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A FEASIBILITY STUDY OF THE ESTABLISHMENT OF A MODERN DAIRY FARM IN DEMOCRATIC REPUBLIC OF SOMALIA

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KHARTOUM

FOROWARD

Honourable Charirman and Members of the Council of Arab Organisation for Agricultural Development.

In response to the request submitted by the Government of Somali Democratic Republic, the Council decided in its seventh seesion that " A Feasibility Study Of The Establishment Of A Modern Dairy Farm In Mogadishu Area" would be carried out as a part of 1978 programme. A team of experts was thus recruited by the Organisation (AOAD) in consultation with the Ministry of Livestock, Forestery and Range (MLFR), Mogadishu. The experts assigned to the study were :-

1 - Dr. AbdelKader R. Abou Akkada, Director, Livestock Production And Health Division,AOAD..... Team Leader.

2- Dr. Mahmoud Abdullahi H. Ali, Director General, MLFR ..... (Counterpart Team Leader)

3- Dr. Ahmed Abdel Aziz, Professor of Animal Breeding and Head, Department of Livestock production, AOAD.

4- Dr. Abdein H. Abdoun, Director General, Agricultural Engineering Administration, Ministry of Agriculture Food and Natural Resources, Khartoum.

5- Dr. Sakr. A. Sakr., Associate Professor of Economics, Institute of National Planning, Cairo.

6- Dr. Adam M. Shommein, Head, Department of Pathology and Diagnosis, Central Veterinary Research Institute, Ministry of

Agriculture, Food and Natural Resources, Khartoum.

The team also secured the assistance of :-

1- Dr Mohammed Ali Hussein, Director, Livestock Production Department, MLFR.

2- Dr. Ismail Alim Nooh, Director, Department of Research Planning and Extension, MLFR.

3- Dr. Ibrahim Osman, Dairy Production Specialist, MLFR.

4- Dr. Mohammed Farah, Animal Health Specialist, MLFR.

5- Mr. Yousif Dool, Agronomist, MLFR.

The team assembled in Mogadishu on 4th and 5th July 1978 and was given a detailed breifing by the Director General MLFR on government policies and priorities in Livestock sector The team, then, made " on ground" visits to: 1) Livestock Governmental farms and projects, Mogadishu, Hargeisa and Kismayo. 2) Milk processing plant, Mogadishu. 3) Municipal Dairy farms. 4) Livestock Development Agency (LDA). 5) Local Livestock markets.

A series of meetings was held with the Directors of MLFR, LDA, milk factory, Regional Veterinary services, Central Agricultural Research Station, Afgoi, Ministry of Industry, State Planning Commission and Dean of veterinary science and Animal Husbandry. Following comprehensive discussions with these experts, a follow up investigation and appraisal of previous studies and proposals, was conducted. The investigations emphasized the necessity of establishing a large-scale dairy project within the irrigated land surrounding the Mogadishu Urban area.

The proposed project will be located in the irrigated area of Afgoi, about 30 km far from Mogadishu. The project will involve the following activities :-

1- The importation and breeding of Fresian cattle and introducting new farming techniques adapted for Somali conditions.
2- Planning an irrigated forage production programme to provide essential feed for the breeding stock.
3- Adequate prepartation for marketing of fresh cooled milk and live animals.
4- Training of local personnel on modern dairy farming operations.

The project will provide the Mogadishu Milk Factory with a continous daily supply of fresh milk of a minimum of 20 tons through out the year. The operation plan of the project will include three phases : Phase 1. pre-operational phase (year 0) 2- phase 2. Importation phase (year 1-4) 3- Phase 3- complete build up and full operation. A training programme was proposed to be carried out prior to the implementation of the project and during its operational phases. The project will be operated by trained Somali personnel under the supervision of expatriates during the early phases of the project.

In view of the financial feasibility of the project, the internal rate of return was found to be 9,13 and 17% when the assumed prices of fresh milk produced by the project were respectively 2.0,2.5 and 3.0 So.Sh. per kg. It is therefore suggested that the project is financially sound even at the lower prices of milk. The project can significantly contribute to the overall improvement of dairy cattle by extending

artificial insemination services to surrounding areas and by continous distribution of the 2 year breeding heifers sold after herd replacement is satisfied. The 6-month old calves can be involved in a progeny testing programme and be used for grading up local cows.

In closing, I should like to extend my thanks to the Government of Democratic Republic of Somalia and H.E., the Minister of Livestock, Forestery And Range for the appreciable care they have given to the team and for facilitating the progress of the study. I sincerely hope that this study will effectively contribute to the development of livestock Sector in Somali Democratic Republic.

Dr. Mohamed Mohib Zaki
Director General

Khartoum, August, 1978

ACKNOWLEDGMENT

I should express my deep gratitude to Dr. Mohamed Mohib Zaki for granting the team of experts the opportunity to conduct the present study.

This study was carried out in coordination with the Ministry of Livestock, Forestery and Range, Mogadishu. I therefore extent my thanks to Dr. Mahmoud Abdullahi H. Ali, Director General, Dr. Mohamed Ali Hussein, Director of Department of livestock Production and Dr. Ismail Alim Nooh, Director of Department of Planning, Research and extension, for their sincere assistance and cooperation throughout all phases of the study.

My thanks are due to: 1) Dr. Mahmoud Ahmed Ali, Director, Livestock Development Agency (LDA) 2) Mr. Hussein Alaba, Acting Director, State Planning Commission 3) Dr. Mohammed Ghany Mohammed, Dean, Faculty of Veterinary Science and Animal Husbandry 4) Mr Ahmed Aboukar, Director, Milk Factory, Mogadishu 5) Dr. Ibrahim Osman, Director 21st October Dairy Farm , for their help and constructive discussions.

Many thanks are due to all members of the team for their strenious efforts which greatly led to the perfection of this study.

Dr. AbdelKader R. Abou Akkada

Team Leader

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SUMMARY

A study carried out by the Arab Organisation for Agricultural Development[1] emphasized the necessity of establishing a large-scale dairy project within the irrigated land surrounding the Mogadishu Urban areas, the capital city of Somalia. The present supply of Milk to these areas comes from surplus milk, above family requirements, produced by small cattle owners. Limited amounts of pasteurized milk and milk products are provided by the Mogadishu Milk Factory, the only fully equipped plant in the country[2]. The population of Mogadishu was estimated as 370671[3], and the per capita consumption of milk was estimated as.4-.5 liters daily[4]. Therefore, about 150 tons of milk are presumably consumed per day. Milk from out lying areas of Mogadishu is insufficient and of poor quality. It is also difficult to collect and can only be considered as a temporary supply.

The development of Modern Dairy project in the irrigated area of Afgoi, about 30 km far from Mogadishu, would provide an important component of irrigated land use and a continuous supply of fresh milk to the Mogadishu Milk Factory. Reasonable measures for the improvement of basic resources, animal health and market infrastructure have been considered in the proposed area. The project will be associated with rangeland projects in neigboring areas, and is assumed to provide artificial insemination coverage of an area of an average distance of approximately 50 km surrounding the A.I. Center at the project.

(1.) Rational Development of Livestock in the Somali Democratic Republic AOAD Khartoum 1978.

(2.) Established in 1965 with a total processing capacity of 20,000 liters per day.

