	7,920	5	1	1	1	1	1	1
	Asst. Coop.Ed. Officr	LM	4,800	3	4	4	3	-	-	-
	Coop Inspector	LM	4,800	-	1	1	2	2	2	2
B. Extension Services	Head of Dept. (exp.)	FH	100,000	1	1	1	-	-	-	-
	" " " (local)	LH	9,600	-	-	-		1	1	1
	Deputy Head of Dept.	LH	9,000	1	1	1	-	-	-	-
	Supervisors	LH	7,920	1	1	2	3	3	3	1
	Extension Agents	LM	4,800	3	6	18	25	24	13	4
	Asst. Extension Agents (i) in training	LL	3,000	18	36	21	-	-	-	-
	(ii) on the job	LL	3,000	-	18	54	75	75	45	20
C. Crop and Animal Trials	Senior technician	LH	7,200	1	1	1	1	1	-	-
	Junior Technician	LL	3,600	1	3	3	3	3	-	-
	Clerk/Storekeeper	LL	3,600	1	1	1	1	1	-	-
	Guards	LL	360	4	10	10	10	10	-	-
	Drivers	LL	2,400	1	1	1	1	1	-	-

FH = Foreign High Level
LH = Local High Level (University graduate)
LM = Local Medium Level (Two years training)after 12th Grade)
LL = Local Low Level (All Others)

INSTITUTION	POSITION	LEVEL	ANNUAL WAGE ETH.$	project years						
				1	2	3	4	5	6	7-20
D. Training Center	Instructor	LH	7,200	.5	1	1	1	1	1	1
	Assistant Instructor	LL	1,800	.5	1	1	1	1	1	1
	Driver	LL	2,400	.5	1	1	1	1	1	1
	Labourers	LL	500	2x.5	2	2	2	2	2	2
	Cook Stewards	LL	360	2x.5	2	2	2	2	2	2
	Guards	LL	360	1	1	1	1	1	1	1
E. Veterinary Dept.	Head of Dept.	LH	10,200	1	1	1	1	1	1	1
	Animal Health Asst.	LM	4,800	1	1	1	2	2	2	2
	Vaccinators	LL	1,500	3	3	4	6	6	6	6
	Drivers	LL	2,400	1	1	1	2	2	2	2
F. Road Section	Road supervisors	LH	7,800	1	1	1	1	1	-	-
	Mechanic	LM	4,200	1	1	1	1	1	-	-
	Operator	LM	4,200	4	4	3	3	3	-	-
	Operator's Asst.	LL	720	4	4	4	4	4	-	-
	Driver	LL	2,400	4	4	4	4	4	-	-
	Time Keeper	LL	900	1	1	1	1	1	-	-
G. Land Planning Dept.	Head of Dept(exp)	FH	100,000	1	1	-	-	-	-	-
	" " " (local)	LH	9,600	-	-	1	1	-	-	-
	Section heades	LH	7,200	3	3	3	3	-	-	-
	Surveyors	LL	2,400	6	6	6	6	-	-	-
	Chainmen	LL	960	12	12	12	12	-	-	-
	Drivers	LL	2,400	3	3	3	3	-	-	-
	Draughtsman	LM	3,600	1	1	1	1	-	-	-
	Labourers	LL	200	18	18	18	18	-	-	-
H. Land Adjudication Department.	Land Adjudication Officer	LH	9,600	1	1	1	1	1	-	-
	Asst. Land Adjudication Officer	LH	7,200	1	3	3	3	1	-	-
	Driver	LL	2,400	1	1	1	1	1	-	-

INSTITUTION	POSITION	LEVEL	ANNUAL WAGE ETH.$	PROJECT YEARS 1	2	3	4	5	6	7-20
I. Land Administration Department	Hwas of Dept.	LH	9,600	0.5	1	1	1	1	1	1
	Senior Clerk	LM	4,800	0.5	1	1	1	1	1	1
	Clerk	LL	3,600	-	-	-	1	1	1	1
	Driver	LL	2,400	0.5	1	1	1	1	1	1
J. Finance & Administration Services	Project Director	LH	14,400	1	1	1	1	1	1	-
	Fin. & Adm. Officer	LH	9,600	1	1	1	1	1	1	-
	Cashier	LM	4,800	1	1	1	1	1	1	-
	Accounts Clerks	LL	3,600	1	2	2	2	2	2	2
	Personal Secretary	LM	7,200	1	1	1	1	1	1	-
	Typist	LL	3,600	2	2	2	2	2	2	2
	Messengers	LL	600	4	4	4	4	4	4	4
	Guards	LL	360	3	3	3	3	3	3	3
	Cleaners	LL	300	3	3	3	3	3	3	3
	Drivers	LL	2,400	1	1	1	1	1	1	1
	Water point attendant	LL	1,200	1	1	1	1	1	1	-
II. TAHECU CO-OPERATIVE UNION										
A. Engineering Unit	Chief Engineer	FH	100,000	1	1	1	1	1	-	-
	" "	LH	12,000	-	-	-	-	-	1	1
	Chief Mechanic	LM	5,400	1	1	1	1	1	1	1
	" Mason	LM	5,400	1	1	1	1	1	1	1
	" Carpenter	LM	5,400	1	1	1	1	1	1	1
	Mobile Unit foreman	LM	4,800	1	1	1	1	1	1	1
	Driver (Tractor)	LL	1,200	1	1	1	1	1	1	1
	Guard	LL	360	1	1	1	1	1	1	1
	Helpers	LL	600	2	5	5	5	5	5	5

INSTITUTION	POSITION	LEVEL	ANNUAL WAGE ETH.$	PROJECT YEARS 1	2	3	4	5	6	7-20
B. H. Q. Unit	General Manager	LH	12,000	1	1	1	1	1	1	1
	Department Head	LH	10,800	-	-	1	1	1	1	1
	Section Heads	LH	7,200	1	1	1.5	2	2	2	2
	Clerks	LL	3,000	1	1	1	1	1	1	1
	Secretaries	LM	4,800	2	2	2	2	2	2	2
	Supply Storekeeper	LL	1,850	-	.5	1	1	1	1	1
	Marketing Section Head	LH	7,200	-	-	.5	1	1	1	1
	Guards	LL	360	1	1.5	2	2	2	2	2
C. crop store	Crop Storekeeper	LL	3,600	-	-	-	12	12	12	12
	Driver/loader	LL	900	-	-	-	72	72	144	216
	Casual labour	LL	312.5				414	649	842	1370
	Guard	LL	360	-	-	6	12	18	24	36
III. CO-OPERATIVE RANCH	Ranch Manager	LH	9,600	-	-	1	1	1	1	1
	Asst. Ranch Manager	LM	4,800	1	1	1	1	1	1	1
	Clerk/accountant	LL	3,600	1	1	1	1	1	1	1
	Driver	LL	2,400	1	1	1	1	1	1	1
	Headmen	LL	720	2	2	3	3	3	4	3
	Borehole/dip operators	LL	1,200	2	2	2	2	2	2	2
	Permanent staff	LL	480	42	43	49	45	61	75	65
	Temporary staff	LL	300	5	5	5	5	5	5	5
IV PRIMARY CO-OPERATIVES	Foreman	LL	900	-	3	6	9	15	20	20
	Casual labour	LL	300	-	12	24	36	60	80	80
A. Grazing Grounds	Pump/Dip supervisor	LL	1,200	-	1	3	4	5	5	5
B. Village Facilities	Secretary/accountant	LL	1,800	-	3	6	9	15	20	20
	Clerk/Storekeeper	LL	960	-	3	6	9	15	20	20
	Miller/Pump Supervisor	LL	600	-	3	6	9	15	20	20
	Asst. Supervisor	LL	120	-	3	6	9	15	20	20
	Labourers	LL	300	-	3	12	18	30	40	40

APPENDIX D

PROJECT AREA METEOROLOGICAL DATA

Table 1: Rainfall (mm)

	Badume			Sheraro		Endatelewa		
	1966	1967	1968	1971	1972	1967	1968	1971
January	N.A	N.A	N.A	N.A	0	N.A	N.A	N.A
February	N.A	N.A	N.A	N.A	0	N.A	N.A	N.A
March	N.A	N.A	N	N.A	-	N.A	N.A	N.A
April	N.A	N.A	8.1	N.A	N.A	N.A	22.0	13
May	35	N.A	71.0	N.A	N.A	N.A	62.5	26
June	166	N.A	157.0	161.7	N.A	144.5	173.5	133
July	126	294.87	113.2	176.0	N.A	350.3	166.9	245
August	59	261.4	72.8	187.1	N.A	123.8	210.4	211
September	14	55.6	30.1	22.1	N.A	133.5	69.4	N.A
October	N.A	14.4	8.4	0	N.A	20.8	8,8	N.A
November	N.A	N.A	N.A	0	N.A	N.A	N.A	N.A
December	N.A	N.A	N.A	0	N.A	N.A	N.A	N.A

Table 2: temperature at Badume

(Degrees Centigrade)

	1 9 6 7		1 9 6 8	
	Max.	mm.	Max.	mm.
January	N.A	N.A	33.1	14.5
February	N.A	N.A	31.2	15.0
March	N.A	N.A	36.0	18.1
April	N.A	N.A	35.0	19.0
May	N.A	N.A	39.5	17.5
June	32.4	18.9	35.1	18.4
July	29.7	18.5	33.6	18.9
August	28.0	18.0	32.2	17.4
September	30.9	17.5	35.7	17.6
October	33.3	17.7	35.3	17.7
November	33.1	16.9	N.A	N.A
December	32.5	15.4	N.A	N.A

FERTILIZER TRIALS

ADIABO AREA

1969	Soil	Control	Yields in Q/ha Increase with application of			
			N	P	NP	NPK
Sesame	Bl. clay	0.9	0.6	0.6	1.5	1.8
	Bl. clay	0.9	0.5	0.8	2.1	2.6
Sorghum	Bl.clay	19.0	11.0	7.0	20.0	16.0

This was an application of 40 kgs/ha of N. as Urea plus 46kgs/ha of P_2O_5 as triple superphosphate.

* Source - Agricultural Development in the Shire Awraja. A prefeasibility study carried out during May 1970 for the steering Committe for the identification of New Agricultural Development Projects.

APPENDIX F

RESULTS OF SOIL ANALYSIS IN PROJECT AREA

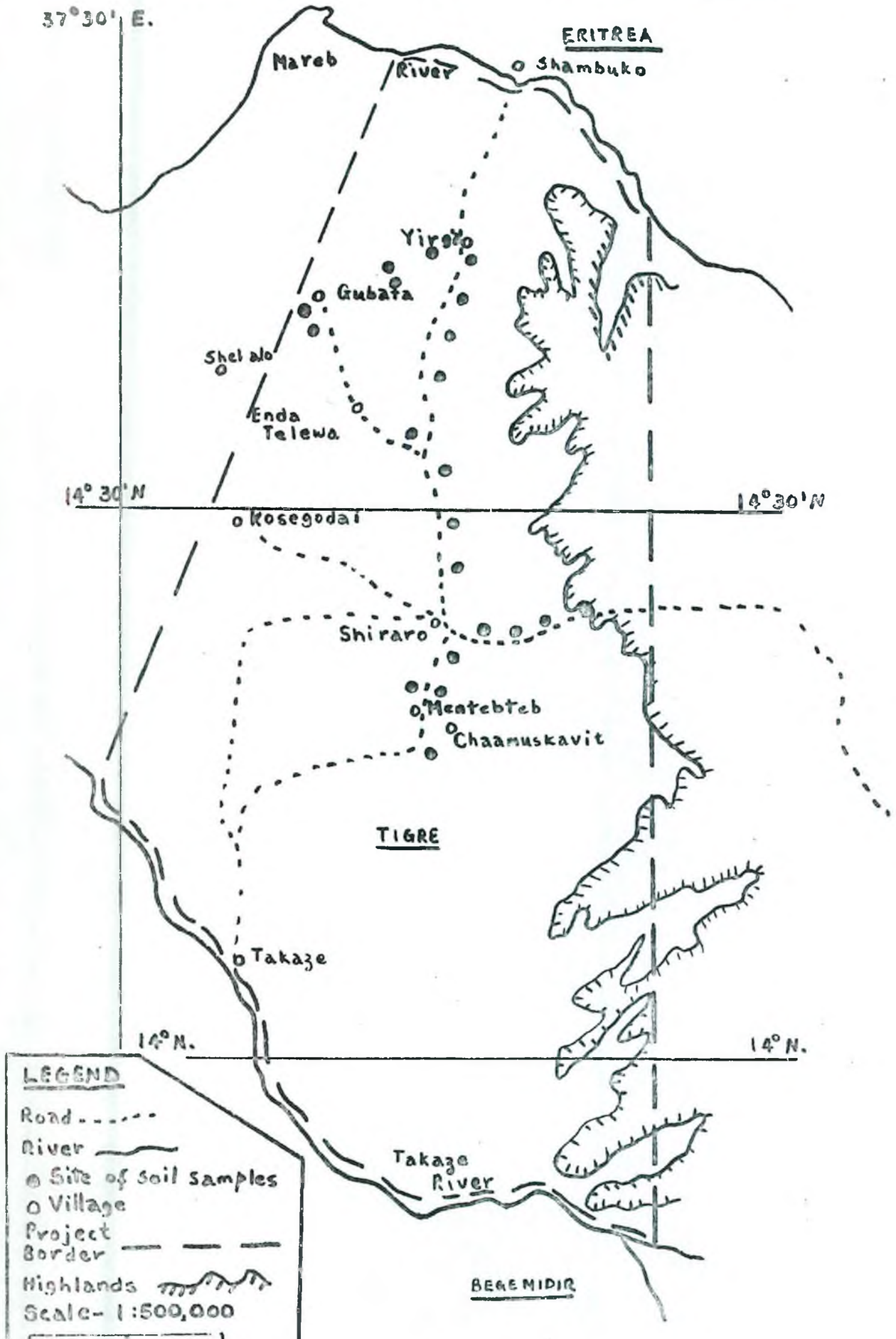
	FIELD DESIGNATION DEPTH AND COLOUR OF SAMPLE										
	1	2	3	4	5	6	20	13	14	15	16
	TOPSOIL RED	TOPSOIL RED	TOPSOIL RED	TOPSOIL RED	TOPSOIL RED	SUBSOIL RED	TOPSOIL RED	TOPSOIL YELLOW/RED	TOPSOIL YELLOW/RED	TOPSOIL YELLOW/RED	TOPSOIL YELLOW/RED
PH	6.5	6.1	6.4	6.5	6.4	6.2	7.6	6.6	6.5	7.6	6.3
Name %	0.38	0.32	0.32	0.22	0.23	0.33	0.32	0.32	0.31	0.29	0.37
K me%	0.80	0.80	1.18	1.04	1.06	0.62	1.08	3.00	3.30	3.30	4.09
Pppm	45	15	45	21	27	11	36	27	30	65	38
N%	0.47	0.37	-	1.03	-	-	-	-	-	-	1.08
C%	0.59	0.59	0.34	1.54	1.37	1.25	0.87	2.61	1.96	1.49	1.58
C/N	1.25	1.59	-	1.53	-	-	-	-	-	-	1.46

	FIELD DESIGNATION, DEPTH AND COLOUR OF SAMPLE									
	17	19	11	18	21	23	24	25	27	18
	TOPSOIL LIGHT BROWN	TOPSOIL LIGHT BROWN	TOPSOIL LIGHT BROWN	SUBSOIL DARK	TOPSOIL BLACK	TOPSOIL BLACK	TOPSOIL BLACK	TOPSOIL BLACK	TOPSOIL BLACK	TOPSOIL BLACK
PH	6.0	6.9	6.0	6.9	6.5	6.7	7.0	7.0	7.5	6.9
Name%	0.28	0.27	0.27	0.32	0.40	0.28	0.31	0.40	0.29	0.32
K me%	3.56	3.96	1.12	1.24	3.00	2.37	2.37	2.20	2.31	1.24
Ppm	55	38	30	38	36	38	27	45	65	38
N%	-	-	-	-	0.83	0.66	-	0.78	-	-
C%	1.74	0.89	2.55	0.89	1.01	1.25	1.33	0.93	0.87	0.89
C/N	-	-	-	-	1.22	1.89	-	1.07	-	-

SOURCE: AGRICULTURAL DEVELOPMENT IN THE SHIRE AWRAJA - A PRE-FEASIBILITY STUDY. MINISTRY OF AGRICULTURE, 1969

MAP 3

SITES OF SAMPLES FOR SOIL ANALYSIS



APPENDIX G

RESULTS OF CROP YIELD STUDY IN PROJECT AREA

G.1 A crop yield study was carried out in November and December 1970. It was carried out by staff of the Livestock and Meat Board and the Statistics Unit of the Ministry of Agriculture. Holdings were, as far as possible, randomly selected from among farmers' names on tax lists, and from each holding one field of sorghum and one of sesame was selected. Within each field a $50m^2$ plot was then randomly selected, and the crop from this plot cut and weighed, and the yield per ha. computed.

G.2 Certain problems arose in the course of the study. A considerable amount of substitution among the holdings sampled had to be made, especially in respect of holdings from which the harvest had already been taken. In other cases part of the plot selected for harvesting had already been harvested, and some compensation for this had to be made. In other cases the crop was not ready for harvesting and the farmer was instructed to harvest the plot at a later date and keep it for subsequent weighing. Mofer Zemach (migrant farmers) were under-represented in the sample and so were fields with red soil.

G.3 The results of the study are given in Tables G.1 and G.2 below. Average yields, in quintals/ha., for the two weredas combined were 3.61 and 10.37 for sesame and sorghum respectively. These yields are considerably higher than the average yields for present farming used in the calculations in the present proposals (2 and 7 quintals per ha. for sesame and sorghum respectively). The reasons for the assumption of much lower yields than those measured are:-

a) 1970 was a year of very favourable rainfall.

b) Mofer Zemach were under represented in the sample and so were the poorer soils.

c) Some doubts must be felt about the accuracy of results of the crop-cutting in view of the difficulties encountered.

d) Mr. Ellman who did a detailed study of farming systems came to the conclusion that this yield survey's results unrepresentatively high. This view is supported by the evidence from control plots on fertiliser trials.