(3.) State Planning Commission, Mogadishu, 1975

(4.) Livestock sector Review, Hunting Vol.1,p.180- 1976

Summary of Finanical Analysis

Alternative	Assumed price for Milk (So. Sh./Kg.)	Value of IRR
1	2.5	13%
2	2	9%
3	3	17%

These results of this financial analysis show that the proposed project seems to be financially sound, even at the lower prices of milk assumed in alternative 2.

The project can significantly contribute to the overall improvement of dairy cattle by extending artificial insemination services to surrounding areas, and by continuous distribution of the 2 year breeding heifers sold after herd replacement is satisfied. The 6-months old calves can be involved in a progeny testing programme and be used for grading up local cows. Specific plans for the achievements of these objectives were outlined in the technical annexes.

I. BACKGROUND AND JUSTIFICATION

i.i Background.

Somalia is a North-Eastern African country. It is formed mainly by a large plateau which declines slowly towards the Indian Ocean. The total area of Somalia is 246000 square miles lying between latitude 2°South to ii°North and longitude 40° East to 53°East. The Northern region is generally high, mountainious and arid. The central region is nearly flat and very arid with some agricultural belts, where animal husbandry is successfully practiced, characterizing the central southern region. The region beyond the Juba river is characterized by dense vegetation. Somalia is crossed by two rivers: Juba and Shebelli. Only the first shows continuos flow throughout the year. Ground water is in general lacking. The rain falls in two seasons but there is considerable annual variation. Average monthly temperatures range from 18°C to 29°C for the whole country. The mean monthly maximum reached was 37°C in May at the station of Belet (i). The population of Somalia is 3492000 (2). Livestock rearing presents the main economic activity. About 90% of the livestock is reared by nomads who represent 67% of the total population of Somalia. In the 1974-78 development plan, So.Sh. 162 millions, representing 4.5% of the total programme investments were allocated for the livestock sector.

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(1) Livestock Review and Project Identification. Hunting- 1976.

(2) Source : State planning Commission. Mogadishu - 1975.

Most of Somalia's land area is suitable only for extensive livestock production. The cattle population in Somalia was estimated as 3476078 heads. The distribution of cattle is presented in table (i.i).

Table (i.i) Cattle Population By Regions

Region	Number of Cattle	% of Total
North	290,643	8.0
Center	1,115,603	29.6
South	2,340,012	62.4
Total	3,746,078	100

Source: Livestock Development Agency. 1975.

The four main breeds of cattle in Somalia are the Boran (Havai), Jiddu (Sruq), Abgal (Casara) and Gharre (Duara) which are all derived from the Zebu type. The first two breeds are dual purpose animals used for milk and meat production. The Duara is recognized as a potencial dairy breed. In general, Somali cattle are hardy, well adapted to harsh conditions.

The FAO agricultural commodity projections for the period 1970-80 indicated milk production from all sources in Somalia to be as high as 988125 tons per year from which 91000 tons are presumably produced by cattle (1). Estimated demand for cattle milk in 1985 of 266000 tons was also reported (2). However, milk has never been

(1) FAO. Production year book, vol. 24 1970

(2) Provisional indication World Plan For Agricultural Development to 1985. FAO.Vol.11.1968

considered as a commercial commodity in Somalia. The majority of stock are managed with fully - or seminomadic systems. Dairy farming in the technical and economic sense is not practiced by cattle owners. Marketing and processing of milk are limited to urban areas to satisfy part of the demand for milk and milk products.

The first three development plans, 1963-67, 1968-70 and 1971-73 concentrated on the problems of animal health and the organization of Livestock market rather than on production probles. It was realized however, that intensification of animal health services alone could not bring about improvement in the quality of Livestock products. Programmes were, therefore, proposed in 1974-78 and 1979-81 plans (i) which aimed at the establishing of intensive animal production system assisted by an AI-network, filling the gaps in the livestock structrues, and modifying the existing farms and projects. However, achievements have been so little.

The introduction of intensive livestock husbandry in areas of high fodder availability or production potencial should provide an improvement of the livestock outputs in the short term. The opportunity for Somalia of the livestock systems has been widely acknowledged (2) (3) (4). It is especially important for the purposes of improvement in dairy cattle production to use the concept of intensive farms which can provide both production and solutions for the existing problems through the modern techniques used in

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(1) State Commision of Planning.

(2) CITACO Technical Unit. Proposal for the establishment of a Livestock research centres. 1976

(3) Ministry of Planning and Goordination. Development Programme 1974-78.

(4) State Planning Commission. A proposal for a large scale dry land and irrigated fattening scheme. 1977.

management, breeding and fodder production. Training and extension work which will be provided by such farms are also of foremost importance.

1.2. Justification:

The present supply of milk to urban areas is provided from three sources:

1. Imported milk and milk products (cow milk only).
2. Raw milk from local sources (cow and camel milk).
3. Pasteurized milk and milk products (cow milk only).

The main bulk of importations (1) was usually passed to the Mogadishu Milk Factory in th form of dried milk powder for reconstitution and standardization of the limited amount of raw milk obtained from local sources. Surplus milk produced above family requirements is sold either to one of the collecting centres cited in the various districts of Mogadishu, which supply milk to the Milk Factory, or sold directly to consumers.

The population of Mogadishu was estimated as 370671 (2). The per capita consumption of milk in urban areas was estimated as 0.4 to 0.5 litres daily(3). Milk from outlying areas of Mogadishu is insufficient and can only be termed as a temporary supply (4). The Milk Factory, established in Mogadishu in 1965 with a total processing capacity of 20000 litres per day, has always been suffering from insufficient and variable milk supply. Milk produced by town dairy men(5) and cattle owners on the out-skirts is of poor quality and is

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(1) Annual average importations for the years 1972-75 was 230 tons of evporated and condensed milk, 550 tons of dried milk, 25 tons of butter and 90 tons of cheese (Ministry of Industry).
(2) State Planning Commission. Mogadishu. 1975.
(3) Hunting op.cit.p.180
(4) Calculated daily milk consumption in Mogadishu is about 150 tons.
(5) Estimated number of cattle kept in Mogadishu is 540000. Economic Trabsformation in a Socialis Framework.1LO. JASPA. 1977.

difficult to collect. The lack of interest shown by them when they entered the milk colony schemes made it necessary for the Milk Factory to improve its milk supply by depending on government-owned farms such as the 21st October Dairy Farm at Afgoi and the Municipality Farm in Mogadishu. The amount of Milk produced by those farms is still far below the level that makes them of major importance as suppliers to the milk factory is hardly approaching 10000 litres/ day (1).

The present situation made it necessary to establish an intensive dairy farming project of adequate size at an economic travelling distance from Mogadishu, The project will maintain a continues supply of fresh and clean milk to the Milk Factory in Mogadishu in an attempt towards meeting the increasing demand of the city population. Similar projects exist in many tropical countries where they have significantly contrivuted to dairy cattle production development.

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(1) Personal communication. DG of the Milk Factory. 1978.

Climatic data : (1)

J	F	M	A	M	J	J	A	S	O	N	D
Average rain fall (mm) (2)											
0	10.1	6.3	76	102.5	69.7	52.8	18.6	6.4	73.1	124.5	25.2
1964-1974 Mean Monthly Temperature (oC)											
27.3	27.6	28.6	28.6	27.1	25.9	24.9	25.5	26.0	26.6	27.6	27.4
1964-1974 Mean Monthly Maximum Temperature(°C)											
33.7	34.4	34.8	34.1	31.7	30.5	28.4	30.1	31.1	32.0	31.9	32.5
1964-1974 Mean Monthly Relative Humidity (%)											
66	63	63	67	72	71	74	74	72	70	71	72
1968-1969 Mean Sunshine/day (hrs.) (3)											
8.2	9.1	8.6	7.2	6.6	6.9	5.9	8.0	8.9	6.8	4.5	6.5
1968-1969 Solar Radiation/day (langleys) (3)											
580	611	588	537	496	511	481	533	575	522	409	425
1968-1969 Average Wind Speed (km/h)											
11.2	14.4	12.3	9.4	8.6	11.1	13.5	12.7	13.0	10.3	6.0	8.5
1968-1069 Calculated Evaporation (mm)(4)											
189	213	237	195	174	171	167	177	204	205	143	161

(1) Sources: - Ministry of Agriculture
- Agricultural and Water Survey-FAO-1968
- Somalia Meteorological Office

(2) Annual Average = 565.7 (mm)

(3) Using Cambell - Stocker Recorder

(4) Penman Formula.

2.3. Irrigated Forage Crops In The Project Area:

No forage crops are grown in Afgoi Area on a large scale. Only some research on fodder crops especially Alfalfa and Sudan Grass is going on at the agricultural research station in Afgoi and there are indications that a variety of these crops might be successfully grown under irrigation. Some scattered observations show that the forage crops which might be suitably grown in Afgoi are:

a) Maize Fodder: Maize is used in livestock feeding in the three forms:-

1) grain 2) Silo-mize 3) Cob mash. Silo-maize is the product of the entire mize plant, collected after waxy maturity of the grain. The Cob mash is the moist meal of grain bract of the maize harvested after the physiological maturity of the grain. If the plant is given the required amounts of fertilizers the yield could be in the order of 30 ton/ha for the silo-maize. The maize fodder may be cultivated twice/year under the Somalia's climate conditions.

b) Sorghum Vulgaris: There are a wide variation of this plant which can be adapted to the climate of Somalia. Possible yields are 40-60 tons/ha of the green fodder/year.

c) Sudan grass: This plant is very resistant to drought. It can yield 3-4 cuts/year with an estimated production of 60-70 ton/ha.

d) Elephant grass: the plant is capable of providing a large mass of green fodder which is platable by animals. The plant can give 8-10 cuts/year with an estimated production of 80-120 tons/ha of green material.

e) Alfalfa : The plant is high in protein contents. Research work on Alfalfa has been conduced in agricultural research station, Afgoi since 1971. The data available on four varieties indicate that the yield can be in the order of 9.0-ii.0 tons of green

income and income per capita and their expected rate of growth, and the expected changes in population in the Mogadishu area both as a result of the natural increase in inhabitant, and the expected increase in urbanization.

Available data regarding the development of national income and income per capita are very limited, and very inaccurate. Based on available data and informed guesses, the UNCTAD Secrtariat has recently published some figeurs in this respect. These estimates indicate that the growth of per capita real product has shown considerable improvement in recent years (1970-74) as compared to the position in the decade 1960-1970, when a negative real per capita growth rate was recorded. This can be seen from the following table.

Table (2-2) Annual Average Growth Rates of Total and per capita Real gross Domestic Product *.

	1960-70	1970-74
Total real product	1.7	5.4
per capita real product	-0.4	3.2

*. At market prices

Source:- UNCTAD SECRTARIAT, UNCTAD 1V, Least developed among developing countries, Statistical Annex, Report No. TD/191/Supp.1 26 March 1976.

This data are, of course, insufficicient to make a detailed analysis for the demand for fresh milk and its expected trands in the near future. Such an analysis will require time series data for quite a long period concerning the development in income for the residents of Mogadishu and the quality consumed of fresh milk. The availability of such data will permit the estimation of the income elasticity of demand for fresh milk, which could

have been used with the expected increase in per capita income in the Mogadishu area, which is not available too, to estimate the expected demand for fresh milk in the near future.

Despite these limitations, available evidence indicates some improvements in the standard of living, and taking the governments effort to improve it in the forth coming three year plan (1979-81), these improvement are expected to go on. On this count we can expect the demand for milk to increase.

An additional factor that will also lead to an increase in this demand for milk is the expected increase inpopulation in the Mogadishu area, not only as a result of the natural increase in the population of the area, but also for the increase in urbanization. Estimates of the population of Mogadishu very from around 450,000 to 750,000, and there is general agreement that the rate of urbanization is quite high. Pilot consus surveys conducted by the Government of Somalia puts the annual growth rate of population in urban areas at around 4.9%.

These expected development are matched on the other hand, by the problems on the supply side referred to in the previous section such as the built in problems that detracts from the suitability of the municipal milk colonies as the basis fro future expansion. These problems are due to their location for away from fodder supply, the unsatisfactory cattle housing design, and the inadequate management.

In addition, the prospects of improving collection of low cost milk from namad herd is too complicated by fluctuation in supply due to seasonal migration, to constitute a satisfactorily reliable source on which to depend for securement of the city's future milk supplies.

These problems constitute the major difficulties facing the Mogadishu Milk Factory, in a-addition to these arising from the attempt of the factory to maintain the price of fresh milk it receives at a lower price than what the market forces permit. The results are inadequate supply of raw milk in addition to the reduced quality as a result of milk adulteration and inferior quality.

The proposed project is going to be located in Afgoi, 30 Km to the North of Mogadishu, which is a suitable area in terms of land, water, soil and proximity to the Mogadishu Milk Processing Plant. The project is designed to contribute to the economic and social developments, not only for the Mogadishu urban areas, but also for Somalia as a whole. Such contributionscan be summarized in the following:-

(1) - The project will provide adequate milk supply of superior quality to the urban areas of Mogadishu. This will help to cover the existing deficiences of supply and the expected increase in demand for such a commodity which is essential for human nutrition. The availability of milk products or eliminating then altogether.

(2) - The availability of such a permanent and adequate source of supply of milk to the Mogadishu Milk Factory, will permit the development and improvement of the operational effeciency of the factory in line with currently foreseable requirement, with adequate development, renewal, and maintenance, the factory could be operated for three shifts per day. Such an economic level of operation will permit sizable, reduction in the fixed cost of the factory per unit of output.

(3) - The project will have a tremendous socio economic inpact on the whole area through providing a cadre of well trained and experienced management staff, a wide range of skilled and semi skilled laborers, besides the introduction of new and developed methods of operation.

(4) - The project will operate a nucleus of highly efficient bred of dairy cattle, and produced breeding animals from the project will permit the overall development of the whole, cattle population in the country.

111 - THE PROJECT

3.1 Objectives:-

The development of a modern dairy project in the irrigated area of Afgoi would provide an important componant of irrigated land use, and continuous supply of fresh milk to the Mogadishu Milk Factory. The project will be associated with rangeland projects in neighboring areas, and is assumed to provide artificial insemination covarage of an average distance of approximately 50 km surrounding the Al-Centre(1).

The project will involve the following activities :-

(1) - The importation and breeding of Friesian cattle and introducing new farming techniques adapted for Somali conditions.

(2) - Planning an irrigated forage production programme to provide essential food for the breeding stock.

(3) - Adequate preparation for marketing of fresh cooled milk and live animals.