TABLE G.1 SESAME YIELDS

a) Location - Tach Adiabo Wereda - Shire Awraja

Sample No.	ub-division	Weighing Straw + Grain kgs.	Results Grain kgs.	Yield/ha. kgs.	Soil type
1	wudas	21	2.25	450	Black
2	"	24	2.5	500	"
3	"	28	3.25	650	"
4	Gubata	18	2.00	400	"
5	"	16.5	2.00	400	"
6	"	22	1.5	300	"
7	Gemahlo	N.A.	.5	100	"
8	"	6	2.5	500	Red
9	"	2.5	1.0	200	Black
10	Biara	21	2.0	400	Red
11	"	9	1.0	200	Red
		Sum	20.50	4,1000	
		Mean	1.86	372.73	
		s.d.	.77	m 160.3	

b) Location - Hedekti Wereda - Shire Awraja

sample No.	Sub-division	Weighing Straw + Grain kgs.	Results Grain kgs.	Yield/ha. kgs.	Soil type
12	Sheraro	6	2	400	Black
13	"	19	2	400	"
14	Adamenti	6	2.5	500	"
15	"	17.5	1.5	300	"
16	Cheameskebet	26	3.0	600	"
17	"	10	1	200	"
18	"	11	1	200	"
19	Maikulbli	13.5	1.5	300	"
20	Zebangedena	36.	2	400	Red
21	Medabe	26	.75	150	Black
22	"	17	2	400	Black
		Sum	19.25	3,850	
		Mean	1.75	350	
		s.d.	.68	224	

Table G.2 SORGHUM YIELDS

a) Location - Tach Adiabo Wereda - Shire Awraja

sample No.	Sub-division	Weighing Straw + Grain kgs.	Results Grain kgs.	Yield/ha. kgs.	Soil type
1	Wudas	2.5	2	400	Black
2	"	N.A.	6	1,200	Black
3	"	14	7.5	1,300	Red
4	Gubata	N.A.	5	1,000	Black
5	"	N.A.	2.75	550	"
6	"	5	4	800	"
7	Gemahlo	2	1.5	300	"
8	"	9.5	6.5	1,300	Red
9	"	7.5	6	1,200	Black
10	Biara	9	6.5	1,300	Red
11	"	4	3	600	Red
		Sum	50.75	10,150	
		Mean	4.61	922.73	
		s.d.	1.97	282.3	

b) Location - Hedekti - Shire Awraja

sample No.	Sub-division	Weighing Straw + Grain kgs.	Results Grain kgs.	Yield/ha. kgs.	Soil type
12	Sheraro	11	8.5	1,700	Black
13	"	9.5	7	1,400	"
14	Adamenti	10.5	8.5	1,700	""
15	"	8.5	7	1,400	"
16	"	4.5	2.5	500	"
17	Cheameskebet	N.A.	10	2,000	"
18	"	3	2.25	450	"
19	May Kuhli	4	2.75	550	Red
20	"	7	4	800	Black
21	"	10	6	1,200	"
22	Zeban Gedna	7	5.5	1,100	Red
23	"	5	3.5	700	"
24	"	8.5	7	1,400	"
25	Medabe	6	4	800	Black
26	"	7.5	5.5	1,100	"
		Sum	84.0	16,800	
		Mean	5.6	1,120	
		s.d.	4	840	

APPENDIX H

SUMMARY RESULTS OF LAND TENURE AND HOUSEHOLD SURVEYS

Part A. Land Holding System in Tach Adiabo and Hedekti Weredas

The information provided here under is based on facts collected from 18 sample Chikas(villages) in both Woredas. All in all in both Woredas there are about 36 Chikas (villages). The survey was carried out in the field by two Ethiopian University service students under the auspices of the LMB and in collaboration with the Ministry of Land Reform and Administration.

System of land holding

In all of the Chikas in the sample the system of ownership of land is gebar*

The gebar land system originated by allotment of the land to the farmers by the Chikashums. The land is believed by the Chikashums as well as the farmers to be originally government land. This allotment was started in 1940 G.C. at the earliest by the Kunamas. Later, highlanders mostly from Eritrea province, who used to graze their cattle in the area as pastoralists, settled as farmers starting from 1952. New settlements are still flourishing in the Woredas. For instance, in June 1970, there were two new settlements in Hadekti Woreda. In all cases, the new farmer applies to the Chikashum orally for allotment of farm land. Then the Chikashum after being paid $1-2 allots a certain amount of farm land. If the new comer wants to be a resident, a plot in the village is given to him to build a house. Always the gebar (farmer) has to bring surety to guarantee the payment of taxes.

Right on Land

The most determining factor as relates to the gebar's (farmer's) right on the land is the payment of land taxes and agricultural income tax on time. As long as land tax is payed, the farmer has a usufructuary right for life. The place of residence of the farmer does not affect his right on the land.

The land is inheritable only if the children had resided in the area before the death of their father.

In 17 of the villages visited land is not inherited equally among sons and daughters. In one village both sons and daughters inherit equally. In all the villages both elder sons and other sons inherit equally.

In 17 villages daughters are not allowed to inherit land. On the other hand, in these villages a daughter even if married inherits land if the father had no male children. In one of these 17 villages, a daughter never inherits land even if the father had no male children. In this case, the land goes back to the brothers of the father. In all the villages visited land division among heirs is done by mutual agreement of the heirs themselves. If not possible, elders arbitrate in 15 of the villages. In one case, in the absence of mutual agreement of heirs the Chikashum arbitrates and if he fails elders arbitrate. In the remaining 2 villages in the absence of mutual agreement of heirs, the uncles (only the father's brothers) arbitrate. Besides, in all the villages visited, questions of inheritance of land are governed by customary law.

Land Allocation

In 13 out of the 18 villages visited, the Chikashum, after the oral application of the new comer, allocates and shows the plots and the boundaries to the new comer by himself. In the remaining 5 villages visited, the allocation of land is made by the Chikashum with the help of three elders.

---

* The word "gebar" comes from the term 'gibir' which means land tax. [illegible] that is subject to land [illegible] called gebar land

The elders advise the Chikashum and act as witness of the allocation procedure. When a new comer is given land no one loses any land. An uncultivated piece of land is given to the new comer. A new comer as a rule gets two types of land: one from the black soil, used mainly to grow sorghum and another from the red soil, used mainly to grow sesame. The size of the plots is not standardized. He can get as much as he can afford to cultivate from the two types of soil. But nowadays, due to shortage of cultivable land and population increase, one person is allowed to farm only about a hectare of land in the red soil. (This is particularly true in Tach Adiabo Woreda). In Hedekti Woreda there is no limit as to the size of the land one may cultivate.

Since there is no rotation of holdings, a new comer is not alloted old holdings with permanent improvment. A farmer does not loss his holding for keeping it idle as long as he pays all taxes. If he keeps it idle and fails to pay taxes, the Chikashum takes back the land and allocates it to another new comer or a resident. Lastly, a word as to the status of married sons and daughters. In 17 of the sample villages only married sons are alloted new land for themselves. But in 1 sample village both married sons and daughters are alloted new holdings to cultivate. However, lately, in 2 villages in the sample, due to shortage of cultivable land, a married son is not alloted a new holding but shares what his father has already cultivated.

Land Transaction

In all the sample villages visited, cases of sale, antichresis or mortgage of agricultural land are encountered. Besides all the Chikashums interviewed have stated that sale, mortgage or antichresis of agricultural land is prohibited since the land is owned by the government.

Particulars about Chikashums

There is a marked difference in the status of Chikashums of the villages of the Woredas. In Tach Adiabo there is one Chief Chika for the whole Woreda and sub-Chikashums responsible to him in each of the villages. The Chief Chikashum is appointed by Leul Ras Seyoum Mengesha and he gets $100 per month for his service. As the head of the Chikashums he prohibits any gebar from farming cultivable areas. Moreover, he is responsible to collect taxes from each village. The sub-Chikashums get no remuneration for their services and are elected by the community.

On the other hand in Hedekti Woreda, there is no such thing as the Chief Chikashum. What prevails is Chikashums in each village responsible to the Woreda governor. Each Chikashum has his area of operation in the village. Services for a Chikashum is for life as long as he does not commit a crime and is acceptable to the government and the community. Only in two of the villages out of 9 visited in Hedekti Chikashums get their post by inheritance while in the remaining villages Chikashums are elected by the community.

Except for the Chief Chikashum in Tach Adiabo, no remuneration is paid to the Chikashums. However, they earn $1-2 when alloting a plot to a new gebar or a mofer zematch, and besides under personal servitude they have their plots farmed and the crops harvested by the gebar.

The duties of Chikashums include land allotment, helping the government in tax collection, acting as middle man between the government and the people and making sure that peace and security prevail in the village and the Woreda at large.

Particulars about Shemagles

The shemagles in both Tach Adiabo and Hedekti villages serve the villages for indefinite number of months or years if accepted by the community.

In all the 18 villages visited, shemagles are elected by the community. In 15 of the villages visited shemagles are appointed temporarily to perform a certain type of duty. But in one village three shemagles are elected to perform all duties for a period of eight years and in another two villages the community elect three shemagles each year. Shemagles are not paid for any of the services they render. Their services, as shemagles include arbitration of disputes between members of the community relating to land, personal property, crime etc. They also act as witness when land is alloted to a new comer. They execute government orders, help in tax collection and appeal to the government when the problems of the community are not resolved. The criteria to be elected as a shemagle include old age, wisdom and ability to tackle certain problems and be in a position to defend the rights of the community.

Particulars about Gobez Alekas

In all the villages visited one Gobez Aleka is elected by the community of each village for temporary period of time; as long as he fulfills the aspirations and desires of the villages. His functions as Chief of the Netch Lebash is to make sure that peace and order prevail in the village. The Gobez Aleka also accompanies government officials in their journeys from one village to the other. It is the duty of the Gobez Aleka that a new comer is looked after carefully in case the individual is a thief, a shifta or a murderer. He gives his services free of any remuneration except for some travel expenses when he has to bring to court individuals who failed to pay tax on time.

Communal Efforts

In the fifteen of the sample villages visited the community does not reserve land for communal use. In two cases, the government had reserved land for developing cattle farming. In the other one case, the community reserved land for collective farming so as to start a credit association. This credit association was formed and has about 13 members.

All pasture land is used communally. There are no privately owned pasture lands. Even, the cultivated area is after harvest, turned into communal pasture land. There is no co-operative farming practiced except in one village where the credit association is formed. The co-operation is only to farm the land reserved for the credit association.

Projects started in the Woredas

In Tach Adiabo Woreda, T.D.O. (Tigre Development Organization) has started farming on a large scale using machinary. But the result of this project is not satisfactory. Secondly, in Tach Adiabo Woreda, all the farmers contributed about $300 for the construction of a school, a clinic and Woreda office, of these only the Woreda office was built. On the other hand in Hedekti Woreda, the Community Development Center is running a clinic and a school for the people in Sheraro. The Community Development Center is also planning to organize grain storage and credit association for the whole Woreda.

Apart from helping each other during harvest and ploughing seasons, socio-economic associations like edir, equb do not exist. What they have is church association - mehaber - where the men engage in traditional oral discussions on various matters. However, in Yirga, capital of Tach Adiabo Woreda there has been started and eder and a communal flour mill.

Movement of Farmers

Due to shortage of cultivable land and grazing area, in 13 of the villages visited farmers move in significant numbers from one area to another especially in search of grazing land. In the Hedekti Woreda there are a significant number of mofer zemets who come from the highlands of Tigre Province to cultivate temporarily each year.

Tenancy

There is no clear cut tenancy since each new comer can get his own land. But due to lack of cash and oxen there are share croppers who farm on ¼ share of the crop. Finally they save money and start their own farm. However, since now a days land is growing scarce, the share croppers may in the future remain tenants all their lives. The period of agreement is usually for one year. After a year the share cropper goes back to the highlands and comes back with his wife to settle as a gebar. Moreover, since in Hedekti Woreda the gebars move around in search of grazing land, they leave a share cropper at their farm and hence encourage teancy. In the household survey conducted, out of 32 sample farmers interviewed 11 had one share cropper each.

Labour services

There are temporary labour services during the whole cultivation period. Labour is engaged either during ploughing, weeding or harvesting. The number of days a labourer is hired is not specific but, depends upon the amount of work he has to do. If hired daily, he is paid $1.50 without food or $1.25 with food and housing. In one village labourers are hired on monthly basis and are paid $5-7 per month with food and housing. In two villages visited, there were no labour services because the villages are late settlements. In the household survey conducted, out of 32 sample farmers visited in 16 villages, 27 of them had hired one labourer each except for one who hired two labourers.

Taxation

Agricultural income tax for the Woredas is, according to the 1960 Agricultural Income Tax Proclamation, determined at the provincial and awraja level. At the Woreda level a certain amount of revenue is fixed as a tribute and then divided among the villages by the Woreda Governor and other government officials. Then the Chikashum of each village with the help of three shemagles, redivide the tribute among each individual farmer according to the size of the holding and quality of crop. The chikashum of each village is personally responsible for the collection of the tax. In both woredas default in payment of tax by resident farmers is none since the sanction for default is imprisonment, penalty in cash and confiscation of the farm land. However, since the number of mofer zemets is not known and the machinery to control them is inefficient, default in payment of tax by them is very substantial.

By reading from the estimation made at the Awraja office, according to the 1960 E.C. Agricultural Income Tax Proclamation, there are about 6544 farmers in both Woredas. Out of these 5187 farmers pay minimum $1.50 as Income Tax each year. 1357 farmers pay Income Tax above $1.50. (The total number of farmers as stated above may not be exact, since new coming farmers will not be listed under the Awraja nor the Woreda treasury until 1965).

The farmers in both Woredas besides paying Income Tax, pay land tax. However, it was not possible to find the means of distribution or how long a farmer has paid land tax since we could not find the list in the Woredas or Awraja treasuries.

Legal Aspects

The common cause of land dispute in order of importance is as follows:-

First comes trespass on property and damage of crops especially by cattle since most of the plots are not fenced. Second comes boundary dispute and is of two types; first there is dispute between two owners of different plots as a result of undetermined boudaries, and second there is boundary disputes between various villages since formerly the boundaries of each village was not specifically determined. The cause of all the boundary disputes appears to be increase in the population and scarcity of land. Lastly, there is some dispute between the share cropper and land owner, because the owner may arbitrarily decrease the amount of crop going to the share cropper.

Part B: Household Survey of Hedekti and Tach Adiabo Woredas

The survey was carried out by two Ethiopian University service participants, Ato Ayele and Ato Syoum, in October 1971 for the Livestock and Meat Board.

In both Woredas the information was obtained by interviewing two randomly selected farmers in each of the 16 villages visited.

Members of the Household in Hedekti

Villages	No. of Farmers in the Survey	Total No. of Children	Male Children	Female Children	Others**	Education*
Adi Benti	2	7	4	3	1	1
Segen Kiflew	2	13	7	6	1	-
Tub Gerzo	2	4	1	3	1	-
Sifra Wedi Hemeday	2	7	5	2	-	1
Gelawdios	2	9	5	4	-	-
Dembe Habela	2	5	2	3	-	-
Sheraro	2	9	4	5	6	3
Mentebteb	2	5	3	2	3	-
Total	16	59	31	28	12	5
Average per house hold	1	3.7	1.9	1.7		3.1

* Education is elementary only with in the visited households.
** Include share croppers and relatives who live with the farmer. There are 8 share croppers and 4 relatives.

Members of the Household in Tach Adiabo

Villages	No. of Farmers in the Survey	Total No. of Children	Male Children	Female Children	Others*	Education**
Afra	2	12	7	5	-	-
Badime	2	10	7	3	1	-
Gubata	2	6	4	2	-	1
Adi Teklay	2	13	4	9	-	1
Adish Adie	2	7	5	2	2	-
Yirga	2	6	3	3	-	-
Wodas	2	12	9	3	2	-
Senbel	2	10	5	4	-	-
Total	16	76	44	31	5	2
Average per house hold	1	4.7	2.7	1.9		0.1

* Others refer to 3 share croppers and 2 relatives living with the farmer.

** Education is elementary.

Occupational Pattern

Thirty-one of the farmers of both weredas surveyed are engaged in farming and cattle raising. However, in Hedekti wereda, one farmer is a subsidiary priest, another runs a tea house and a third one is a merchant. While in Tach Adiabo wereda there is only one farmer as a subsidiary priest in the villages visited.

Average Holding in Parcel and size in Hedekti Woreda

Villages	No. of farmers in the sample	Average size of holding in Timad*	Average No. of Parcel Each own	Type of Tenure
Adi Benti	2	12.5	2.0	Gebar
Segen Kiflew	2	11.5	3.0	"
Tub Gerzo	2	10.5	2.5	"
Seifra Wedish	2	8.0	2.0	"
Gelawdios	2	20.5	4.0	"
Dembe Habela	2	58.5	5.0	"
Sheraro	2	35.0	3.5	"
Mentebteb	2	19.0	3.5	"
Total	16	175.5	25.5	-
Average perholding	1	21.8	3.2	

* Timad= 35x40 sq.m. of land

Average Holding in Parcel and size in Tach Adiabo Woreda

Villages	No. of farmer in the sample	Average size of holding in Timad*	Average No. of Parcel Each own	Type of Tenure
Afra	2	16.5	2.5	Gebar
Badime	2	16.0	3.5	"
Gubata	2	17.5	2.0	"
Adi Teklay	2	21.5	3.5	"
Adish Adie	2	12.0	2.5	"
Yirga	2	9.5	2.0	"
Wodas	2	11.5	2.0	"
Senbel	2	13.5	2.5	"
Total	16	118.0	20.5	-
Average perholding	1	14.7	2.5	

Inventory of Livestock In Hedekti Woreda

Village	No. of farmers in the sample	Av. No. of cows each owns	Av. No. of oxen each owns	Av. No. of goats each owns	Av. No. of donkeys each owns
Adi Benti	2	2	2	5	0.5
Segen Kiflew	2	10	3	10	3.0
Tub Gerzo	2	14	2	-	-
Sifra Wadi H	2	8	2	-	1.0
Gelawdios	2	27	2	-	1.0
Dembe Habela	2	3	2	-	1.0
Sheraro	2	20	3	-	1.0
Mentebteb	2	20	5	3	1.0
Average perhousehold	1	13.0	2.6	2.2	1.0

Inventory of Livestock in Tach Adiabo Woreda

Village	No. of farmers in the sample	Av. No. of cows owned	Av. No. of oxen owned	Av. No. of goats owned	Av. No. of donkeys owned
Afra	2	5	1	-	1
Badime	2	13	3	3	2
Gubata	2	14	3	4	2
Adi Teklay	2	21	4	2	3
Adish Adie	2	7	2	2	1
Yirga	2	7	1	-	1
Wodas	2	5	2	7	0.5
Sembel	2	2.5	2	2.5	1.5
Total	16	74.5	18	20.5	12.0
Average perhousholde	1	9.3	2.2	3.5	0.75

N.B. In Both cases the number of cows and oxen is not reliable.