(4) - Training of local personnel on modern dairy farming operations.

Although the functions involved in a large scale dairy enterprise have not been ascertained under Somali conditions, available information on dairy cattle projects from countries having essentially similar conditions indicate the feasibility of investing in this type of farming at a commercial scale.

See annex 1 for description of Al Services.

3.2. Description

The project is designed to provide the Mogadishu Milk Factory with a continuous daily supply of fresh milk of about 20 t tons throughout the year(1). This required keeping a 3200-cow herd, 80% of which are regularly in milk. At full operation, annual milk production will amount to 7680 tons. Animal sales will be 2190 heads annually, 1682 of which can be sold for beeding purpose. The remaining 508 animals, wheiging 263 tons of liveweight, are finished and sold for meat production.

The project (2) will be operated under high standards of breeding, management and health control. Operations will be strictly confined to dairy production. The 2 years breeding heifer net of replacement requirements, 6 months breeding males, and culled animals are transferred to neighboring ranch and feedlot projects, possibly at Uar-Mahen and Balaad.

The project will have its own fodder supply. The breeding stock will be kept on four farms and a central unit(3). The central unit will include only the ½-1 year breeding heifers (Fig 3-1). All other classes are kept on the dairy farms(4). Each dairy farm will be operated as an integrated farm. Coordination and adminstration of the whole project will be the responsibility of the General Manager and the core staff(5).

(1.) Exact estimate at full operation = 21.041 tons (section 4-3)

(2.) Description of project area is given in section (2-1)

(3.) Phasing of the project is given in section (3-7)

(4.) Full description of farm constructions is given in section (3.4.2.).

(5.) Administration system and responsibilities of the staff are discussed in detail in section (3.4.7.)

2) Housing

I T E M	Cost So.Shs		Total
	Local	Foreign	So. Shs.
Manager	72,000	168,000	240,000
Family Quarters	240,000	560,000	800,000
	312,000	728,000	1,040,000

3) Dairy Farm

Table (3-5) Showing Cost of Dairy Farm Building

Stable for milkings & dry cows	1,188,000	2,772,000	3,960,000
Maternity barn	105,600	246,400	352,000
Calves barn (suckling)	96,000	224,000	320,000
Calves barn(male&Female)	96,000	224,000	320,000
Milking Parlour	162,000	378,000	540,000
Cold Storage room	72,000	168,000	240,000
Shed for bay	48,000	112,000	160,000
Grain store	24,000	56,000	80,000
Siloes	70,000	30,000	100,000
Office	27,000	63,000	90,000
Roads	29,400	12,600	42,000
Fencing	36,000	36,000	72,000
Water Tank	15,000	35,000	50,000
Total	1,969,000	4,357,000	6,326,000

The costs are for only one dairy farm. Noting that there are dairy farms in the project, the total costs for construction is as four times as these calculations, Table (3-19).

Dairy Equipment

Table (3-6) Costs of Dairy Equipment

	Cost So. Shs. Local	Foreign	Total So. Shs.
1. Stable Equipment	100,000	900,000	1,000,000
2. Milking Equipment	240,000	560,000	800,000
3. Cleaning equipment	40,000	360,000	400,000
4. Storage	300,000	300,000	600,000
5. Spare Parts	95,000	175,000	270,000
Total	775,000	2,295,000	3,070,000

5) Other Equipment

Table (3-7) Showing costs of other equipments

1. Water installations	30,000	70,000	100,000
2. Generators	95,000	175,000	270,000
3. Feed mixing unit	30,000	70,000	100,000
4. Hammer mill	30,000	70,000	100,000
5. Elctrical installation	230,000	420,000	550,000
6. Spare Parts	63,000	117,000	180,000
Total	518,000	922,000	1,400,000

6) TRANSPORT

Table (3-8) Costs of Transport Vehicles

I T E M	No.	COST So.Shs		Total So.Sh.
		Local	Foreign	
Milk tank (St)	5	260,000	490,000	750,000
Trucks & Buss	8	210,000	510,000	720,000
Pick-up Vchicle	4	70,000	154,000	224,000
Station Wagon Vehile	2	40,000	90,000	130,000
Spare Parts	-	80,000	150,000	230,000
TOTAL		660,000	1,394,000	2,054,000

It is to note that the estimates in the tables (3-5) and (3-6) are calculated for each dairy farm separately. For the complete project the total costs will be four times that number, as there are four dairy farm units. Tables (3-7) and (3-8) are concerning the whole project.

3.4.3. FARM MACHINERY

a) GENERAL

Mechanization of agricultural crops is far beyond full utilization in the Democratic Republic of Somalia. This is attributed mainly to shortage in trained personnel and technical know-how. There is a considerable number of machines, which has been imported in the country, but the pattern and practice of agricultural production did contribute to that effect.

Accurate records and statistics about tractors and agricultural implements are not easily attainable. Yet some indications depict from the recent data that a remarkable rise in the import of tractors could be pursued, in particular the numbers that had been introduced by ONAT, Table (3-9). However, it can to observed that there is inconsistancy in importation of machinary when comparing the value percent from one year to another on eleminating all factors of fluctuation etc. Fig (3.9)

According to the last 5 year-plan period (1974-78) about 367 tractors with their implements were found in the country; out of which about 121 tractors were of higher power (100 HP). Since the ONAT had taken over, the number is icreasing, because this organisation is acting as a marketing agency. At the same time it offers services for the farmers through hiring its implements on rates which are acceptable to the individual farmers, who cannot affort purchasing implements.

In all cases, however, there are about three well known makes of tractors and implements present in the country, namely Flat, Mferguson and same. Through this limited number of makes, it is expected to have good control on spare-parts, on availability and better maintenance facilities and services.

b) CULTURAL OPERATIONS

Proper working with machines in the agricultural production is not fully identified. In some areas there is an accumulation of machinery without getting benefit out of them. These are specifically confined to irrigated areas, partly due to inaccuracy of procurement and hence not meeting the specifications in question. Also there are certain constraints facing the application of machines that can handly render them properly achieve their purpose. These can be summarised in the lack of skilled labour, who can

efficiently carry out agricultural operations. Availability of spare-parts at the right time constitutes also a big problem in maintaining agricultural machinery at hand. Very well equipped workshop and other services are also in short all over the country.

TABLE (3-9) Import of Agric Tractors and Implements

Year	Tractors	Combines		Threshers		Implements										Trailers
		Maize	Rice	Maize	Sorghum	Disc Pl.	Disc Harr	Chisel Pl.	M.P. Pl.	Tooth harr.	Ditcher Ridger	Rotary weeder	Seed drill	Planter	G.N. digger	
1974	14	-	-	-	-	3	3	-	-	-	-	-	-	-	-	2
75	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	90	6	5	4	4	87	46	22	95	-	18	9	-	-	3	66
77	114	6	3	-	3	-	-	-	19	8	6	14	8	12	7	12
78	154	-	-	-	-	24	24	-	-	4	-	-	12	12	-	24
Total	437	12	8	4	7	114	73	22	114	12	24	23	20	24	10	104

Source : Personal communications to ONAT, UNDP, Settlement Department 1978

In this project it should be evident that all conditions will be satisfied in order to have appropriate utilization of machinery. Imrovement of production is obtained by exercising the minmum costs and the accurate requirements.

1) Seed-bed Preparation

It is the rule to use deep ploughing in heavy clay soils, especially to recognize that this operation becomes quite necessary when seasonal water logging tends to occur in the soil. However, manure spreading can be applied before ploughing in order to keep it well incorporated in the soil. Whenever possible, crop stubble and debris can also be ploughed in the soil after harvesting (1) for they are, as well beneficial to clay soils as manure. Manure is provided from the farm and not brought from outside.

It is planned to grow some-crops of nutritional value for fooder production such as maize, sorghums, alfalfa and ground-nuts, Nevertheless, resting the soil is inclined to be done in the first year, as it can help greatly to have thorough preparation of the soil. Avoiding the peak times which normally call for more machinery utlization particularly deep ploughing- a rather slow operation is the aim. This will reduce the demand for more implements and hence the costs will be lowered to a reasonable level. Disc plough is the right implement to be recommended for deep ploughing. It can be followed by the disc harrow to fairly pulverise the soil and crush the clods which are formed by the action of the disc plough.

2) Planting

Sorghum is sown by the seed drill, which is fitted with fluted feed run. Drilling of sorghums is normally carried out on the flat

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(1) Research Circular No. 1-ARI Afgoyo-1976

However, maize, ground-nuts and beans will be grown by a 4-row planter. It is an efficient machine, which is capable of achieving well defined seed rates in accordance to the recommendations of research results. Sowing on the top of ridges is advisable depending on the type of soils and proper spacing. Ridging is done by a 4-bottom ridger mounted on the tractor before sowing.

4) Weed Control

Using the rolling cultivator is proposed on furrow areas. The tooth cultivator is possibly applied in sorghums, which is normally sown on narrow spacing between the rows. The aim is to have fine texture of the soil, besides weeding, as well as conserving the soil moisture. This will help uplifting groundnuts later on harvesting time.

The use of herbicides is probable, but more experiments should be carried out to adjust residue- carry over, which is observed by ARI(1), and to confirm work done elsewhere. Justification for application of herbicides in dairy farm is needed. Moreover, the costs should comparatively compete with the other methods remarkably.

5) Plant Protection

The area is rather small for aerial spraying, so it is most practical to use tractor mounted field sprayer, which is expected

(1) Research Circular No.1
ARI Afgoye- 1974

to be robust and durable. It is to be equipped with pump that can load the container with the required amount of water directly in the field. This will definitely save time during the operation.

6)Harvesting

The types of forage harvesting machines are various depending on the variety of crops grown in the farm. The rotary mower is suitable to cut the alfalfa for the advantages it entails in such an operation. It is efficient, quick and fairly strong to tolerate hard soil conditions.

Mowing is followed by raking which is normally done by side Delivery Rake in case of green and dry matter, as well as putting groundnuts plants into rows to be ready for collection to threshing platform. Digger-shaker is the machine that uplifts the groundnuts out of the soil. Residues from threshing can be used as fodder to be baled or grazed by the herd in the field.

Chopper loader is required to harvest green material of maize and sorghum. It cuts it into small parts and disposes it directly into the trailer, which will be towed to the tractor. The pick-up is, on the other hand, used in alfalfa to yield pressed bales, which are easily carried by the aid of front loader (fork-type).

Stationary threshers are to be procured for grains and also for groundnuts. These will supply the feedlot with its requirements from grains. A maize combine is also necessary; it size is advised to be suitable to harvest that specific area.

C) REQUIREMENTS

In view of the planned rotation for the croping system, a schedulex has been drawn as shown in Figure(3.10). By checking

the time of each operation and their overlap on each other, the number of implements has been calculated, (Fig.3.11). The number is related to the total area of 1000 ha grown with the crops in question e.g. (300) ha sorghum, (300) ha maize, (200 ha alfalfa and (100) ha groundnuts. The table below shows the estimated requirements and their specifications, taking into consideration that sorghums and maize are grown twice a year, Table (3-10) consideration that sorghums and maize are grown twice a year, Table (3-10) and Table (3-11). This has been elaborated in the next tables for costings and phasing.

Table (3-10) - Number and specification of machinery

Sr. No.		Number	Life time years	Specification			
				efficiency %	Working width	Speed km	Output ha/hr
1	Tractor 80-90HP	(5)	7	-	-	-	-
2	" 65-75HP	(14)	7				
3	Disc Plough	(4)	8	80	2-3	5	0.80
4	Disc harrow	(3)	8	80	3	6	1.40
5	Land plane	(2)	10	75	2-3	6	1.40
6	Rolling cultivator	(3)	7	80	3-4	10	2.40
7	Tooth "	(1)	10	80	3-4	10	2.40
8	Mature Distrib	(1)	7	70	2-3	6	1.05
9	Fertilizer spreader	(2)	10	80	9-12	6	4.8
10	Field sprayer	(3)	7	70	4-6	5	1.75
11	Rotary mower	(2)	8	85	2-3	10	2.55
12	S.D. Bake	(2)	8	80	3	10	2.40
13	Chopper loader	(3)	7	75	2-5	3	0.56
14	Pick-up baler	(1)	10	75	2-5	3	0.56
15	Ditcher	(4)	10	80	2	6	-
16	Planter	(3)	8	65	4	6	1.30
17	Seed-drill	(2)	10	65	3-4	5	1.56
18	Ridger	(3)	7	75	4	6	1.80
19	Front loader	(2)	12	65	1-2	-	-
20	Digger-shaker	(2)	5	70	2	5	1.40
21	Thresher, G.nut	(1)	7	75	2	-	-
22	" Sorghum	(1)	7	85	2	-	-
23	Combine maize	(1)	7	85	2	6	1.00
24	Trailers	(15)	7	75	2	5	-
25	Water tank	(2)	10	-	-	-	-
26	Fuel "	(2)	10	-	-	-	-

Table (3-11) - Phasing Farm Machinery

	Farm Machinery	YEAR				TOTAL
		0	1	2	3	
1	Tractors 90 hp	2	1	-	2	5
2	" 75 hp	5	3	-	6	14
3	Disc plough	2	-	-	2	4
4	Disc harrow	1	-	-	1	3
5	Land plane	2	-	-	-	2
6	Rolling cultivator	1	1	-	1	3
7	Tooth "	1	-	-	-	1
8	Manure distributor	1	-	-	-	1
9	Fert. spreader	1	-	-	1	2
10	Field sprayer	-	2	-	1	3
11	Rotary mower	-	1	-	1	2
12	S .D. Rake	-	1	-	1	2
13	Chopper loader	1	1	-	1	3
14	Pick-up baler	-	1	-	-	1
15	Ditcher	1	-	-	-	1
16	Planter	1	1	-	1	3
17	Seed drill	1	-	-	1	2
18	Ridger	2	-	-	1	3
19	Digger shaker	1	-	-	1	2
20	Front loader	2	-	-	-	2
21	Thresher G-nut	-	1	-	-	1
22	" sorghum	-	1	-	-	1
23	Combine	-	1	-	-	1
24	Trailers	7	3	-	5	15
25	Water tank	1	1	-	-	2
26	Fuel tank	1	1	-	-	2
27	Workshop equipment	-	1	-	-	1

$C = \frac{SWt}{8.33} = 1.40 - 3 \times 6 \times .08 = 10.285$

d) COSTINGS

The costs for machinery and running cost for all operations are stated in this paragraph, Tables (3-12), (3-13)