Analysis of Land According to crops and Gross Income from Crops

	No. of farmer in the sample	No. of times crops raised/ annum	Average quantity produced per annum in quintal		Unit Price in E.$	
			Sorghum	Selit *	Sorghum	Selit
Adi Benti	2	1	17.0	2.5	-	33
Segew Kiflew	2	1	4.5	2.0	17	35
Tub Gerzo	2	1	4.0	1.0	-	38.50
Sifra Wedi H	2	1	-	-	-	-
Gelawdios	2	1	-	-	-	-
Dembe Habela	2	1	2.0	10.0	18	40
Sheraro	2	1	21.0	4.0	-	-
Mentebteb	2	1	13.5	4.0	13	38

- Other crops like millet and cotton are grown by some farmers.
- Selit = Sesame

Analysis of Land According to Crops and Gross Income from Crops In Tach Adiabo Woreda

Villages	No. of farmers in the sample	No. of times crops raised per annum	Av. Quantity produced in Quintals per annum		Unit Price in E.$	
			Sorghum	Selit *	Sorghum	Selit
Afra	2	1	5	0.25	-	40
Bedime	2	1	8.5	2.5	15	40
Gubata	2	1	10.5	2.5	-	34
Adi Teklay	2	1	21.5	2.0	20	30
Adish Adie	2	1	9.5	2.5	15	30
Yirga	2	1	7.5	4.25	-	35
Wodas	2	1	10.	3.00	-	30
Senbel	2	1	6	3.00	-	40
Average per house hold	1	1	9.8	2.50	-	-

The price of sorghum varies from $15.20 per quintal. * Selit = Sesame.
Selit is grown as a cash crop by all farmers.

Land Use other than crop Growing

In the sixteen villages visited of the two Woredas, all the uncultivated land is used as communal grazing land cattle from other Weredas and provinces like Eriterea come to these areas. All the cultivated land is turned into communal grazing land after harvest.

Livestock Products in Hedekti Woreda

Villages	No. of farmers in the sample	Total No. of Livestock and Products sold			
		Cows	Oxen	Goats	Donkeys
Adi Benti	2	-	-	-	-
Segen Kiflew	2	2	-	-	-
Tub Gerzo	2	1	--	-	-
Sifra Wadi H.	2	-	-	-	-
Gelawdios	2	1	-	-	-
Dembe Habela	2	1	-	-	-
Sheraro	2	-	-	-	-
Mentebteb	2	11	-	-	-

Livestock Products in Tach Adiabo Woreda

Villages	No. of farmers in the sample	Total No. of Livestock and Products sold			
		Cows	Oxen	Goats	Donkeys
Afra	2	-	-	-	1
Badime	2	-	-	-	-
Gubata	2	1	--	-	-
Adi Teklay	2	1	1	-	-
Adish Adie	2	-	-	-	-
Yirga	2	2	-	-	-
Wodas	2	1	1	3	-
Senbel	2	-	-	-	-

APPENDIX I

SUMMARY OF HYDROGEOLOGICAL REPORTS

I. 1. Field Studies

The following notes and recommendations are based on three component studies:

: geological mapping of the area by Temesgen Hailu of the geological survey.
: a brief preliminary study and a nine day field study, December to January 1971 by E. Shachnai and Mr. Beith.
: a brief field visit in May 1971 by E. Shachnai.

I. 2. GEOLOGY of the AREA

The plains of Sheraro and Badima are a rift valley probably part of the western branch of the East African Rift Valley, partly covered by basalt prior to the rifting which has weathered to a dark black soil. All of the rocks in the area with the exception of the sheet basalt and alkaline trachyte plugs are part of the Precambrian Basement.

3. The project area can be divided into two geological environments:

i. Sheraro Plains - laterite developed on Arkosic sandstones and slates. The Arkosic sandstone is exposed mainly on the horsts.
ii. Badima and Enda Telewa Plains - laterite developed directly on the Metavolcanics and grey granodiorites.

I. 4. HYDROGEOLOGY

The Arkosic sandstones are a potential aquifer and contain many hand-dug wells, but the metavolcanics are unlikely to be an aquifer because they contain a great deal of chloritic granodioritic gniess around Badima and Enda Telewa and are intensively intruded by the grey granodiorite. Only the upper weathered surface may contain water.

5. As well as these two main environments, there are in the south two basement synclines composed of limestone, dolomite and slate, which overly the poorly prospective metavolcanic sequence, and are partly overlain by the Arkosic Sandstone. These synclines are likely regional collectors or reservoirs for the underground water. At Maiteni, a series of water ponds are located along the synclinal axis of the southern syncline and it is probable that they represent the water tables within the syncline, as is the case with similar springs in the Arkosic Sandstone area. The northern and bigger syncline does not have surface springs or ponds and should be drilled to test its potentials.

6. The Sheraro Plains Arkosic Sandstone regimen was studied by an analysis of the ground water characteristics at three different sites:

Chamuskavit: a natural spring controlled by the fault escarpment where the elevation of the seepage probably represents the water table in the eastern margin of the upthrown block to the west. A test hole drilled established the water table at 12 m - and a subsequent baling test demonstrated an adequate continuous supply (Ref. Table 1 for test figures)

Mentebteb: this is a small spring whose waters originate in a small graben almost on the top of upthrown block. Although the place is high and the catchment area limited the small graben acts as a water collector. The water flows down the local fault escarpment is stopped by flexures in the Arkosic sandstones and exploited by means of shallow hand dug wells in the creek bed. One hand dug well showed an emissionof CO^2 bubbles and was subsequently analysed. (Ref. Table 2)

Shéraro Town. Several hand dug wells in the Arkosic sandstone have struck water at 10 to 15 metres which provide year round supplies for domestic consumption. A test well drilled in the town centre struck water at 18m. and a subsequent baling test demonstrated adequate continuous supply for domestic and livestock purposes (Ref. Table 1)

7. In Sheraro West there are several river seepages and shallow hand dug wells which collect water originating from basalt and surface soil on top of the lateritic horizon. These have little exploitative value.

8. The Badima Enda-Telewa plains have poor groundwater potential. A test borehole sited in a flat graben in alluvium was drilled to 50 metres. Well production was disappointingly low with the well being emptied after a bailing of 3½ - 4 cubic metres of water over 30 minutes.

9. The water occurences in the Badima region are controlled not by any geological structures, but by local phenomena such as barriers of bed rock in river beds or weathered basement rock in contact with riverbed water. There is thus no relationship between individual small water occurances.

10. Ground water in this regimen is limited and occurs in small localized quantities in two aquifers; river bed water in contact with fractured and weathered basement rocks and on top of the lateritic horizon.

11. RECOMMENDATIONS

Although there are possibilities of producing limited amounts of ground water by exploiting a few localized geological river bed and subsurface phenomena in the metavolcanic and granitic regions, a major drilling program to produce economically exploitable quantities of water should be restricted to the Arkosic Sandstone region. Any well driven down to this aquifer is likely to produce acceptable quantities of water.

12. An exception to this are the two southern limestone synclines. Wells sunk in these two areas are also likely to yield economically acceptable water quantities.

TABLE 1

Drilling Specifications and Baling Test Results of

Test Wells at Shiraro, Chamuskavit and Enda Telewa.

Well Site	Depth Well	Depth to Water	Baling test Results
Shiraro	54 m	Struck water-18m. At 41m water started to rise. S.W.L.-10.80m.	Approx 16cu/m bailed in 2 hours. Recovery reasonably quick from well bottom to S.W.L. Assumed yield - 6-7cu/m/hour
Chamuskavit	40 m	Approx. 12m.	18 cu/m bailed in 2 hours, with drawdown of 10 cm. Assumed yield - very high
Enda Telewa	50 m	18m.	4cu/m bailed in 30 minutes and well emptied. Assumed yield - very low.

TABLE 2

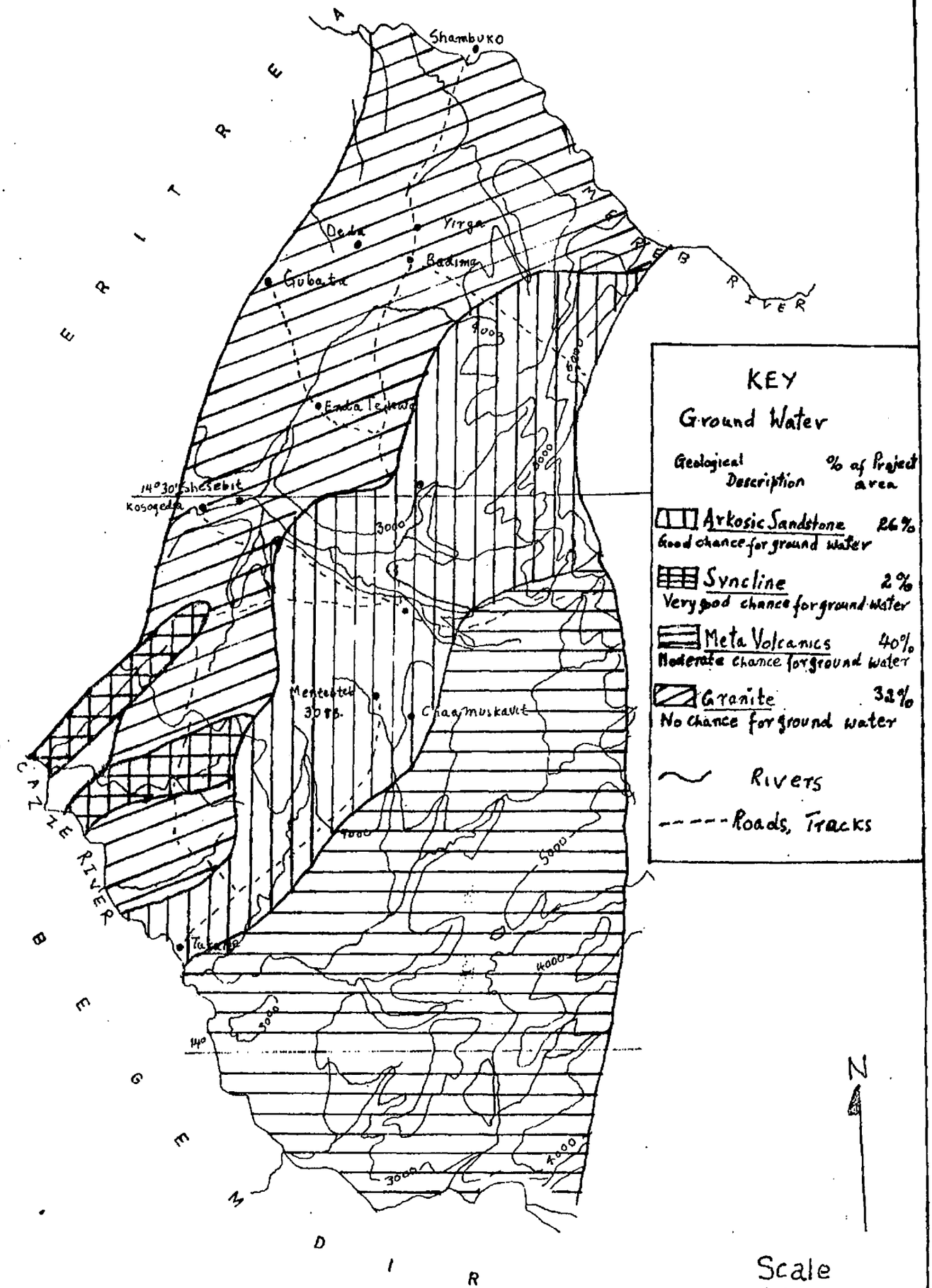
Analysis of Water from Hand Dug Well Chamuskavit. P.P.M.

	P.P.M.		P.P.M.
Potassium	4	Copper	< 0.1
Sodium	8	Zinc	< 0.12
Lithium	< 0.05	Lead	< 0.3
Calcium	83	Carbonic Acid (HCO_3)	554
Magnesium	63	Sulphates SO_4	15
Manganese	0.26	Chlorine	11
Iron	0.1	F	< 2
Nicket	0.3	Carbon Dio Oxide	108
Cobalt	0.3		

P.H. 6.5 Water slightly acidic
General Quality - good.

MAP 4

GROUND WATER POTENTIAL



APPENDIX J

SUMMARY OF VETERINARY TEAMS REPORT ON THE LOWER SHIRE AREA.

A short summary of cattle diseases encountered or suspected in the project area.

Anthrax (most common local names, lalish, hibbet, nephri). No clinical cases were seen. Conversations indicate that outbreaks may occur of up to 30% morbidity, but usually lower, less than 5% annually. Mortality may be 100%.

Blackleg (local names, hibbet, nephri). Six cases were diagnosed clinically, two post mortems were carried out and diagnosis was confirmed. The disease is well recognized by the local people. The disease occurs most frequently during the wet season. Commonly young healthy animals in good condition are effected.

Brucellosis (local name; none). Serological tests showed that 5% of meture-females examined gave a positive re-action to the Rose-Bengal plate test. This indicates a low level of infection. The highest single herd figure was 12%. Questioning of local people on the subject of abortions provided a variety of replies. Some said that a persistant low level occured throughout the year. Others described actual abortion storms, where up to 30% of pregnant females would abort late in pregnancy.

Calf Scours (local name - Kalvo). Local questioning reveals that the disease is most commonly seen in calves from one week to three months of age. Morbidity in a group of calves is up to 70 - 80% in a bad outbreak. Mortality is up to 30% and death may occur in 24 hours. The disease is more common in the younger age group during the wet season.

Pasteurellosis (local name - none). No clinical cases were seen, but the disease cannot be ruled out as a cause of sudden death in cattle. As such the disease would probably be regarded as, "lalish" or "nephri" by the local people.

Arthritis (local name - none). Two cases of lameness due to arthritis were seen.

Mastitis (local name - none). There is a lot of local damage to teats and udders by ticks. As far as the local farmers are concerned this is the most important reason for tick control.

Keratoconjunctivitis (local name - none). Eye disease is quite common. Up to 20% of some herds are affected.

Rinderpest (local name - Gulhai). Rinderpest is the most important single disease in the area. Outbreaks occur annually, with an estimated morbidity of up to 100%, and mortality up to 70% among non-vaccinated animals. Although a vaccination programme has been in operation in the area for some years, the efficacy of the vaccine is not yet established.

Foot and Mouth Disease (local names - aniso, etchlam), The disease is well recognized by the local people. It is not considered to be of great importance. Morbidity may be high, up to 100%. but mortality is low, in many cases lower than 5%. Usually only calves are seriously affected. Immunity to the disease following an outbreak varies, according to the opinions of the local farmers. Some suggest that life-long immunity persists, others that it persists for only one or two years In any case it is likely that more than one strain exists in area. Types A.O.C. are known to exist in Ethiopia.

Contagious Bovine pleuro-pneumonia (local names - sambu, sanabu). According to local reports, CBPP has not been seen in the area for a period of between six and twenty years. The absence of the disease is thought to be due to vaccination in Eritrea.

Pleuro-pneumonia is endemic in other parts of Tigre province.

Skin diseases:

(1) Strepto thricosis. This is the most common skin disease of cattle in the area;

(2) Viral papillomata. Warts are quite common with up to 20% morbidity among some groups of calves;

(3) Ring worm. Only one case was seen;

(4) Bird damange. Red oxpecker inflicts great damage to hides especially where there is an initial lesion for it to attack.

Fascioliasis (local name - none). In all the faecal samples examined no fluke eggs were demonstrated. At post mortem one case of F. Gigantica infection was discovered.

Paramphistomes (local name - none). Paramphistomes was found at post mortem on seven occasions.

Cestodes cysticercus tenuicollis, cysticercus bovis, and hydatid cysts were recovered at post mortem from adult cattle.

Parasitic gastro-enteritis (local name - sherock). P.G.E. is seen in young cattle in their first year at grass at the start of the rainy season. It is well recognized by local farmers.

Parasitic bronchitis (local name - none). No disease fitting the clinical picture of parasitic bronchitis was seen, and none was described in the various conversations with farmers. Despite this, Dictyocaulus Viviparous was demonstrated at post mortem in the Bronchi and Bronchioles of an adult animal from Sheraro. This animal had come from Enda Selassie in April and had become sick during August.

Filariasis (local name - none). By the micro-haematocrit technique up to 10% of calves and adults around Sheraro were shown to have micro-filariae in the blood stream.

Thelaziasis (local name - none). Thelazia Rhodesii was observed in one, or more commonly both, eyes of 20% or more of calves at Tekeze. In other areas occurence in adults and calves was more sporadic. Flies of Musa species are the intermediate hosts.

Anaplasmosis (local name - selim). During the dry season no clinical diseases resembling Anaplasmosis was seen. However, ticket of boophilus, species, which are the main vector of anaplasmosis, were found. During the wet season, four clinical cases of "Selim" were shown to have intraerythrocytic enclusions resembling A. Marginale. In two cases the clinical symtoms resembled chronic trypanosomiasis, with emaciation and anaemia. In other cases, anaemia and a high urinary bilirubin level were demonstrated.

Theileriasis (local name - none). No Rhipicephalus appendiculatus were found in the area during the wet or dry season. This probably precludes theileria parva from being a disease problem. One clinical case was seen in which erythrocytic inclusions resembling theileriae were observed.

Babesiosis. No evidence of babesia infection was found clinically or during conversations with local farmers. The presence of babesia cannot be precluded in an area such as this where tick vectors are

Coccidiosis. No evidence of Coccidiosis was found clinically or in conversation with farmers.