Table(3-12) showing costs of machinery

	No.	Cost in So.Sh.		TOTAL
		Local	Foreign	
Tractors 80-90 hp	5	47500	427500	47500
" 65-75 hp	14	105,000	945,000	1,050,000
Disc plough	4	6,000	54,000	60,000
" harrow	3	6,000	54,000	60,000
Land plane	2	6,000	54,000	60,000
Rolling cultivator	3	6,000	54,000	60,000
Tooth cultivator	1	800	7,200	8 ,000
Manure distributor	1	4,000	36,000	40,000
Fertilizer spreader	2	3,000	27,000	30,000
Field sprayer	3	6,000	54,000	60,000
Rotary mower	2	2,000	18,000	20,000
S.D. Rake	2	3,000	27,000	30,000
Chopper loader	3	18,000	162,000	180,000
Pick-up baler	1	6,000	56,000	60,000
Ditcher	1	1,000	9,000	10,000
Planter	3	9,000	81,000	90,000
Seed Drill	2	8,000	72,000	80,000
Ridger	3	3,000	27,000	30,000
Front Loader	2	3,000	27,000	30,000
Digger shaker	2	4,000	36,000	40,000
Thresher-G.nuts	1	9,000	81,000	90,000
" - sorghum	1	15,000	135,000	150,000
Combine maize	1	20,000	180,000	200,000
Water tank	2	10,000	90,000	100,000
Fuel tank	2	10,000	90,000	100,000
Trailers	15	60,000	540,000	600,000
W/shop equipment	-	15,000	135,000	150,000
Spare-parts 15%	-	57,950	521,500	579,450
TOTAL		444,250	3,999,200	4,442,450

Table (3-13) Cost of machinery required for every operation

	Cost So. Sh.		Total
	Local	Foreign	
Tractors:	152,500	1,372,500	1,525,000
Land preparation	22,000	198,000	220,000
Planting	17,000	153,000	170,000
Cultivation	6 ,800	61 ,200	68,000
Fert. & manure	7 ,000	63 ,000	70,000
Spraying	6 ,000	54 ,000	60,000
Harvesting :			
a) grain	48,000	432,000	480,000
b) Fodder	26,000	234,000	260,000
c) Haybaler	6,000	54,000	60,000
Transport trailer	80,000	720,000	800,000
Workshop equipment	15,000	135,000	150,000
Spare-parts 15%	57,950	521,500	579,450
Total	444,250	3,999,200	4,442,450

e) **RUNNING COSTS**

1) **Fuel and lubricants**

The requirements have been calculated according to the operations carried out in the field for fodder and grain production, a summary is shown in table (3-14). Also fuel consumption for other operations is included in this table. Storage facilities are necessary to case and prompt utilization in the production area.

Table (3-14) Fuel Costs of the project(1)

Item	YEAR					Cost of consumption annually after year 4
	0	1	2	3	4	
1.Agric operations		294800	463000	631500	800000	800,000
2.Irrigation		295000	295000	442500	590000	590,000
3.Electrical supply		198750	397500	596250	795500	795,500
4.Transport:						
Benzine	39000	39000	78600	78000	78000	78,000
Dies.oil	36600	101300	166000	231000	259000	259000
Total	75,600	967,850	1,399,500	1979,250	2522,500	

(1) Fuel and oil consumption in So. Sh.

2) LABOUR

The wages of permanent staff, who are operating the agricultural machinery for crop production and transporting from the field to the farm are included in the table below- (3-15). Also skilled personnel for running the workshop to do maintenance and services as well as irrigation and electrical supply is included in the roll. Estimates of wages are taken from official records and previous studies which are duly adjusted.

Table (3-15) Labour Wages

	No.	Wages in So.Sh.		Total SO.Sh.
		per month	per year	
Supervising mechanic	1	1500	18000	18000
Mechanic	2	1000	12000	24000
Carpenter	1	800	9600	9600
Blacksmith/welder	1	800	9600	9600
Fitters	2	800	9600	17200
Electricians	2	800	9600	17200
Manson/painter	1	800	9600	9600
Plumber	1	600	7200	7200
Tractor drivers	20	600	7200	7200
W/shop attendents	2	400	4800	9600
Labourers	5	300	3600	18000
Time-keeper/guad	2	300	3600	7200
				291200

f) TRAINING

One of the biggest constraints is the shortage of skilled labour in the country. The scarcity of trained staff should be covered before the farm starts operations. Training courses for mechanics, tractor operators etc. is important. Selection of such personnels should be from good levels of education to help future upgrading and further training. A normal plan can be drawn to annually put into action the programme for training in order to qualify personnel when the project is started. Such a simple action can be seen hereunder:

Mechanics	6 month training
Artisan	3 month training for upgrading per each.
Tractor-drivers	9 month training in professional centre for agric. machinery, before starting work.

G) TOTAL COSTING

Phasing the engineering part of the project has been done according to the plan that calls for starting construction works before provision of the dairy herds. However, programming of such schedule is included here, Table (3-17). Details about the costs of every item has been set in Table (3-16). The costs are calculated on the assumptions of the prevailing prices and tax charges in the country.

Table (3-16) Total Costing of Farm Machinery, building and equipments.

Item	YEAR				Total
	0	1	2	3	
1. Farm Machinery	1,550,200	1,477,750	-	1,414,500	4,442,450
2. Farm Buildings	1,238,000	7,126,000	6,326,000	6,326,000	32,610,000
3. Dairy Equipment	3,070,000	3,070,000	3,070,000	3,070,000	12,280,000
4. Other Equipment	430,000	490,000	200,000	100,000	1,400,000
5. Transport	507,000	507,000	480,000	330,000	1,824,000
6. Irrigation	2,660,000	1,255,000	685,000	-	4,600,000
GRAND TOTAL					57,386,450

b) Maize

It can be used as grain in the feedlot rations or green fodder and kept as silage in the recommended for silage. Maize can be mechanically cut after the plant reaches the waxy maturity stage of the hashed grain or otherwise when the cobs exhibit certain characteristics of maturity. The plant is known to be rather sensitive to water logging and affected by soil density, the range of which is limited to about 1.2 g/cm3(1). Maturity of the crop is 90-120 days. Two crops are possibly grown in the year. Specing of the plants is set to be 25 cm. within the rows and 75-80 cms between the rows, using a planter which can dispose the seed rate of 25-30 kg/ha. It is most preferred to sow maize on the furrow, because it helps controlling salinity as well it facilitates irrigation and drainage(2). The estimated yield of maize forage is in the order of 60 tons/ha/year.

c) Sorghums

It is an important staple food of the population. Using it as fodder should be justified in relation to its economical return in the irrigated areas. Seed drill machine is procured to make sowing within the range of seed rates and over distribution and accurate spacing. Seed rate is 60 kg/ha. It is estimated to start harvesting when the dry matter is about 25-30% when the crop is cut at about 5 cm above the soil level (3,4).