Trypanosomiasis (local name - selim). The disease occurred in outbreaks during the months of August and September. The chronic form commonly persists throughout the dry season. The symptoms described by the local people fit the clinical picture of T.vivax infection. The appearance of the disease with the emergence of biting flies was also described. Four flies potentially capable of mechnical transmission have been identified. No flies of glossina species were found. During the dry season 700 blood samples were examined, but no trypanosomiasis were found, but micro-filariae were commonly seen which suggests that the technique itself was not at fault. Several hundred blood smears were examined but no trypanosomes were seen. During the wet season four cases of trypanosomiasis were diagonosed clinically, and the diagnoses supported by demonstration of the organisms on blood smears and by micro-haematocrit technique. These animals were from Tekeze, Chaamuscavit, and Sheraro. Morbidity is said to be up to 30%, mortality is generally less than 10%.

Ticks Although local farmers do not recognize ticks as a cause of a disease other than superficial damage, they still considered them a major problem. In Hedekte wereda most farmers would be willing to pay up to $2. per animal per year for regular dipping. In Tach Adiabo the situation is less clear.

Damage by predators Especially round Yirga local farmers claim that the greatest threat to their herds is attack by hyenas. Hyenas attack in groups by night and can inflict severe damage on cattle of all ages. Calves are frequently lost. Jackals too may attack youngesters or sick animals.

Fertility of one hundred and ninty-five matured females examined the number found to be pregnant was 140. Of the fifty-five cattle found to be empty, five had had calves within three months prior to examination. This gives an overall fertility of just over 70% which is extremely high. There is some indication that calving occurs at two main periods of the year.

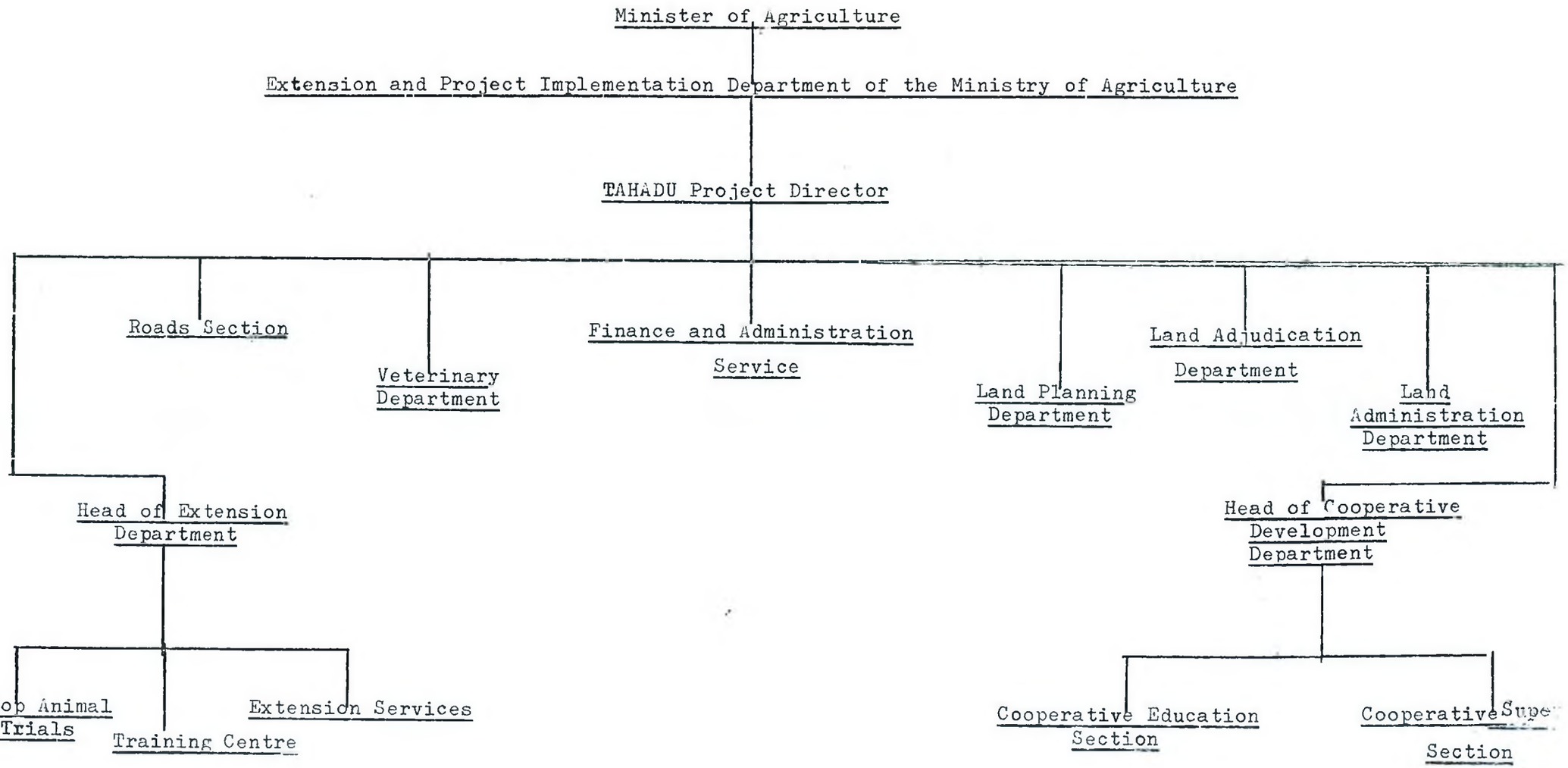
1. July to September;
2. December to January.

Calves Calves at birth are very small, commonly weighing from 15-25 pounds. Calf mortality figures are difficult to ascertain.

Puberty Heifers usually conceive at about 2½ to 3½ years of age. Male animals may attain sexual maturity by two years of age, but rarely serve at this age.

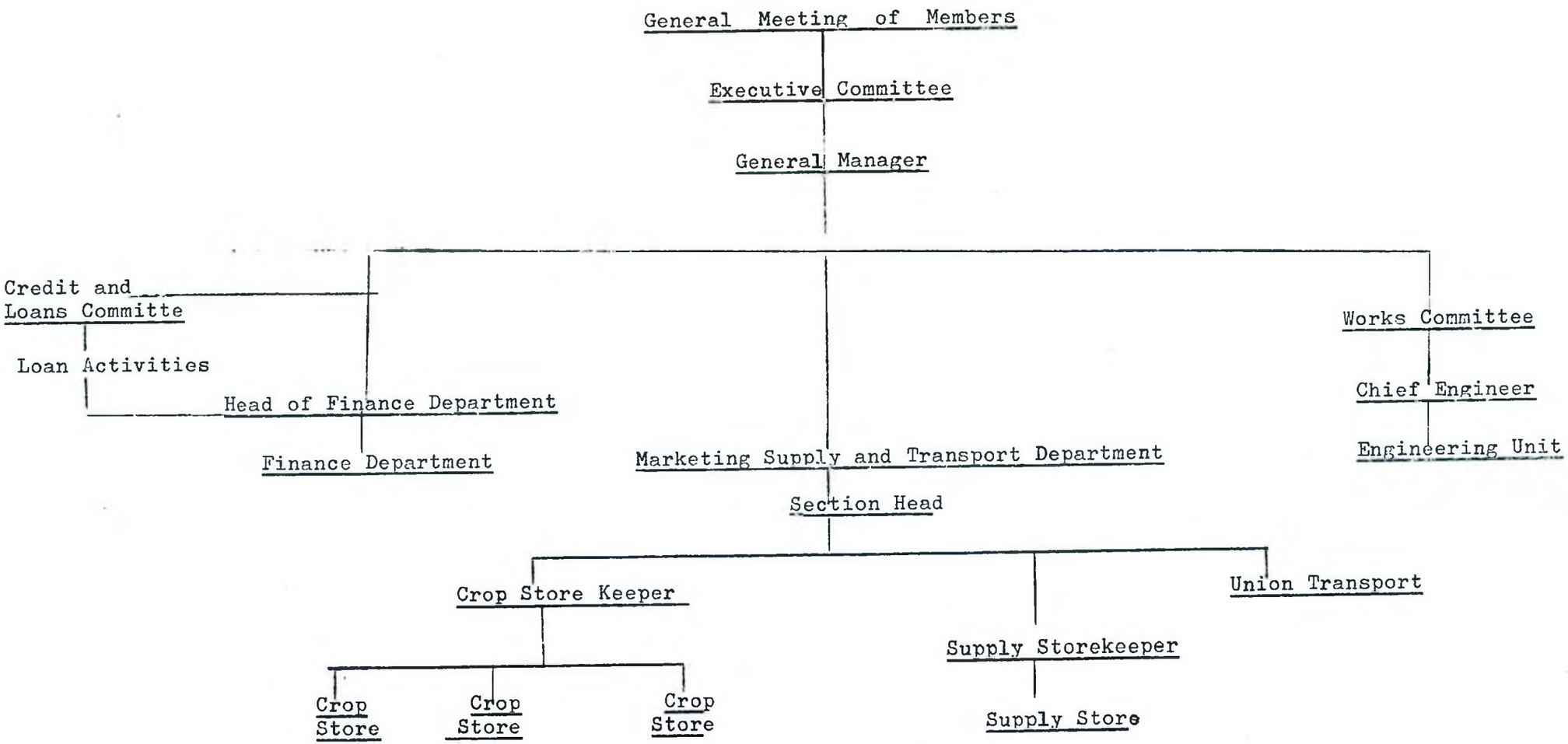
APPENDIX L

TAHADU DEVELOPMENT UNIT ORGANISATION CHART



APPENDIX M

TAHECU COOPERATIVE UNION ORGANISATION CHART



A P P E N D I X N

NOTES ON LAND USE AND PLANNING

N.1 This appendix will discuss:-

A) The basis and justification for the figures contained in the text (esp. paragraph 3.47) concerning cultivated and fallow land and additional land which is thought to be cultivable but not yet cultivated.

B) The future location, within the project area, of the different forms of land use (cultivation, village grazing areas, commercial ranch).

C) The extent of any future relocation required of existing farms.

D) Some miscellaneous problems in land planning and allocation.

N.2 The main piece of evidence on which estimates of existing and potential land use are based is the aerial survey carried out by Dr. Watson (of Resource Management and Research, Nairobi) in March 1972. The report of that survey will be made available in full to an appraisal team. The survey relies on sampling techniques and is not a full census. In addition, therefore, to errors that may creep into the results as a consequence of difficulties in definition and measurement, there may also be further sampling errors. The information provided by Dr. Watson has been supplemented by, cross-checked, and in some cases rejected, in the light of other information provided by Ellman and by other studies commissioned by the Livestock and Meat Board (see Bibliography at Appendix A). Not all the conclusions drawn or recommendations made by Dr. Watson have been accepted in drawing up the present proposals for this project, but his survey presents the most thorough and systematically-based source of information available.

N.3 Dr. Watson was asked to estimate human and livestock populations of the project area, and also the extent of cropped, fallow, and potentially cultivable but not yet cultivated, land. The last of these categories was defined as land which has the appearance of having the same soil type as land already cultivated; and is not so steep, broken, stoney or in other way unsuitable as to be incapable of being cultivated by existing ox-ploughing techniques; and is located in parts of the surveyed area which by the appearance of the natural vegetation have a rainfall as high as that of other parts which are cultivated.

N.4 Summary of Dr. Watson's Survey

The following is a summary of Dr. Watson's most important finding:-

I.	Size of project area	451,429 ha	100%
of which:	Black soil	87,622	19.4%
	Red soil	70,864	15.7%
	Pink soil) Gray soil)	292,943	64.9%

II. Estimates of Cultivated, cultivable and uncultivable land

		SOIL TYPE				TOTAL
		Black	Red	Pink	Grey	
A	Cropped in 1971 Ha.	31,036	35,633	2,782	16,330	85,781
	(% of all cropped)	(36.2%)	(41.6%)	(3.2%)	(19.0%)	(100%)
B	Fallow Ha.	3,990	13,214	1,668	6,672	25,544
	(% of all fallow)	(15.6%)	(51.7%)	(6.5%)	(26.2%)	(100%)
C	Cleared for cropping but not yet cropped Ha.	264	1,984	0	962	3,210
	(% of all cleared)	(8.2%)	(61.8%)	(0%)	(30.0%)	(100%)
D	Potentially cultivable not yet cultivated Ha.	15,897	19,115	4,526	8,934	48,472
	(% of all potential cult.)	(32.8%)	(39.5%)	(9.3%)	(18.4%)	(100%)
E	Subtotal all cropped, fallow, cleared and potential cult. A. to D) Ha.	51,187	69,946	41,874		163,007
	(% of this colour of soil)	(58.4%)	(98.7%)	(14.3%)		(36.1%)
F	Not cultivated and not potentially cultivable Ha.	36,435	918	251,069		288,422
	(% of this colour of soil)	(41.6%)	(1.3%)	(85.7%)		(63.9%)
G	Total of above (E+F) Ha.	87,622	70,864	292,943		451,429
	(% of this colour of soil)	(100%)	(100%)	(100%)		(100%)

III. Standard errors of estimates of cultivated and cultivable land

		SOIL TYPE				TOTAL*
		Black	Red	Pink	Grey	
A	Cropped in 1971 Ha.	627	673	7	167	935
	(%)	(2.02%)	(1.89%)	(0.24%)	(1.02%)	(1.09%)
B	Fallow Ha.	6	94	3	43	104
	(%)	(0.15%)	(0.71%)	(0.18%)	(0.65%)	(.41%)
C	Cleared not yet cropped Ha.	Large	4	-	Large	N.A.
	(%)		(0.19%)			
D	Potentially cultivable not yet cultivated Ha.	159	206	14	44	266
	(%)	(1.00%)	(1.08%)	(0.32%)	(0.49%)	(0.55%)

* The figures for the standard errors of estimate for all soil types together have been calculated on the assumption that the occurrence of one soil type in an area is statistically independent of the occurence of another soil type in the same area. Since there is propably a negative correlation between the occurrence of different soil types these estimates of

IV. Estimates of populations	Estimate	Standard error of estimate
No. of occupied human dwellings	9,420	N. A.
No. of cattle	58,264	7,340
No. of goats	18,595	5,222
No. of camels	1,760	Large
No. of donkeys	2,612	Large

N.5 Watson also tried to estimate average field-sizes and his results were as follows:-

	Average Size (ha)	SE of estimate	Modal size (ha)
Black soil	1.8	.123	1.9
Red soil	1.4	.254	0.3
Pink and Grey field	1.6	.177	0.7
All fields	1.6	N.A.	N.A.

However, Watson's estimates for field size are markedly divergent from other estimates made by ground-surveys, and which were also based on sampling techniques. Three other surveys found average field-sizes as follows: Ellman (1971) measured average size of parcel of land (presumably a parcel is a field) at 0.7 ha. An LMB crop-yield survey (1970) measured average field-size at about 0.3 to 0.4 ha. An LMB land-holding system survey received reports (but did not measure) field sizes of 0.9 ha. It would seem likely that, from the air, Watson was unable to distinguish the boundaries of individual parcels (fields) and that what he thought was a field was in fact a collection of 2 - 4 fields in a single definable patch of cultivation. Although the estimate of field-size is a component in Watson's calculations of cropped, fallow, cleared and potentially cultivable areas, this probable error on his part in calculating field-size does not invalidate his estimates of these areas, since his overestimation of field-size is counterbalanced by an exactly corresponding underestimate of field-numbers.

N.6 Watson estimated the average size of farm holding in the project area at 7.19 ha. This is based on an average field (parcel)-size of 1.597 ha, and an average number of parcels of 4.5 (1.597 X 4.5 = 7.19). Watson has since stated, in correspondence, that his estimate of the average number of parcels per holding of 4.5 was due to a misreading of Ellman, and that the figure should be 3.15. Using this figure (3.15) but Watson's estimate of average field size, we get an average holding size of 5.0 ha.

N.7 Reconciliation of different sources of information

It is difficult to reconcile Watson's estimate of cropped area (86,000 ha) with his estimates of cattle population (58,000 head) and of resident human population (9,400 occupied houses in March. This would represent the number of resident farmers, since Mofer Zemach - migrant farmers - would not be in the project area in March, the time of year that Watson carried out his survey). The problem is that the area of cropped land can not be reconciled with the number of oxen available to plough it. It is most unlikely that a pair of oxen, in this area and with this climate, have the time to plough more than 3ha. of land. If we take the proportion of the total cattle herd which are work-oxen at 30% (a high figure for Ethiopia) then a resident herd of 58,000 cattle contains 17,400 oxen (58,000 X 0.3) or 8,700 pairs of oxen. These can cultivate 26,000 ha. (8,700 X 3). This leaves about 60,000 ha. (86,000-26,000) to be cultivated by Mofer Zemach (and by their cattle) if Watson's figures of 86,000 cropped hectares is right. Since Mofer Zemach are unlikely to have more than one pair of plough oxen each, this would imply a ratio between Mofer Zemach and resident farmers of 2:1, and this is a higher ratio than the authorities in the area appear to consi-

N.8 It is necessary to effect a reconciliation of the various figures in the light of the best information available, Watson's survey technique for estimating the number of livestock and occupied human houses is better than his techniques for estimating areas of land. The reconciliation which has been made in these proposals is shown below in contrast to the results of Watson's survey and other information collected. The reconciliation has been strongly influenced by certain assumptions which have not been the subject of full statistical investigation in the project area. These assumptions are:-

i) A pair of oxen, under existing techniques, can only plough 3 ha. in a season.

ii) Oxen form 31% of the total resident cattle herd.

iii) The ratio between Mofer Zemach (migrant) and resident farmers is not in excess of 1.5:1

Contrast between these proposals and Watson's survey

	Watson's Survey	Reconciliation adopted in these proposals
Number of resident farmers	9,400	10,000
Number of residents' cattle	58,000	65,000
Extent of land cropped in 1971 (ha)	86,000	70,000

Contrast between these proposals and other surveys' results

	Average number of parcels per holding	Average parcel size (ha)	Average holding ha.
Ellman 1971[(i)]	3.15	.70	2.2
LMB Land Holding System study 1970[(i)]	2.85	.90	2.6
LMB Crop Yield study 1970	N. A.	.35[(ii)]	N.A.
Watson 1972	N.A.	1.60	N.A.
These proposals	N.A.	N.A.	2.9[(iii)]

(i) Unweighted average of two weredas

(ii) But if the field was a large one often only $\frac{1}{3}$ to $\frac{1}{2}$ of it was measured, and then this was counted as a complete field

(iii) Weighted average of Mofer Zemach and resident farmers.