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(1) Trans-Juba Livestock Project Review. 1977
(2) Research Circular NO.1, ARI Afgoye- 1976
(3) Juba River Development - Vol. IV
(4) Appendix Feasibility Study on Feedlot Project 1973

d) Groundnuts

It has been included in the rotation because of its value as oil crop. At the same time its cakes can be useful in the feedlot. There is no processing facility and usually it can be given to cattle as green fodder or as dry hay. The plant residues are assumed to fairly contribute to feeding provision because it includes considerable ratio of T.D.N. and reasonable percentage of D.P.(1).

e) Silage Production

It is tended to secure its availability in the dairy as flexible requirements for cattle feed. Transporting of the material from the field to the siloes is mostly done on trailers. Simple methods for silage reservation are recommended. Practically, silo trenches are prepared in Afgoye Dairy Farm. The are dug in the soil in dimensions ranging to 2.5m deep and 0.5m above soil level about 8m wide and 80m long. Normally the walls and pavement are of concrete style. Such a method gives a permanent installation for silage.

Another type of siloes is presented in Kenya and it is expected to be cheaper in construction costs, but may be not over lasting. It is designed to achieve the purpose in an easy and pratical way, which can lead to quick unloading. The platform is solid and sloping about 1% for good drainage of liquid discharges. Poles are fixed to support heavy duty black PVC, which is to be stretched on chicken wire. An earth embankment is raised on the outer side to help shaping the silage at the end of the periods.

However, the former method of silage making is known in the country. So it may be appropriate to install pit siloes, though they are comparatively more expensive.

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(1) Livestock Sector Review and Project Identification, H.T.C. Vol. 1-1976

3.4.5 FEEDING PRACTICES AND REQUIREMENTS

Feeding of the herd in the dairy farm would be mainly based on the freshly cut green fodder and the crop residues of the irrigated farm of the project (see 3.4.4.). The concentrate portion of the ration would consist of the agro-industrial by-products available in Somalia; namely sesame cake, cotton-seed cake, maize bran and bone-meal. The composition of the proposed concentrate mixtures is given in Tables 3.18 and 3.19. These concentrate mixtures are of high nutritive value and can be obtained at reasonable prices because of the high availability of the ingredients within the project area. It is noted that mixture 1 is alloted for young calves; thus it is devoid of cotton-seed cake and contains more maize grain.

As previously reported the herd consists of fresian animals at various ages and at different stages of production. In the light of data in Tables 3.18 and 3.19 and the presence of freshly cut green fodder together with the farm residues (maize and sorghum stover) as roughages; the daily retions of calves, heifers and breeding cows would as outlined in Table 3.20. The concentrates would be fed individually at the milking barns wheras group feeding system would be used when the roughages are offered to the herd. It is also suggested that the farm residues specially maize and sorghum stover should be hammer milled to fine size and then fed together with the copped green fodder. Some of the green fodder would be converted into silage for feeding the herd during the short periods of the dry season. The concentrate would be mixed in a feed-mixer and then fed with a small proportion of the hammer milled roughage.

In view of the proposed feeding regime, the green fodder and concentrate mixtures required for feeding the herd would be in the order of 56963 and 4188 tons/year respectively (Tables 21 and 22). Assuming about 60 tons/ha of green maize or sorghum in double cropped land/year, the total area for forage production will be approximately 900 hectares.

Table (3.2.0) Composition of the ration Fed to the herd

Animals	Green Fodder		Crop residues		Concentrates	
	Daily kg	Annual ton	Daily kg	Annual ton	Daily kg	Annual ton
Calves (1) 3-6 months	8	0.72	1	0.09	1	0.09
Heifers(2) 6-12 months	12	2.16	1.5	0.27	1	0.18
Heifers one year	15	5.48	2	0.73	1	0.37
Heifers two years	20	7.30	3	1.10	1	0.37
Dry Cows	20	7.30	3	1.10	-	-
Milking cows	35	12.78	3	1.10	3	1.10

a)

(1) Calves from birth- 3months will be fed on 450 kg whole milk/ head/period, 300 kg green fodder/head/period, 70 kg concentrate mixture 1

b) Estimates are based on a period of 90 days.

(2) Estimates are based on a period of 180 days.

(3) Crop residues are mainly sorghum and maize stover or dry groundnuts plants.

Table (3.21)- Green Fodders (tons) required for feeding the hard throughout 7 years of project Development

Animals / Years	1	2	3	4	5	6	7
Meaned(1) calves (birth 3 months)	169	327	467	639	641	641	691
Calves 3-6 months	-	495	961	1314	1879	1886	2009
Heifers 6-12 months	-	718	1068	1984	2714	2725	2902
Heifers one year	-	1355	2871	4109	5649	5665	6072
Heifers two years	-	-	1942	4256	6176	7913	7913
Breeding cows(2)	9298	17956	25665	33884	34690	36932	37376
Total (tons)	9467	20851	32974	46186	51779	55804	56963

(1) Estimates are based on 300 kg of green forage from birth-3 months.

(2) 80% are milking and 20% are dry cows.

Table 3.22) - Concentrate mixture (tons) required for feeding the herd throughout 7 years of development

Animals	YEARS						
	1	2	3	4	5	6	7
Weaned calves (1)	39.5	76.30	109.1	149.1	149.7	159.4	161.3
Calves 3-6 months	-	49.7	96.1	137.3	187.9	188.6	200.9
Heifers 6-12 months	-	49.7	96.1	137.3	187.9	188.6	200.9
Heifers one year	-	100.3	193.0	276.4	380.0	381.1	408.5
Heifers 2 years	-	-	98.4	215.7	313.0	401.1	401.1
Breeding cows (2)	689.9	1332.3	1904.9	2552.9	2613.6	2782.6	2816
Total of Mixture 11	689.9	1532.0	2214.2	3319.6	3682.4	3942.0	4027.4
Total of Mixture 1	39.5	56.3	109.1	149.1	149.7	159.4	161.3

(1) Estimates are based on 70 kg of concentrate 1 during the period from birth to 3 months.

(2) 80% are milking and 20% dry cows.

Water requirements usually are estimated as 10% of the live-body weight. The required is therefore 5,10,20, and 50 litres/ day respectively for each head of weaned calves, calves 3-6 months heifers 6-12 months, heifers on year old, heifers 2 years old and breading cows. The daily water requirements for weaned calves, calves 3-6 months, heifer 6-12 months,heifers one year, heifers two years and breeding cows are respectively 11520,22320,22560, 33120,43360 and 160000 litres. Assuming 20% water losses the total daily water requirements would be in the order of 351456 litres.

3.4.6. Disease Control and Veterinary Services

For efficient control of epirootic diseases and provision of proper veterinary services in the farm of such type a veterinary clinic must be established withing the general complex of the farm. The clinic will carry out all the necessary prophylactic measures, biological tests and treatment of any disease case that may crop up in the farm primises.

a) Personnel

The clinic shall consist of the following personnel:-

- Veterinary officer	2
- Veterinary superintendant	5
- Veterinary Labourers	20
Total	27

b) Disease Control policy in the Farm

As a rule all cattle 6 months old and over must be vaccinated against all of the epizootic diseases preveiling in Somalia. Since vaccines and biological products in the country are supplied free of charge. This will not entail any financial commitanent

on the farm. We suggest the following schedule for vaccination and clinical tests:-

1. Rinderpests.
2. C.B.B.P.
3. Anthrax
4. Haemorrhafii Septicaeimia
5. Blackquarter.

Vaccination against the above mentioned diseases should be carried out at 6 months of age or immediately after their arrival in the farm. Vaccination then should be repeated every year afterwards.