N.9 On the basis of the reconciled figures of these proposals 10,000 resident farmers owning 20,000 oxen (65,000 X .31) crop 30,000 ha. of land (3.0 ha. per farmer), leaving 40,000 ha. (70,000 - 30,000) to be cropped by 14,000 Mofer Zemach (2.86 ha. each). These proposals accept Dr. Watson's estimates of fallow (25,544 ha), cleared not yet cropped (3,210 ha.), and potentially cultivable but not yet cropped or cleared (48,472 ha.) land. However, not all the land at present cropped, cleared, fallow, or potentially cultivable, will be available for cropping in the future, since some of this land occurs in areas which will be reserved for grazing and from which cropping must be excluded. This is further discussed in the next section.

N.10 Location of facilities

Map. 5 (drawn from Dr. Watson's report) divides the project area up into ecologically homogeneous strata (which formed the basis of Dr. Watson's sampling procedures). Map 6 and Map 7 show the percentage of each of these strata under cultivation, fallow, recently cleared, or potentially cultivable but not yet cultivated respectively. On the basis of this information it is possible to select the areas to be reserved for extensive livestock production (i.e. for the village grazing areas and the commercial ranch). The criteria for selecting an area for reserving for extensive livestock production are:-

i) that it is itself big enough, or is contiguous with other areas which together are big enough, to contain one or more village grazing areas.

and ii) that it does not have much value for cultivation, as evidenced by the extent of existing cultivation, or by Watson's assessment of its potential so far unused.

Altogether for the complete development of the whole project area, in both the first (this project) and second phases of development, some 260,000 ha. of extensive grazing land are required, made up as follows:-

	Ha.
a) Commercial ranch - 1st phase	20,000
b) Village Grazing Areas - 1st phase. 20 at 6,000 ha. each:	120,000
c) Village Grazing Areas - 2nd phase. 20 at 6,000 ha. each:	120,000
	260,000

The "requirement" for village grazing areas of 6,000 ha. each is based on the requirement of extensive grazing, providing supplementary animal feed to what can be grown on crop-land, sufficient to enable participating farmers to maintain their plough oxen and the breeding herd necessary to provide replacements for these plough oxen.

N.11 Of the 260,000 ha. of extensive grazing area thus required, some 220,000 can be immediately identified. These 220,000 ha. are comprised of entire strata as defined by Dr. Watson, and occur on the southern, north, and north-eastern edges of the project area. The identification of the remaining 40,000 ha. required for extensive grazing will have to await the work of the land planning team in the first year of the project, when parts of other strata can be reserved as suitable only for extensive grazing. The area considered most suitable for crop production falls in the centre of the project area in a strip some 20-40kms. wide and 70kms. long, and whose major axis runs from south-east to north-west. The area tentatively earmarked for the commercial ranch lies in the extreme south west of the project area in strata numbers 36 and 17, and is 20 kms long and 10 kms wide, with its main axis running from south-west to north-east.

N.12 The strata identified as being most suitable for extensive grazing (commercial ranch and village-grazing areas) contain some existing patches of cultivation and some areas thought suitable for cultivation but not yet cultivated. The farmers farming the patches of existing cultivation will probably have to be moved and relocated elsewhere, although detailed ground study by the land planning team may enable some of the patches of existing cultivation to be fitted in between the village grazing areas. The list below shows the strata designated as suitable for extensive grazing, their total areas, and the areas, and proportions within the total, that are already cultivated or have cultivable but so far uncultivated land.

Entire strata to be reserved for extensive grazing

Stratum Identification No.(see map 5)	Total area of stratum Ha.	Area of cropped cleared or fallow land		Area of potentially cultivable but not yet cultivated land	
		Ha.	% of stratum total	Ha.	% of stratum total
1	20,798	922	0.44%	957	4.60%
2	21,700	9,895	13.34%	1,632	7.52%
6	14,763	738	5.00%	1,262	8.55%
7	5,410	608	11.23%	1,546	28.57%
8	2,090	42	2.01%	1,700	81.34%
17	7,208	200	2.77%	410	5.69%
18	33,220	1,030	3.10%	1,488	4.48%
20	2,750	0	0	0	0
36	87,315	1,790	2.05%	6,217	7.12%
42	24,500	1,823	7.41%	1,284	5.22%
TOTAL	219,754	10,048	-	16,496	-

Some 10,000 ha. of land currently cropped, fallow, or cleared will revert to grazing (of it 5,586 ha. was cropped in 1971) requiring the relocation of some 1926 farmers (5586/2.9).

N.13 It is now possible to draw up a balance sheet for land which will be available for cropping during both the first (this project, involving 12,000 farmers) and second phases (involving a further 12,000 farmers) of development of the project area.

Add	Ha.	Ha.
a) Presently (1971) cropped	70,000	
b) Presently fallow	25,544	
c) Presently cleared not yet cropped	3,210	
d) Cultivable not yet cultivated	48,472	
Sub total.....	147,226	147,226
Deduct		
a) Land now cropped, fallow, or cleared, in strata to be reserved for extensive grazing	10,048	
b) Land cultivable not yet cultivated in these strata	16,496	
Sub total.....	26,544	- 26,544
Balance available for cropping in the future.....		120,682

There is, therefore, a potential net addition to the present cropped area of some 50,682 ha. (120,682 - 70,000), enabling a rise in the average area cropped by the estimated 24,000 farmers of the project area from 2.9 ha. each (70,000/24,000) to 5 ha. each (120,682/24,000).

N.14 Some miscellaneous problems in land - planning

The strata selected for extensive grazing (see strata 1, 2, 6, 7, 8, 17, 18, 20, 36 and 42 on Map 5) need to be viewed in the light of the potential for ground water shown on Map 4 in Appendix I. Strata 6, 7, 8, lie wholly in the area described as having "no chance" for

to be well supplied with wells in sandy river beds). However, stratum 8 is a strip along the Mehreb river, where water can always be found in the sand bed of the river. While the bulk of strata 17 and 36 lie in an area where there is said to be "no chance" for ground water, both strata are transected by limestone synclines where the chances of obtaining ground water are said to be "very good". Strata 18, 42 and 20 lie in an area where the chance of finding ground water is said to be "only moderate". However, Watson found that strata 18, and 42 are fairly well supplied with riverine pools (Cossins, 1971, however, found it to be a very dry area). Most of stratum 1 lies in an area where there are "no chances" for finding ground water except near river beds, but part of it, and almost the whole of stratum 2, lie in the Arkosic sandstone where there are "good chances" for finding ground water.

N.15 One of the effects of the project, through the introduction of improved ploughs and harrows and by more timely ploughing, is expected to be an increase in the amount of land cultivated by each farmer from an average of about 2.9 ha to 5.0 ha. While the overall figures for the whole project area suggest that there is sufficient cultivable land to allow for this without evicting any farmers completely from the area, the question arises whether there is enough land in particular parts (strata) of the area to allow expansion of the average farm size in that stratum without relocation of some farmers from that stratum to others.

N.16 We do not know enough about differences in the size of existing farms (i.e. cropped area per farmer), nor are Watson's methods designed to allow the precise answering of this question. Nevertheless, with that caveat, we can roughly categorize the strata into three classes.

a) Class I: Existing farmers in this stratum can be accomodated on bigger farms within the stratum, but no additional farmers can be accepted.

b) Class II: Existing farmers can not be accomodated if their farm size is increased. Some must, therefore, be relocated elswhere.

c) Class III: Existing farmers can be accomodated within the stratum and additional ones, relocated from elsewhere, can be accepted.

By these definitions we can classify those strata not reserved for extensive grazing as follows:-

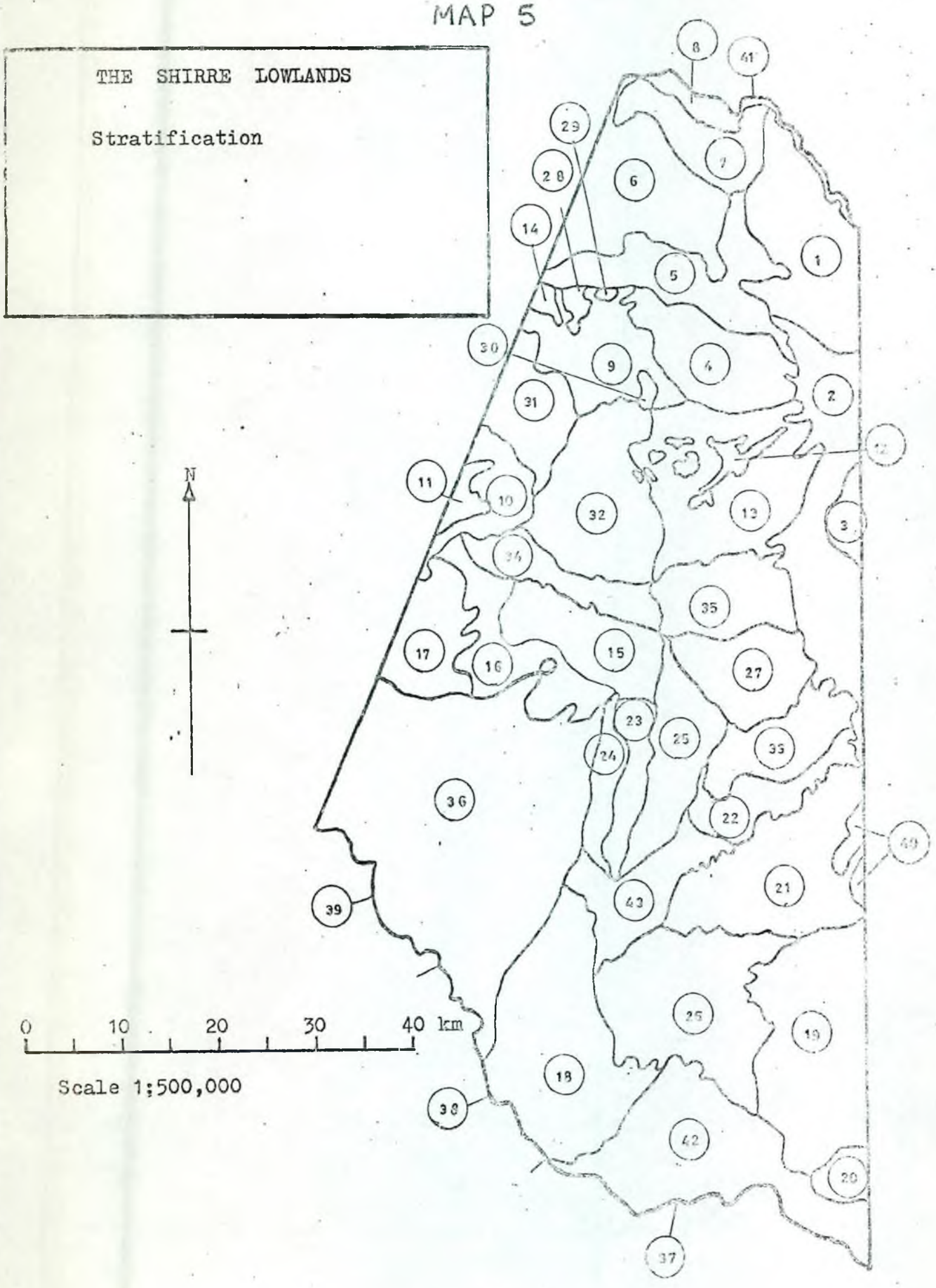
	Class I	Class II	Class III
Strata Numbers	4	14	3
	11	23	5
	12	25	9
	15	28	10
	16	29	13
	19	34	24
	21	40	37
	22		38
	26		39
	27		43
	30		
	31		
	32		
	33		
	35		
	41		

In addition to the estimated 1926 farmers who will have to be moved out of strata reserved for extensive grazing and relocated elsewhere, it appears that a further 830 farmers will have to be moved out of Class II strata if existing farm sizes within these strata are to be increased. It appears that they can be accomodated in strata adjacent to the ones in which they previously farmed.

MAP 5

THE SHIRRE LOWLANDS

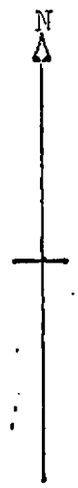
Stratification

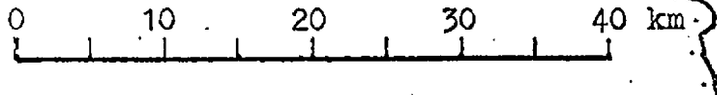


MAP 6

THE SHIRRE LOWLANDS

Percentage of each stratum under cultivation, fallow or recently cleared, for all soil types



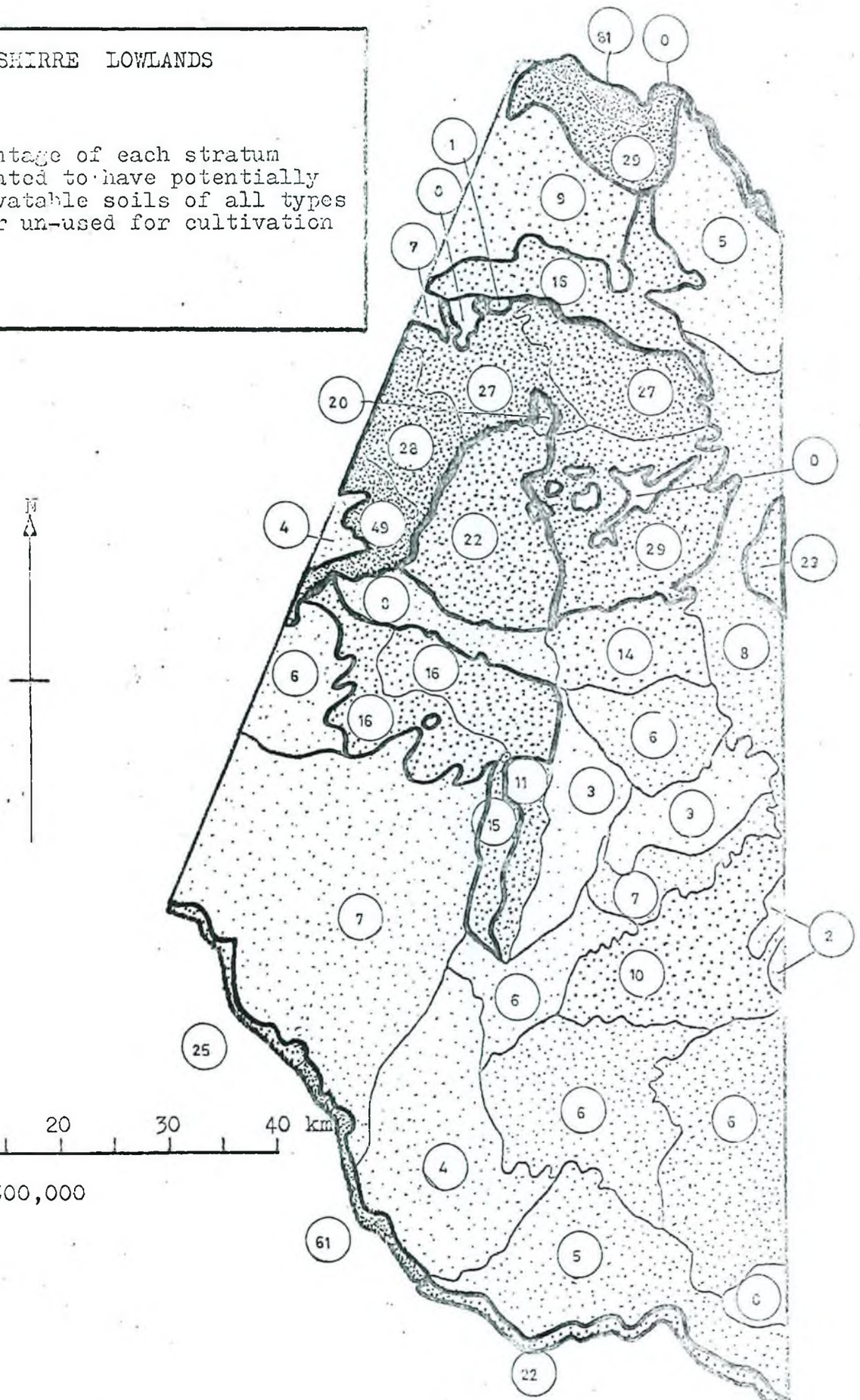


Scale 1;500,000

MAP 7

THE SHIRRE LOWLANDS

Percentage of each stratum estimated to have potentially cultivatable soils of all types so far un-used for cultivation



Scale 1:500,000

LOWER SHIRE PROJECT

APPENDIX O

NOTES ON POSSIBLE CROP AND LIVESTOCK IMPROVEMENTS AND AND ON TRIALS AND INVESTIGATIONS TO BE CARRIED OUT UNDER THE PROJECT

O.1. The economic justification of the project is based on the assumption that the provision, through the project, of certain inputs and services (capital and recurrent inputs, marketing, extension supply, credit, etc.) will lead to a substantial increase in agricultural output from the project area. This assumption about a potential for increased output implies that the technical means for increasing output are already known, or can easily be discovered. This Appendix discusses separately the technical possibilities for increasing crop and livestock output.

O.2. The Potential for Increasing Crop Output

The output of crops can be increased by bringing into production fresh areas which have never been cropped before and by increasing per ha. output on areas previously cultivated. Per ha. output can be increased both by increasing yields on the area actually cropped in any one year, and by reducing the amount of fallow required.

O.3. About 56% of the area available for, and with potential for cropping (after allowing for some relocation of farmers), is currently under a crop, a further 21% is fallow, and 23% has potential for cropping but has not yet been cultivated (some of it has been cleared). The present ratio of fallow to cropped land is much lower on black than on other soils (about .143:1 as compared to .5 : 1 on other soils). At present the main crops grown are sorghum and sesame, with 25-30% of the total area cropped in any one year being cropped with sesame and the remainder with sorghum. Present yields of sorghum and sesame, averaged over good and bad years alike, are about 7 quintals per ha. and 2 quintals per ha. respectively. In good years sorghum yields average about 10 quintals per ha. and sesame 3.5. The present ratio, for all soils taken together, of fallow : cropped area is 0.37:1. The average "holding" of farmers presently resident in the area is, therefore, approximately as follows :-

Area cropped with sorghum	2.0 ha. approximately
Area cropped with sesame	1.0 ha. approximately
Area fallow	1.1 ha. approximately

O.4 **Future increases in agricultural output for the market or for human consumption must primarily be sought through increasing per ha. yields.** Any increase in the total area cropped each year, whether achieved by bringing entirely new areas under cultivation or by reducing fallow, will mainly be given over to the growing of fodder crops for consumption by the farmer's own livestock. It is forecast that yields (averaged over good and bad years together) of sorghum and sesame can be progressively raised to 14 quintals/ha. and to 5.5 quintals/ha. in the first five years after each participating farmer joins the project's programme. In good years sorghum yields will average 16 and sesame 6 quintals per ha. Yield increases after the first five years from each farmer's incorporation in the programme will be more gradual. At the end of 5 years a typical farmer's cropping pattern will b:

Sorghum	1.7 ha.
Sesame	1.0 ha.
Beans (or other crop)	0.3 ha.
Fodder crop	2.0 (minimum 1.5 ha.)
Fallow	0.0 (maximum 0.5 ha.)
	5.0 ha.

0.5. Farmers explain the present high fallow : cropped area ratio (on soils other than black ones) as being a result of the declining yields obtained from land cropped for 3 or more years in succession. The decline in yields is attributed both to increasing weed infestation and to declining natural fertility, but it is not known whether the declining fertility is a result of exhaustion of nutrients, deteriorating soil structure or some other cause. The generally low level of yields on new and old fields alike is attributed by Ellman (1971) to:-

a) Inadequate rainfall ;
b) Late planting due to slow methods of seed bed preparation, which cannot start until the start of the rains has softened the soil ;
c) Inadequate seed bed preparation - partly due to inefficient tools and partly due to lack of time to do it properly (often only one ploughing is done which simultaneously breakds the land and covers the seed which was broadcast before any ploughing);
d) Poor seed and seed varieties, inadequate amounts of seed, unevenly sown and badly covered ;
e) Poor soil structure and fertility;
f) Inadequate weed control ;
g) Infestation by pests.

0.6. So far very little reliable information is available from the project area itself to show precisely how these causes of low yields may be overcome. The T. D. O. farm in Tach Adiabo has had to struggle with such severe organisational problems that it has not been able to provide much useful information. Nevertheless, some of the yields, especially for sorghum, recorded in the fertiliser trials carried out in the area show that good yields in the area are possible, and research results elsewhere, especially in similar parts of the Sudan and in Ethiopia, show ways in which most of the problems can be overcome. The crop trials component of the project will not engage in original research (unless some peculiar local problem emerges) but will concentrate on testing which of the useful research results obtained elsewhere can be adopted and recommended for use in the project area.

0.7. Although some irrigation potential exists on the banks of the Mehreb and Tekazze Rivers, the development of this is not one of the project's components. Moisture available to the crops will, therefore, always be a fairly severe constraint on the level of crop yields. The average rainfall in the area is thought to be in the range of 550-600 mm per year. Rain gauges have been located in four places in the project area spasmodically since 1966 (see Appendix D). Nevertheless, neither the length of time for which records exist, nor the skill with which these gauges are tended and read, is sufficient to enable an accurate estimate of average rainfall and its reliability on the basis of these alone. The project area lies near the centre of a triangle of which the Apices are Asmara, Gondar and Setit Humera (for all of which longer and more reliable records exist), but is somewhat north of the triangle's centre and nearer the Setit Humera to Asmara line. Annual rainfall at Asmara (altitude 2,325 metres) averages 518 mm. (67 years of records), at Setit Humera (altitude 550 metres) 587 mm. (20 years), and at Gondar (altitude 2,120 metres) 1,255 mm. (31 years). The table below gives a summary of available and relevant rainfall records.

Place	Location	Distance (Kms) and direction from centre of project area	Period of rain fall records		Average Rainfall (millimetres) p. a.	Maximum rainfall (millimeters) and year	Minimum rainfall (millimeters) and year	Altitudes (metres)
			Years	No. of years in average				
Asmara	15°1717N 38°55'E	150 NE	1903 to date	67	518	957 (1916)	265 (1915)	2325
Adi Ugri	14°53'N 38°49'E	120 ENE	1895 on wards G	47	612	1054 (1935)	276 (1941)	1980
Adowa	14°09'N 18°54'E	100 ESE	1937 to dat G)	16)	758	1077 (1939)	524 (1966)	1980
Axum	14°10'N 38°40'E		1961 to dat G)	)				2150
Berentu	15°09'N 37°36'E	80 NNW	1924 to date G	38	460	782 (1953)	170 (1963)	980
Culuccu	14°55'E 37°40'E	60NNW	1923-40 G	15	599	731 (1929)	478 (1925)	880
Gondar	12°36'N 37°29'E	220 S	1937 to date G	31	1255	1767 (1964)	907 (1952)	2120
Om Hager Setit	14°21'N 36°37'E	140 W	1919-39 G) 1968- date	20	587	842 (1937)	297 (1919)	550

G- There are gaps in the series in the period covered.

SOURCE : Water Resources Potential in the Barca, Marab-Gash and Tekezzie - Setit Basins. Electroconsult, Milan, December 1971 (draft).

All these figures suggest that an estimate of annual average rainfall for the project area of 550-600 mm. is probably about correct. Vegetation within the project area does not give any indication of great differences in rainfall between one part of the area and another. The rainfall is highly concentrated in the months of June, July, August and September, with most of it falling in July and August. Given the limited annual total, this distribution is highly favourable for bringing one crop per year to maturity. During July and August, at any rate, rainfall precipitation is almost certainly in excess of evapotranspiration, and the latter variable is likely (because of differences in altitude) to have a lower value than at Setit Humera, 100 kilometres further west, which probably has the same rainfall, and where good crops can be grown. In other parts of the tropics (for example at Abu Naama in the Sudan) yields equal to or in excess of those forecast for the same crops under the project have been attained with no more favourable rainfall regimes. Further information on meteorological phenomena will be collected as part of the crop trials programme carried out under the project.

0.8 Where yields decline on continuously cropped land as a result of weed infestation, the process can be halted and reversed by herbicides, improved cultivation techniques and appropriate rotations. Trials with herbicides on sorghum are already being carried out at Setit Humera, with post-emergence Dicuran 80, at 2.8 kg/ha., giving good control on sorghum against weeds other than Striga (giving an 8% increase in yield/ over a standard of hand-weeding that was far higher than is lilely to be met on peasant farms). Striga is a problem in the project area and needs to be controlled by introducing new striga-resistant varieties (now being tested at Holetta Research Station) and by a crop rotation involving the growing and then cutting or grazing, of sorghum and its ploughing-in before the striga has had a chance to set seed. The requirement that all farmers given land under the project should reside permanently in the project area, and should not migrate between high-land and lowland farms, will improve the standars of hand-weeding. Weed-control techniques will be one of the subjects of trials under the project, and in the projection of a model farmer's operation (Annex 1) the use of a herbicide has been introduced in year 4. There is some evidence (from CADU) that use of the VITA-type plough and spiketooth harrow (introduced into this project's model farm's operations in years 4 and 3 respectively) can also substantially improve weed control (CADU publication 52 p.14).

0.9 Where yields are low, or decline over time as a result of the exhaustion of soil nutrients, the use of artificial fertilisers may be called for Soil analysis (see Appendix F) indicates that the area's soils are poor to medium in phosphorus status. The results of fertiliser trials already carried out in the area are given in Appendix E. These trials are not so far conclusive, although in 1969 a good response in the case of sorghum, and a fairly good response in the case of sesame, was shown to NP applications. In an area of moderate and somewhat uncertain rainfall the application of artificial fertiliser may be very unprofit-able in some years, although even in these cases there will be a residual improvement to the soil, carrying into the next year. The use of fertiliser, at an application of 50kg/ha. is introduced on 1 ha. in the projection of the model farmer's operations (Annex 1) in year 2, and on a further ha. in year 4. Further investigations on the use of artifical fertiliser will be carried on in trials under the project, and other methods of maintaining fertility, e.g. by appropriate crop rotation, will also be investigated.

0.10 Deterioration in soil structure, due to continued cropping of the same bit of land, may also be a cause of declining yields, and some of the areas already cultivated on hillsides could be susceptible to damage from erosion. There is not particular evidence that deterioration in soil-structure (e.g. moisture-retaining capacity) is a problem (see Ellman 1971 pp. 27 - 28), but if it were on a wide scale, it might be more difficult to cope with. Appropriate rotaions and cultivation practices might provide the required remedies. Investigations on this point will be included in the trials programme under the project.

0.11 It is probable that late planting is one cause of present low yields in the project area (as has been found to be the case elsewhere). One reason for late planting is because Mofer Zemach immigrant farmers have two farms, one in the highlands; and the lowland farm only begins to get attention after crop sowing on the highland farm is complete. Another reason for late planting is that with the traditional plough, and the poor condition of work oxen at the end of the dry season, it is difficult to start ploughing until after the start of the rains has softened up the soil.

0.12. A related problem is the very poor standard of seed-bed preparation and seed-covering. To produce a good seed-bed with the traditional local plough, up to 4-5 ploughings may be required, the last being to cover the seed. These repeated ploughings may require over 100 hours of ploughing time per ha., probably at least a month's work (oxen dependent on unfenced, unimproved, grazing can not plough for more than a few hours per day). In the project area, however, because there is no time to do all this after the start of the rains, if the crop is to be planted in time for it to escape drying out unmatured when the rains stop, often only a single ploughing takes place, with the seed being scattered on the unbroken land before this ploughing. Not surprisingly this technique leads to many unbroken clods of earth and seed buried far too deep.

0.13 At CADU, admittedly in a quite different ecological zone, good results have been obtained by the introduction of cheap locally produced spike-toothed harrows (E$30) and VITA type mould-board ploughs (E$40), now made by the Ethiopian Metal Tools factory in Addis Ababa. A combination of the use of these two has led to a 33% reduction in the time (from114 hours to 77) required for seed-bed preparation and seed covering. Associated with this reduction in time is a substantial reduction (20%) in the pull-power required from the oxen to pull the VITA, as opposed to the traditional, type of plough ; and this may permit much earlier ploughing. The use of the spike tooth harrow at CADU also appears to give better seed germination (because of more regular and controlled seed-covering) than the local plough, with a yield increase (on wheat) of some 20% (CADU publication 52, pp. 9 and 15). The provision of fencing and other facilities on village grazing reserves, as proposed in the project, will improve the condition and productivity of ploughing oxen.

0.14 It cannot be assumed that the same new tools which have given superior results to the traditional at CADU will necessarily do the same at a different altitude, on different soils and with different crops, in Lower Shire. It would, however, be surprising if no improvement on the traditional type of tools could be found. Trials with different tools, different dates of planting, and different cultivation methods (including post-emergence cultivation), will form part of the trials carried out under the project. The use of a spike tooth harrow and a VITA - type plough have been introduced into the farmer's model in Annex 1 in the 3rd and 4th years respectively.

0.15 In other parts of the world the introduction of new varieties of seed has had dramatic effects. Variety trials will be carried out under the project to see whether improvements on local varieties of sesame and sorghum can be found, although experience elsewhere (Setit Humera and WADU) with sorghum and sesame suggest that Ethiopian varieties may be best. The varieties currently in use in the project area, however, may have come down from the highlands, and may not be the best adapted to conditions at a lower altitude (the ones now grown in Lower Shire appear to be different varieties to these grown at Setit Humera). Since cultivation has not been going on for very long in the project area, the best adapted varieties may not yet have been adopted. Trials, under the project, will also be carried out on possible new crops for the area. In the medium and long term, prospects of increasing prosperity for the area depend on finding a higher value crop than sorghum (grown for grain). Fodder crops (especially sorghum), to enable cattle finishing on peasant holdings, will be one type of crop investigated. The use of improved seed is introduced in the 3rd year of the farm model of Annex 1.

..

0.16. Not a great deal is known yet about crop pests in the area, except that at Badime froghoppers appear to be a serious problem. Sudan dioch does not yet appear to be a problem. Trials for pesticides and pest control measures will be carried out, Control of froghoppers has been introduced in the 2nd year of the farm model of Annex 1.

0.17. In summary the programme of crop trials carried out under the project will cover the following:=

a) Collection of meteorological data on a systematic basis ;
b) Herbicides and weed control techniques ;
c) Fertiliser trials ;
d) Crop rotation trials to determine crop rotations to:-
   (i) maintain soil fertility and structure ;
   (ii) control weeds and pests ;
e) Time of planting trials ;
f) Testing of improved tools and of cultivation techniques ;
g) Variety trials for sorghum and sesame ;
h) Adaptation, and later variety trials for other crops (including fodder crops), conservation and use of fodder crops ;
i) Pest control trials.

A limited number of crop-trials, incorporating some of the components listed above, will be carried out under the auspices of the Minimum Package Programme in the 1972 crop-season.

0.18 Out of the 5 ha. holding proposed for farmers under the project 3 ha. are expected to be put to crops for sale or human consumption. The remainder of the holding will be used for the production of fodder to feed the farmer's livestock. The best fodder crop will be Sorghum (S. Vulgare, or possibly Sudan Grass, S. sudanense). The very long dry season in the project area will prevent the establishment of permanent pastures. The fact that 3.7 out of the total of 5 ha. on the holding will be sown to sorghum (1.7 for grain and 2.0 for fodder) will be an advantage rather than a disadvantage. The fodder - sorghum will be cut before maturity, and the roots and the stumps ploughed in as a green manure. Not only will this improve the condition of the soil, but it will also help in control of Striga, since the gowing of sorghum will stimulate the germination of striga seed (no other crops and only a few other host plants will) while the cutting and ploughing in of the sorghum, and its associated striga, will prevent the striga setting seed. This system has been used to good effect in the Central Rainlands in the Sudan. The sorghum cut for fodder will be turned into hay. This has proved successful elsewhere (e.g. in Botswana). Average yields of.....kgs. dry matter per ha. are forecast.

0.19 Apart from the maintenance of soil fertility and structure, the main constraint on peasant farming systems tends to be the availability of human and animal labour in relation to the demands made upon them. The following shows the labour utilisation projected for the proposed cropping pattern :-

LABOUR REQUIREMENTS ON 5 HA. FARM *

PERIOD	T A S K S	Man-days (i) of human labour required	Oxen-pair (ii) days required
February-April	a) Very little labour required. Some maintenance work will be undertaken		
May (31days)	a) plough 2 ha. ploughed in previous September (once)	12.0	12.0
	b) Plough 1 ha. not ploughed in previous September (once)	12.0	12.0
	c) Spread fertiliser on 2 ha.	2.0	-
	Period Total	26.0	24.0
1st - 21st June (21 days)	a) Harrow 3 ha. ploughed in May (Twice each)	6.0	6.0
	b) Plough 1 ha. for fodder crop (once)	12.0	12.0
	Period Total	18.0	18.0
22nd June-July (16 days)	a) Broadcast seed on 3 ha. cash and food crops	4.5	-
	b) cover seed with harrow on 3 ha. cash and food crops	3.0	3.0
	c) Plough 1 ha. of fodder crop(once)	8.0	8.0
	Period Total	14.5	11.0
Remainder of July (24 days)	a) Harrow 1 ha. fodder crop (twice)	2.0	2.0
	b) Broadcast seed on 1 ha. fodder crop	1.5	
	c) Cover seed on 1ha. fodder crop	1.0	1.0
	d) Apply herbicide on 3 ha. cash and food crops	6.0	
	e) Apply insecticide on 2 ha. sorghum and beans	4.0	-
	f) Harrow 1 ha. fodder crop (twice)	2.0	2.0
	g) Broad cast seed on 1 ha. fodder crop	1.5	-
	h) Cover seed on 1 ha. fodder crop	1.0	1.0
	i) Hand weed 1½ ha. cash and food crops (1st time)	6.0	-
	Period Total	25.0	6.0
August (31 days)	a) Hand weed 1½ ha. cash and food crops (1st time)	6.0	-
	b) Hand weed 2 ha. fodder crops (1st time)	12.0	-
	c) Hand weed 3 ha. cash and food crops (2nd time)	12.0	-
	Period total	30.0	-

* In fifth year

PERIOD	T A S K S	Man days of human labour required	Oxen - pair days required
September	a) Cut and carry 1 ha. fodder crop	10.0	8.0
	b) Plough in one ha. fodder crop	4.0	4.0
	c) Cut and carry 2nd ha. fodder crop	10.0	8.0
	d) Plough in 2nd ha. fodder crop	4.0	4.0
	e) Bird watch grain sorghum*	7.0	
	Period Total	35.0	24.0
October 1-15th (15 days)	a) Bird watch grain sorghum*	17.0	
Oct. 16-30th (15 days)	a) Harvest 1 ha. sesame	16.0	-
	b) Birdwatch grain sorghum*	1.0	-
	Period Total	17.0	-
November	a) Thrash sesame (5.5 quintals)	17.5	-
	b) Harvest 0.3 ha. beans	4.0	-
	c) Harvest 1 ha. sorghum	8.0	-
	Period Total	29.5	
December	a) Harvest 0.7 ha. sorghum	6.0	-
	b) Deliver 5.5 quintals sesame for sale	2.0	2.0
	c) Thrash 12.0 quintals sorghum	12.0	4.0
	Period Total	20.0	6.0
January	a) Thrash 11.8 qtls. of sorghum	12.0	4.00
	b) Deliver 15 qtls. sorghum for sale	7.0	7.0
	Period Total	19.0	11.0

* If child labour can be used more time should be given to this task

(i) Theoretical maximum availabilities per farm-holding are :-
Man-days -40 (no hired labour)
Oxen - pair days - 30 (1 day = 6 working hours)
In practice limits of 35 and 25 respectively are more probable. Initially, because of the very strong hold of the church in the area, limits of labour availability will be less, and as few as 17 or 18 working days may be allowed in some months. It is probable that as the area develops this particular constraint on availability will tend to relax.
The figures in the table ignore requirements for cattle - herding which will be met by hired or child - labour.

0.20. As can be seen from the above table the critical months for use of human labour are June - October inclusive, and for oxen labour the months of May, June and September. At the prices forecast for sorghum and sesame in the early years of the project there is no great difference in gross value of output between a hectare of sorghum and a hectare of sesame. At the prices forecast for year 6 of the project onwards the gross value of a hectare of sesame is higher than that of sorghum, and a limited switch from sorghum to sesame production may be possible. However, the constraint of labour availability for sesame harvesting is more acute than would appear from labour - availability and requirement figures for a whole month, since sesame harvesting may have to be compressed into a 2 - week period. A critical assumption is that ploughing in of 2ha. of fodder crops in September, and the lower pull-requirements of improved tools compared to the traditional plow, will permit the ploughing of 3 ha. of land in May or earlier before much rain has softened up the soil.

0.21. It is difficult to predict the precise rate at which the level of farm output may change over time in response to new practice and inputs. More precise forecasts are given in Annexe 1.

The table below, however, summarises the changes forecast (excluding output of fodder crops)

Year of farmer's incorprotation in project	1	2	3	4	5
Farming Innovations introduced during this year.	No innovations introduced except granting to farmer of sub-lease to land on specified conditions	a) Fertiliser on 1 ha. b) Use of insecticide on 2 ha.	a) spike - tooth harrow b) Improved sorghum seed c) Improved sesame seed	a) Use of fertiliser on further ha. b) Use of herbicide on 3 ha. c) Ox - cart d) Improved plow	a) Use of herbicide on further ha.
% of 5-year increase in value* of crop - output gained during this year	0	18	26	37	19
Cumulative % of 5 year increase gained	0	18	44	81	100%

* Total increase in value of crop output (at constant prices) over 5 years is $ 388 per farmer.

0.22 THE POTENTIAL FOR INCREASING LIVESTOCK OUTPUT

There is, at present, no net sale of cattle from the project area. Rather the area is a net importer of cattle. The reasons for this are the extremely high mortality rates, low fertility, and the very high requirements by the area of oxen for ploughing. The causes of mortality are summarised, from the veterinary team's report, in Appendix J. Mortality (including abortions) of calves in their first year of life is about 33%. For older animals it is probably about 10-12%. According to herd owners (Cossins 1971), the causes of death among calves are as follows:-

	% of all calf deaths
Rinderpest	26.3
Starvation	15.6
Abortions	13.8
Hyaena attack	8.6
Coccidiosis	6.6
Trypanosomiasis	6.0
Blackquarter	4.8
Other	13.3
	100.00

Precise details are not available for adult animals, but Rinderpest is almost certainly the most common cause of death. The veterinary team (1971) cite Rinderpest, Blackleg, Trypanosomiasis and Anaplasomosis as the most serious diseases. CBPP is not, at the moment, a problem in this area. Although Trypanosomiasis exists in the area, it is not thought to be an important direct cause of death although the high proportion of animals said to die "from starvation" may be partially attributed to this disease. Tick infestation in the area tends to be heavy. Tricks are the probable cause of some diseases (Brucellosis, Anaplasomosis) found in the area, but are more generally regarded by local farmers as the cause of overall bad conditions in animals, and especially of damaged udders in female animals, leading to poor milk production.

0.23 Questioning herd owners about cattle fertility produced answers suggesting a fertility rate of about 50-60%. When the questioning was accompanied by physical per rectum examination to aid pregnancy diagnosis, howerer, a much higher fertility rate (70%) was indicated (Vets' Team, 1971). For present standards of husbandry a fertility rate of 70% seems improbably high.

0.24 Shortage of water points, or more particularly shortage of water points where adequate amounts of water can be drawn with the available labour force, is also a problem. Cattle are watered in the dry season every other day, instead of daily. Shortage of water points leads to uneven use of the grazing, with areas further away from water points not being so throughly grazed.

0.25 After disease, the most critical constraint on livestock development is shortage of grazing. Watson (1972) estimating livestock numbers in the area in March, gives a figure of 58,000 cattle. Cossin's (1971) estimate was 31,000 of which 6 - 8,000 belong to temporary immigrant herders. The implied actual stocking rate derived from these figures is therefore between 12 and 7 ha. per animal and probably, therefore, between 9 and 6 ha. per livestock unit. The World Bank (1970) Mission estimated the carrying capacity of the area at 4 ha. per livestock unit, although most other observers have been more pessimistic.

Apart from the usual problems arising from uncontrolled grazing there are particular problems on the black soils arising from the dominance of Hyperrhenia and Cymbopogon species. These are unpalatable to stock except when young, and are commonly burnt off every year, which again perpetuates the dominance of these particular species. The resulting preference of the cattle for the red soil grazing has led to a degree of overutilisation that has destroyed most of the grass cover on these.

0.26 Present castration methods are inefficient. In some animals it is ineffective. In others it leads to a severe check to growth.

0.27 In most cases the technical solutions to these problems of livestock are known, although appropriate methods for managing the grass species and grazing in the area have yet to be determined. The majority of the cattle in the project area will be incorporated into village grazing schemes, and the following are the measures which will be taken to overcome the problems listed above:-

(i) Free and compulsory vaccinations against:-

a) Rinderpest, regularly
b) Anthrax (when required)
c) CBPP (when required)
d) Brucellosis

(ii) Vaccinations not compulsory and for a charge, against:-

a) Trypanosomiasis
b) Liverfluke (Fascioliasis)
c) Blackleg

(iii) Compulsory regular dipping, effective against tick infestation generally, and specifically to reduce the incidence of anaplasmosis, brucellosis (possibly), and mastitis.

(iv) Provision of water supplies. These will:-

a) Enable daily watering, keeping all cattle in better condition.

b) Improve hygiene at watering places, and hence reduce the incidence of fascioliasis.

c) Enable better and more even exploitation of grazing. It is, estimated that 90% of the area of each village's grazing area will be less than 5km. from water.

(v) The supervisor of each village grazing area will be issued with proper castration equipment, and will be instructed in its use.

(vi) Fencing of village grazing areas. This will permit:-

a) Limitation of total cattle numbers on the area;

b) Prevention of indiscriminate grazing by nomadic herds;

c) Some grazing management and, as a consequence an improvement in pastures;

(vii) A hyena control programme, which woll reduce mortality, especially that of calves.

0.28 All the measures listed above will also be taken on the cooperative ranch; and the degree of management of grazing on this will be much higher than on village grazing areas, allowing faster growth of animals and reduced incidence of certain diseases (e.g. parasitic gastro-enteritis, parasitic bronchitis)

0.29. The following investigations and trials will be carried out under the project to investigate technical problems for which the answers are not yet known, and the solutions to which offer substantial and early economic returns :

a) Different vegetation types/associations will be defined, mapped, and prima facie stocking capacities determined. (To enable initial stocking-limits on village grazing areas to be laid down.)

b) Trials will be carried out, on natural pastures, to determine the long-term actual stocking capacity under different grazing - management techniques (including fire control), using a combination of animals and simulated grazing ;

c) Some chemical analysis of pasture at different times of year will be carried out ;

d) Trials, on a limited scale, will be carried out of new varieties of grazing species, their introduction and management.

0.30. As a result of the veterinary and other technical innovations available it is estimated that cattle mortality on village grazing areas will decrease sharply; and in the herd projection of Annexe II. 1 an eventual calf mortality rate of 10% and an adult cattle mortality rate of 5% has been forecast as probable. The more evenly distributed water supplies, and the fencing of grazing, is forecast to allow a gradual improvement in stocking capacity from 6 ha. per livestock unit to 4 ha. This should be feasible with a rainfall of 550-600 mm., although the rather monomodal rainfall pattern of this area may prevent the stocking rate achieved at Adami Tulu (1.6 ha. per livestock unit), where total rainfall amount is similar, although the distribution is more bimodal, being attained. A fertility rate of 70% will become possible.

0.31. In spite of the reduction in mortality forecast the village grazing areas will not, initially, produce a sizeable surplus of young male animals which could be finished either on the commercial-type cooperative ranch or on fodder crops on a farmer's holdings. The reason for this is the high proportion of the herd which has to be kept for draught purposes. Until the stocking capacity of village grazing areas increases, not enough of the herd on these can be breeding cows for a substantial surplus of young animals to be available for sale. Later, when stock carrying capacity increases, more cows will be brought in, and at that stage a surplus will become available. Cash sales in the early years will pay the necessary grazing fees and other expenses for the remaining animals, and leave a small cash surplus for the farmer.

0.32. The fact that the cash surplus from village grazing areas is relatively small does not, however, indicate that the benefits from them are correspondingly small. The project area at the moment is almost certainly a net importer of animals, especially of oxen on a short term seasonal basis. The provision of village grazing areas will convert this net import into a small surplus initially, and later into a larger surplus.

A P P E N D I X P

A NOTE ON A PROJECT ROAD PROGRAMME

P1. The project area is already connected to outside markets by motorable dry-weather tracks from Sheraro to Enda Selassie (120 kms.) (eastern access route) and Yirga to Shembuko (across the Mehreb River) to the new Barentu Adi Ugri road (about 40 kms.) (northern access route). The eastern access route is passable with difficulty during the rains by four-wheel drive vehicles. The northern access route is closed for three months (July, August, September) by the Mehreb River. The project area is also connected by a new dry-weather motorable track to Setit Humera, but this road is also closed to traffic for four to five months by the Takazze River. All these three motorable tracks were constructed by the Tigre Development Organization(TDO), and both the northern and eastern access routes are now used by traders' vehicles exporting produce from the project area. The eastern route appears to be much busier than the northern, and has a daily bus service.

P2. An Italian firm of consultants, engaged to study several roads, will also study the question of road access to the project area. Their report may be available by the time an Appraisal Mission is sent to evaluate this project. If they report that a road of IHA (Imperial Highways Authority) feeder road standard to connect with the project area is justified, it would be possible to include such a road in the Sixth-Highway Programme, and construction of it could start in 1976.

P3. The rest of this note, however, assumes that the consultants will find that a feeder road to IHA Standards will not prove to be economically justifiable, and that only a road of considerably lower standard should be built. A provisional estimate by the district engineer IHA of Adigrat (dated March 1971) suggests that a road to approximately feeder road standards of 98 kms. length from Enda Selassie to Sheraro, and for a further 179 kms. within the project area, would cost Eth. $9.99 million, an average of Ethiopian $37,300 per kilometer. TAMS, the consultants retained to study the Setit Humera project, are also looking at the Enda Selassie to Sheraro to Setit Humera track as an alternative means of access to Setit Humera, but the results of their study are not yet known.

P4. Since the project area is already connected to outside markets, any further road programme has to be justified by:-

a) A consequent reduction in transport costs on the project's outputs.

b) A consequent reduction in transport costs on the project's inputs.

c) A consequent reduction in transport costs on the country's outputs other than those of the project, which are also affected by the road programme (inputs other than those to the project area are assumed to be neglible).

d) An inducement effect, caused by the reduction in transport costs, on the quantity of those non - project outputs (the quantity of the project's outputs is assumed to be relatively inelastic to the cost changes).

e) Increased efficiency in the execution of the project, brought about by all-weather and quicker road access. This benefit is unquantifible. but administration of the project will be exceptionally difficult in the absence of reasonable all-weather road access.

P5. It is assumed that production to the north, south, and west of the project area will not be affected by the project area's roads (with the exception of Setit Humera). This assumption is justified in terms of topography and other lines of communication. The only non-project outputs to be affected will, therefore, be those from the project area itself, from Setit Humera, and from country to the east of the project area. The latter would not be affected by the improvements in the Yirga to Shembuko link . (norther access route).

P.6 The following data and assumptions are used in the subsequent analysis ;

a) Transport costs on roads of IHA feeder road standards, and above, are Eth. $ .0084 per quintal/km.

b) Transport costs on existing project area roads are Eth. $0.0017 per quintal/km.

c) Transport costs on the access road between the project area and the nearest road of IHA feeder road standard or above will be Eth. $0.012 per quintal/km. for the standard of road proposed to be constructed under the project (see paragraph P8 below).

d) That the distance from :-

(1) Yirga to the junction with the Barentu/Adi Ugri road through Shembuko is 40 kms. (northern access road).

(2) This junction to Adi Ugri is 120 kms. (feeder road standard).

(3) Sheraro to Enda Selassie (by the new 1972 alignment) is 120 kms. (eastern access road).

(4) Enda Selassie to Asmara is 239 kms. (primary road)

(5) Adi Ugri to Adwa is 103 kms. (primary road).

(6) Adi Ugri to Asmara is 54 kms. (primary road).

(7) Enda Selassie to Adwa is 82 kms. (primary road).

e) That because of its more central position, produce collected from farmers and bulked at Sheraro has to travel 15 kms. less than if it is bulked at Yirga. The average distance from farm gate to Sheraro is 20 kms.

f) That sorghum from the project area will be sold for consumption in Tigre, with Adwa as a typical place of sale; and that sesame will be sold in Asmara.

g) That the cost of transporting one quintal from farm gate to final market is as follows (see table P. 1) for the two potential access routes, and for improved or unimproved access.

TABLE P1

Transport Costs From Farm Gate To Final Market (Eth.$ per quintal)

Crop	Access Route Via:-			
	Yirga-Shembuko (northern)		Sheraro-Enda Selassie (eastern)	
	Improved access	Unimproved access	Improved access	Unimproved access
Sorghum	2.78	3.15	2.37	3.03
Sesame	3.36	2.73	3.68	4.34

As can be seen in the case of sorghum, because of the prospective destination being Adwa, it is alsays cheapest to take the road from Sheraro to Enda Selassie, while in the case of sesame it is cheapest always to take the road through Yirga and Shembuko.

P7. Given the assumptions made in the previous paragraph, we can now evaluate the net present worth (at a 10% discount rate) of the costs of transporting the project's forecast outputs (as scheduled over time) using four alternative assumptions about the routes to be taken. We can then compare these costs with the cost (similarly discounted) o f taking these outputs out by the present cheqpest route at unimproved standards, and so evaluate the incremental gross benefits to be derived from constructing each of four alternatives in preference to the present situation. (see table P2). The four alternatives are:-

(1) To abandon the northern access route and improve eastern access route.

(2) To abandon the eastern access route and to improve the northern access route.

(3) To maintain the northern access route at its present standard but to improve the eastern access route.

(4) To improve both the northern and eastern access routes.

In this evaluation no account has been taken of cost reduction in the transport of the project's inputs or of non-project outputs. Nor have alternative timings of construction been considered.

TABLE P2

Present Value (Eth$000s) of Cost of Transporting Project Outputs to Market by Different Routes

	Net Present Worth of Cost of Transporting to Market			Gross Benefit of Route, i.e. reduction in costs in comparison to present
	Sorghum	Sesame	Sorghum and Sesame	
Alternative I	2,739	1,419	4,158	397
Alternative II	3,213	910	4,123	432
Alternative III	2,739	1,053	3,792	763
Alternative IV	2,739	910	3,649	906
Present Routes	3,402	1,053	4,555	-

P8. We can now compare these gross benefits (i.e. potential reductions in the cost of transporting the project's forecast outputs) to be derived from operating different access routes with the costs of operating them. The basis for computing costs is two notes produced by WADU ((a) WADU Minor Roads Construction Costs, and (b) The WADU Road Construction Scheme) in early 1972, incorporating the results of WADU experience. The specifications of the roads constructed at WADU, which are thought to be suitable for access routes for this project also, are:-

a) Motorable road crown is 4 metres wide.

b) Road from drain bottom to drain bottom is 6 metres wide.

c) Drain width is 4 metres.

d) Overall width, including drains, is 14 metres.

WADU costs of road construction, including depreciation on machinery and overheads, per kilometre, are given as:-

	Allocated	Overhead at 25%	Total
a) Earth works and clearing	679	170	849
b) One, single-culvert, flood bridge	842	211	1,053
c) Two, type C culverts	488	122	610
d) 10 cm spot murram application on 100 metres	250	62	312
Total cost per km.	2,259	565	2,824

P9. Within the Lower Shire project area, the Sheraro-Enda Selassie road (eastern access route), the Sheraro-Yirga road, and the Yirga to Shembuko section of the potential northern access route through Yirga have been inspected, and notes made of the drainage crossings and surfacing required. The section (16 kms) of the northern access route north of Shembuko was not visited, but it is assumed to be similar to that south of it. The proposed route south from Sheraro for 40 kms is not demarcated on the ground, and was not visited, but is assumed to have the same number of drainage crossings per km. as that between Sheraro and Yirga, but to have much less black clay soil on it, and therefore less requirements for surfacing. In the light of these inspections, the following schedule (see Table P3) of requirements for improvement were drawn up.

TABLE P3

Basic data on Road Construction Requirements

Road	Length km	REQUIREMENTS									Other
		Earth Moving			Bridges or Culverts			Surfacing			
		Unit	Units per km	Total units for road	Unit	Units per km	Total units for road	Unit	Units per km	Total units for road	
I Eastern Access Route					(ii)			(iii)			
a) Plateau section	48	Machine hours (i)	18	864	Bridges or Culverts	2.31	111	M^3 of spread surfacing material	146	7,008	
b) Escarpment section	55	"	36	1,980	"	2.73	150	"	240	13,200	
c) Bottom section	17	"	18	306	"	2.12	36	"	480	8,160	
Sub total for road	120	"	-	3,150	"	-	297	"	-	28,368	
II Sheraro-Yirga	44	"	18	792	"	1.45	64	"	420	18,480	
III Sheraro-South	40	"	18	720	"	1.45	58	"	80	320	
IV Northern Access Route	40	"	18	720	"	2.96	118	"	20	800	Bridge over Mehreb at $300,000 Eth.
TOTAL OF ABOVE	244	"	-	5,382	"	-	537	"	-	47,968	

i) Assumed to be in the ratio of 10 hours of 120 grader to 8 hours of D7 Bulldozer
ii) Assumed to be in the ratio of one slab bridge to 3 single-culvert flood bridges to six C6 culverts.
iii) Spread to 20 cm thickness on sections requiring surfacing on all except escarpment section of Sheraro-Enda Sellasie road, where it is spread to 30 cm thickness.

P10. On the basis of the unit costs reported in the WADU notes referred to (slightly adjusted in respect of quarrying and loading costs of sand, grave and stone where the WADU notes are self contradictory) the following (see Table P4) are the estimated operating costs for the construction of the different roads (totalling Eth.$763,000) and (see Table P5) the requirements for equipment-time. Overhead costs, i.e. capital costs (original purchase or depreciation) and permanent staff costs, are not included, in Table P4 nor is the cost of a bridge over the Mehreb river on the northern access route. The net undiscounted cost (after allowing for resale of the D7 bulldozer after 2 years at 30% of its original value) of the overhead costs is estimated at a total of Eth$813,000 (still excluding the Mehreb river bridge). If we allow for phasing in costs over time, and apply a 10% discount rate, some reduction in the present worth of overhead costs is obtained below the Eth$813,000 quoted above, to about Eth$687,000.

P11. From examinging the gross benefits, arising from a reduction in the costs of transporting project outputs, as shown in Table P2, and the cost of road construction (dicounted at 10%) as shown in Table P4 and the previous paragraph, it appears that on the basis of the reduction in transporting the project's forecast outputs alone, the incremental (discounted) costs of the road programme exceed the incremental (discounted) benefits by about Eth$850,000 in the case of Alternatives I (Improve eastern access but abandon northern) and Alternative II (Improve northern access and abandon eastern access route), and by about Eth$480,000 in the case of Alternative III (Improve eastern access and maintain northern). In the case of Alternative IV (improve both access roads) the excess varies between Eth$425,000 and $725,000 depending on whether a brigde is built over th e Mehreb river. If any improved road programme is to be justifiable, further benefits have to be found, e.g. in reduction in the costs of transporting the project's imputs, non-project outputs, and improved efficiency from all-weather access.

P12. However, if we take into account the marketed output of farmers not yet incorporated into the budget, and the marketed output of farmers in the area east of the project betweeen Sheraro and Enda Selassie, annual cost reductions, arising from road improvements, in respect of transporting this output will be obtained, ranging from Eth. $94,000 in year 1 of the project to Eth. $65,000 in year 6, and thereafter. When discounted at 10%, these cost reductions yield a present value of about Eth. $600,000. There are additional, but unquantified, benefits from reductions in the cost of transporting project inputs and improved efficiency from all-weather access. There are, of course, also annual maintenance costs to be considered, but some maintenance would be required to keep the present tracks at their present standard; and any increase in maintenance costs arising from improvements can be offset against the unquantified benefits.

P13. The conclusion to be drawn from examining the benefits to be derived from an improved road programme in reducing the cost of both the project's and other outputs, is that first priority should be given to improving the eastern access route, but that once the capital equipment required is purchased it also makes economic sense to improve the northern access route also, but not to install a bridge on the Mehreb river. The road construction costs of Appendix VII Table 1C are based on the improvement of both access routes.

T A B L E P4

Operating Costs of Road Construction

Road	TYPE OF COST						
	Wholly purchased materials	Skilled labor (excl. permanent staff)	Unskilled labor	Operating cost of machinery	Operating cost of transport equipment	Contingencies at %	Total
I Enda Selassie-Sheraro							
a) plateau section	32,967	12,765	14,430	25,206	40,575	12,594	138,537
b) Escarpment section	44,550	17,250	19,500	52,978	69,750	20,403	224,431
c) Bottom section	10,692	4,140	4,680	13,794	36,708	7,001	77,015
Sub total	88,209	34,155	38,610	91,978	147,033	39,998	439,983
II Sheraro-Yirga	19,008	7,360	8,320	32,763	73,920	14,137	155,508
III Sheraro-South	17,226	6,670	7,540	15,443	6,554	5,343	58,776
IV Northern access route through Yirga	35,046	13,570	15,340	17,181	16,534	9,767	107,438
TOTAL	159,489	61,755	69,810	157,365	244,041	69,245	761,705

T A B L E P5

Requirements for Equipment Time (hours)

Road	D7 B/dozer	Grader (Caterpillar 120)			Dump Trucks (Mercedes $3m^3$) at $2m^3$ per hour
		Earth moving	Surfacing	Total	
I Enda-Selassie-Sheraro	960	1200	1241	2441	18,380
II Sheraro-Yirga	352	440	808	1248	9,240
III Sherar -South	320	400	14	41[illegible]	820
IV Northern Access Route	320	400	35	435	2,066
TOTAL	1,952	2,440	2,098	4,538	30,506

APPENDIX Q

SORGHUM AND SESAME PRICE SERIES IN ASMARA MARKET

Monthly Average Prices of Sorghum and Sesame (1968 - 1971) in Asmara Wholesale Market. (Eth.$ per quintal)

MONTH	1967		1968		1969		1970		1971	
	SESAME	SORGHUM	SESAME	SORGHUM	SESAME	SORGHUM	SESAME	SORGHUM	SESAME	SORGHUM
JANUARY	55.00	22.60	50.83	13.00	42.00	15.50	-	17.67	62.00	17.00
FEBRUARY	56.00	24.06	50.18	14.00	44.38	19.25	-	21.00	58.00	17.00
MARCH	57.75	23.31	49.00	14.50	46.50	18.33	61.00	23.10	63.50	20.00
APRIL	-	-	46.80	13.90	46.62	18.00	62.00	25.66	-	-
MAY	66.03	22.93	45.87	10.00	47.75	17.50	60.25	27.00	64.50	22.00
JUNE	67.20	24.00	42.62	9.37	50.80	18.10	60.00	27.83	-	-
JULY	-	-	42.00	10.14	-	20.50	-	-	-	-
AUGUST	-	23.00	43.50	11.06	51.00	21.00	-	31.00	-	-
SEPTEMBER	27.00	22.00	44.60	11.70	-	21.00	-	33.00	71.00	15.00
OCTOBER	27.00	22.00	41.12	12.87	-	-	59.00	30.00	62.25	17.12
NOVEMBER	46.48	17.00	39.37	13.37	49.66	19.00	60.00	27.00	58.66	21.66
DECEMBER	48.25	13.33	41.70	15.00	-	20.00	60.50	26.50	58.25	26.00
AVERAGE	50.71	21.42	44.80	12.41	47.34	18.93	60.39	26.34	62.27	19.74

- = INFORMATION NOT AVAILABLE

SOURCE: ETHIOPIAN GRAIN CORPORATION

APPENDIX R

A NOTE ON THE MARKET PROSPECTS AND PRICES FOR THE PROJECTS' OUTPUTS.

R.1 This Appendix discusses the market prospects for the three major initial outputs of the project, sorghum, sesame and cattle. While, obviously, some detailed discussion of their prospects is required, it must also be remembered that the project is not inextricably bound up with these commodities alone, and that considerable substitution of more profitable for less profitable crops will be possible in response to relative price changes. For this reason very conservative price projections are not used.

R.2 For all products prices will be calculated ex-store at Sheraro in the project area even if it is likely that the store may be located elsewhere. For sorghum and sesame price-quotations over a considerable number of years are available for the wholesale market in Asmara. Both these, and future trends, can then be appropriately adjusted for transport and other costs to give the ex-store price in the project area. It is assumed that the project's sesame will be marketed in Asmara where it will be sold to exporters. For sorghum it is assumed that the project's output will be consumed in highland Tigre; and Adwa is selected as the place of disposal. There is evidence that the flow of sorghum in internal trade is from Asmara south wards to Tigre, and not the other way round. Sheraro sorghum at present goes to Asmara, but this is because storage space and working capital are lacking at the moment to hold it in Tigre. This will be remedied by the project. For example part of the Setit Humera crop goes through Asmara into Tigre. The Adwa price is, therefore, assumed for the present to be <u>above</u> the Asmara price by a differential equal to the transport costs between the two places. The price for beef cattle is also calculated "ex-project area."

R.3 <u>Sorghum</u>

Appendix Q shows prices of sorghum in recent years in Asmara wholesale market. The average Asmara price for the years 1967 to 1971 was $19.75 per quintal. According to data provided by farmers and merchants in Sheraro(both on a monthly and seasonal basis) the average project-area price is about $4 less than the Asmara price, although there are big variations around this average, including reverse differentials.

R.4 If the Asmara wholesale price is Eth.$x per quintal, the Adwa price should be $x + 1.30 (i.e. transport costs on 157 kilometers at $.084 per ton/km. which is the current rate on this road). At <u>present</u> movement costs from Sheraro to Enda Selassie are $2 per quintal; from Enda Selassie to Adwa $0.70 per quintal; so that present transport costs from Sheraro to Adwa are $2.70; to which must be added $0.20 for handling (on and off) charges, making a total charge from Sheraro to Adwa of $2.90. For an Asmara wholesale price of $x per quintal the price at Sheraro should, therefore, be $(x + 1.30 - 2.90) or $(x - 1.60). The difference ($2.40) between the $1.60 Asmara to Sheraro differential and the $4 quoted in the previous paragraph can be explained as trade margin; made up (according to the Ministry of Agriculture's 1970 team to lower Shire) of:-

a) Broker's margin	0.10
sacking	0.22
tax	0.10
merchants' margin	1.00
subtotal explained	1.42
unexplained balance	0.18

The unexplained element is not surprising. The Ministry of Agriculture's team drew their information from merchants, and the merchant's margin of $1 quoted by them is very improbable. Elsewhere in Ethiopia the merchant's margin is normally 20% of the wholesale value of the crop. This would give us a merchant's margin of about $3, not $1, and so explain the whole of the difference. While the present state of the roads continues a differential between the price at Sheraro and at Asmara in favour of Asmara of $1.60 per quintal of sorghum looks probable. It should,however, be possible, with the road improvements to be carried out under the project, to reduce the present Sheraro to Enda Selassie transport cost of $2 quintal by about $0.60, from $2.00 to about $1.40. The expected price differential per quintal of sorghum between Asmara and Sheraro would then be $1.00.

R.5 Between 1957 and 1966 sorghum prices in Asmara wholesale market averaged $16.65 per quintal, with fluctuations in the annual mean figure from $12.63 (1960) to $19.96(1958), (National Bank of Ethiopia prices series). From 1967-1971 inclusive, monthly mean figures ranged between $9.37(June 1968) and $33.00(September 1970) per quintal, averaging $19.75 over the five years (unweighted average of Grain Corporation figures). It is estimated (see Annex XVI to the draft minimum package project application to IDA) that domestic sorghum prices will rise slowly unitl 1975, and will then decline to an export parity level by 1985, which, on the assumptions made in the minimum package application, gives an Asmara wholesale price of $11.50($13.20 alongside ship at Massawa, less $1.70 for port dues, export tax, brokerage and transport Asmara to Massawa). If the flow of sorghum is still southwards from Asmara at this stage, this gives a price at Sheraro of $10.50. But if by then Tigre as a whole has become a sorghum surplus area, the Sheraro price will be only $7.90.

R.6 Given the fact that sorghum prices are subject to great instability, and that several elements in the calculations are extremely difficult to predict, it has not seemed appropriate to use a different price in the calculations of output and benefits for each year of the project. Instead two prices are used. For the first six years of the project (say 1974 - 1979 inclusive) a price of $14.00 per quintal, ex-primary co-operative store in the project area is used. For the remaining fourteeen years (say 1980 onwards) a price of $10.50 is used. Both these prices assume that Tigre as a whole remains a cereal-deficit area, and that the flow of sorghum between Tigre and Asmara continues to be in a Southerly direction. If, after 1979, Tigre as a whole became a surplus area, then the price of ex-primary co-operative store would be $7.90 instead of $10.50. But if sorghum prices fall as low as this there would undoubtedly be a switch away from growing sorghum to growing higher value crops, e.g. sesame, even if extra costs (e.g. in labour for harvesting) were incurred. It is possible that some switch will be possible even without hiring extra labour, but there is some doubt about the precise requirements of labour for harvesting sesame.

R.7 Sesame Appendix Q also shows prices of sesame-seed in recent years in the Asmara wholesale market. They have risen, at an annual average rate of 12%, from $44.80 per quintal in 1968 to $62.27 per quintal in 1971. One reason for the sharp rise in wholesale price in the last three years, which is greater than the corresponding rise in export prices, appears to be a strengthening of the bargaining position of the Setit Humera sesame producers.

Sesame produced on this project will go for export. Total world trade in sesame seed in recent years has been of the order of 190,000 tons (1969). World Production is thought to be of the order of 1,600,000 tons. Africa is the major exporting region, accounting for 78% of total world exports. Major individual exporting countries are Sudan (45% of world exports), Ethiopia (14%) and Nigeria (8%). Major importing countries are Italy (25% of total world imports), Japan (22%) and USA (9%). Major producing countries are India (25% of world production), China (22%) and Mexico (13%).

R.8 In recent years Ethiopian exports of sesame seed have been as follows:-

	64	65	66	67	68	69	70	71 (½) Half
Price. FOB Eth$/ton	472	446	554	576	519	510	587	655
Value Eth.$ million	6.8	10.0	11.2	11.4	14.0	15.6	22.3	12.9
Metric tons(rounded)000	14.4	22.4	20.2	19.8	27.0	30.6	39.7	19.7

SOURCE: C.S.O. and Customs

The major export destinations of the Ethiopian sesame crop are Japan, South Yemen, Saudi Arabia, Israel and Greece. South Yemen's proportion decreased from 20% to 10% between 1967 and 1970, while Japan's has increased from 25% to 45%. Greece's share has also increased from a negligible amount to 10%. Eight countries account for about 85-90% of Ethiopian exports.

R.9 Sesame oil is classified by FAO as a "soft oil", and in the FAO's commodity projections for 1970-1980 a growing surplus (assuming constant prices) of world supply over demand is forecast for soft oils; and this carries the implication that prices for soft oils will weaken, in order to bring supply and demand into balance. However, there is only limited substitutability between sesame and other soft oil seeds, since much sesame is used as a confection, and in pharmaceuticals. The supply of sesame appears to be less elastic than that of other soft oil seeds, and FAO, on the basis of past trends, project only a 1.8% per annum increase in production of sesame seeds during the 1970s.

R.10 The recent sharp rise in world prices appears to have been largely the result of faltering production in the Sudan. This could be a temporary phenomenon. Sesame-oil is a high quality oil for which the income elasticity of demand is thought to be high. In the light of the low projection for growth in output of sesame seed, this high elasticity, and the low substitutability between sesame and other oil seeds, sesame seed prices are likely to remain above the pre 1969 levels. However, if Sudanese production picks up again, the present very high price may decline a bit. In the calculations in this proposal, therefore, a sesame price of just under $50 in the Asmara wholesale market, equivalent to a price of $47 per quintal ex-primary co-operative store in the project area.

R.11 Cattle Over the last three years several surveys of cattle prices in Lower Shire have been made, with the results shown below.

(Eth.$ per head)

TYPE OF ANIMAL	Min. of Agri. team 1970	CSO study 1970	Cossins 1971	Ellman 1971	Ato Abay Tedla 1971
1 year-old calf	30-40				
2 year-old inmature	50-60				
3 year-old inmature	60-80				
Cow	60-80	90-100		100	
Bull or steer	80-100		90	100	100-150
Ploughing ox		100	140	100	120-150

The canning plants in Asmara currently pay (at the plant) between $0.27 and $0.33 per live weight kilogram. For animals of higher quality than normally go for canning, prices up to E$0.50 or $0.60 per live weight kilogram are paid in Asmara. The LMB's Middle East Marketing Mission's (1971) report shows that live exports to Saudi Arabia would fetch $0.70 per live weight kilogram in Jeddah, which, after deducting all the intervening costs other than the pure profit margins of traders, gives a price in the project area of E$0.44 per live weight kilogram.

R.12 As a result of the project, cattle from the project area will start to flow into the trade stream. These will increase from about 3,200 adult culls (50% female) in the third year of the project to about 10,340 adult culls and 1,900 finished male animals by about the 12th year.

R.13 The calculations in this proposal assume that the average live weight of culled animals (male and female together) will be about 280 kg. for the first six years of the project (say 1974-1979) inclusive, and 310 kg. thereafter. Both these figures, and especially the latter, are considerably higher than the average weight of animals processed by the meat industry in Asmara at present. But then these animals will have been kept under much better conditions, especially in the later years, than the animals now making up the Asmara intake. For the finished steers produced by the commercial-type co-operative ranches an average livesweight at sale of 400 kg. is assumed.

R.14 The FAO 1970-1980 commodity projections forecast a growing gap (at constant prices) between world demand for meat and its supply. By 1980 world import demand is projected to exceed world export supply by some 2.1 million tons, an amount equivalent to about 40% of the world's present (1970 base) trade in meat (and its products). For beef and veal the projected deficit, 1.7 million tons, is equivalent to about 60% of the present level of world trade in this commodity. The estimates of demand going into this projection take into account growth in world population and incomes and income elasticities of demand. On the supply side the projection takes into account past trends, the probable impact of recent policy measures, carrying capacities of pastures, and some technical changes. A reasonable proportion of the projected "world gap" arises in respect of countries in the Middle East and Asia, whose hygiene requirements for meat imports are not as high as those of Western Europe.

R.15 The implication of these projected "world gaps" is a rising trend in meat prices, and especially those of beef and veal. In the calculations made in this proposal a price of E$0.33 cents per live weight kilogram at the canning plants at Asmara is used for all culled animals for the first six years of the project (say 1974-1979 inclusive), and a price of $0.37 (i.e. a 12% price rise) thereafter.

The cost of transporting an animal (including marketing fees) from Sheraro to Asmara is calculated at $9 per head. On the weight and price assumptions made, this gives a price per head for culled animals in the project area of $83 in the first period and $106 in the second. For higher quality finished animals from the commercial-type co-operative ranches a price per live weight kilogram of $0.44 in the project area is assumed for the first six years (1974-1979), and a price of $0.50 thereafter. For the sale weight assumed this gives price of E$176 in the first period and E$200 in the second.

R.16 The table below shows the forecast marketed outputs of the project:-

Forecast of Outputs marketed by the project's farmers and institutio

Project Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14-20
Sorghum '000 tons	-	0.72	3.06	6.48	10.40	13.71	16.05	18.34	20.07	21.64	23.29	24.74	25.71	26.16
Sesame '000 tons	-	0.36	1.08	2.07	3.39	4.47	5.69	6.51	7.09	7.45	7.81	8.11	8.31	8.40
Cull adult-Cattle - '000's head	-	1.49	3.34	5.58	7.91	9.14	10.04	12.36	10.73	10.72	10.36	10.34	10.34	10.34
Quality-finished-steers - '000' head	-	-	-	-	-	0.66	0.80	0.74	1.81	1.91	1.92	1.91	1.90	1.90