6. Foot and Mouth Disease:

Animals 6 months old and above should be vaccinated annually against FMD. Calves receiving the vaccine for the first time should be given two doses of the vaccine with an interval of two weeks between the first dose and the second one. The vaccine must include the types of the FAD virus known in Somalia viz.o,a,C and Sat 1.

7. Brucellosis:

All calves one year and above should be vaccinated against brucellosis. The vaccine should be repeated every year.

8. Tuberculin Test:

All cattle in the farm should be tested against tuberculosis with tuberculin every six months. All suspected animals should be retested after three months from the date of the first testing. All positive reactors should be culled from the herd.

9. Brucellosis test :

Cattle in the farm should be tested twice a year for brucell-

osis. The test should be repeated with every cow that aborts. The time allowed is one months between abortion and the resting.

10. All milking cows should be screen- tested daily for the presence of mastitis and positive reactors must be isolated and treated immediately.

11. All cattle should be sprayed for ectoparasites every 15 days.

12. Animals suspected of epizootic diseases should be isolated in the quarantine prior to treatment. culling or destruction.

13. Carcasses of dead animals must be disposed of according to the standard hygienic measures.

14. No animals should be admitted to the farm without clinical and biological tests.

C) Buildings

Two offices, a store, an operation room and a quarantine shall be constructed to sevre as a veterinary clinic of the farm.

The quarantine will accomodate 20 sick cows and 50 calves at a time. A provision is made for a room for milking quarantined or sick cows in addition to an intensive care unit of 4 cows capacity. An attendance room is to be build within the general complex of the quarantine.

d) Transport

Since the farm area is about 1000 hectors, animals will be scattered over this area for grazing or in their sheds a four-wheel drive pick-up car pereferably a landrover is necessary to provide quick mobility.

e) Equipments& Drugs

The clinic shall be provided with the necessary clinic equipments and vaterinary drugs.

f) Requirements of the vet dlinic

Item	No. or Quantity	Cost.in So.Sh.
1. Personnel		
Veterinary officer Sh.12,000 X 48 months) (Sh. 14,000 X 48 months)	2	213,400
Vet. Assistant (Sh.450 X 48 months)	5	300,000
Driver (Sh. 350 X 48 months)		41,400
Vet,Labourers(Sh. 350 X 48 months	20	336,000
Sub-total		1,382,400

Item	No. or quantity	Cost in So. Sh
2. Buildings		
Office	2	
Store	1	
Operating theater	1	
Quarantine	1	360,000
Subtotal		408,000
3. Vehicles		60,000
4. Equipments		40,640
Clinic equipment		7640
Surgical "		8450
Subtotal		56,730
5. Drugs and Chemicals		
Drugs		129,000
Vaccines		30,000
Chemicals		113,400
Subtotal		272,400
Grand total of vet. requirements		2,179,530

3.4.7. ADMINISTRATION AND MANPOWER

a) Administration

The whole dairy project is run by the managing director with responsibility for six groups. Each group is responsible for one of the following duties:-

a) Dairy production
b) Veterinary and attendance
c) Engineering and services
d) Field production
e) Administration
f) Artificial Insemination centre

a) Dairy Production

For each farm there is a farm manager who has over-all responsibility for the instrumentation of the project director's orders. The farm managers are assisted by 5 assistants.

b) Veterinary and attendance

Two veterinarians are responsible of veterinary care, quarantine and maternity service. The veterinarians are assisted by 5 assistants.

C) Engineering and Services

An assistant manager is responsible for all technical installations and for the care of cars and agricultural machinary.

Super intendants for milking and coaling and other installations, electrical installations, and farm machinary and vehicles.

d) Field Production

The agricultural production assistant manager is charge of forage crop production and storing.

e) Administration

An assistant manager is responsible for all buying and selling activities and is in charge of the personnel office and funds. He is assisted by employees for:

- The finance and accounting office
- The personnel office
- The stores.

f) The Artificial Insemination Centre

Assistant manager of A.I.- Centre, assisted by lab-technicians dairy and meat production staff, and veterinarians is in charge of the breeding policy of the farm. He is also responible of the processing, storing and distribution of semen to the project farms, and of keeping breeding and production records and supervising progeny testing programmes.

b) Manpower

Local Staff

Counterpart general manager	1
Farm manager	5
Veterinarians	2
Assistants	15
Foremen	22
Administrative Personnel	10
Artisans	26
Laborers	300

Expatriates

General Manager	1 Year	(0-4)
Assistant General Manager	2 Years	(1-2)
Veterinary expert	1 Year	(1-2)
Forage Crop Production Expert	1 Year	(0-1)
AI-expert	1 Year	(1)

c) Production Norms for laborer

Because of the low efficiency of laborers, the production per laborer was deliberately chosen as law as 75 kg of milk/day/man. Considering that a cow is equal to 1 Au, the norms for different catagories of animals per man are (1):

Caws	7.5
heifers 2yr	10
heifers 1yr	15
calves	30

(1) Include laborors,artisans and foremen

3.5. WATER REQUIREMENTS & IRRIGATION

3.5.1 GENERAL

Haydrological works for water survey are conducted recently in the Democratic Republic of Somalia, when individual (1964) and international interests (1968,1973) have been disclosed on the request of the government. However, some projects on the control and management of the Shabelii river, in particular, had been intiated. But this did not labour very detailed studies on the river course and its effects on the agricultural and technological aspects. Should that have been carried out, successfully, better utilization of the river waters could be materielised earlier.

Theree water sources in the Shabelli valley are identified:-

SURFACE WATERS

Supporting more agricultural projects along the Shabolli River is now a premature innovation, though the river can flow all the year round, regardless, certain exceptional years that may lead to drying out in some months of the year. As mentioned above reliable date are failing, whereby no periodical checks on the exact quantities which should irrigate more land for development.

The river behaviour is rather slower twice a year, discharging on the average at lower periods about 10 cummes, Figure (3-13). These two periods of low flow may result in some difficulties, hence will lead to drop in the entire utilization of the maximum requirements for longer intervals. Moreover the quality of the Shebelli waters is not fully investigated with regards to the question of Salinity build-up on the surface of the soils, in particular during the dry spell and the leaching action of the

Delaberately, pump site is to be chosen, and it will be of some concer to change the style of the existing pumping stations on the Shabelli river. It might be well proposed to reduce the suction head in order to increase the efficiency of the pumps during the low flow periods. Constructing a concrete pumping basin at lower levels from the ground will help discharging almost constant quantities of water annually. The pump station should be well protected against erosion.

Long furrow irrigation had been recommended to be applied in the fields and the appropriate implements will be provided. This operation is important, as it will help the application of machine in the field, and can only be effective when the soil is well levelled.

3.5.3. WATER REQUIREMENTS

Exact water requirements for fodder crops in this area are lacking. Short also is the information about accurate assessment of water demands by the plant during the dry season of January and March. The effect might not be serious for fodder crops in case of the risk of failure to secure promptly the exact demands because some crops can naturally withstand a certain degree of drought conditions on the dry periods.

It has been anticipated to grow maize, sorghum, groundnuts and alfalfa as fodder crops to supply the dairy herd with constant forage feed and partly small areas for grain production. The maize and sorghums can be grown twice a year and hence basically acquiring more quantities of water. In order to calculate the requirements, it is more practical to rely on certain date from previous studies rather than verbally accumulated figures which are absolutely not

documented (1,2). It is more or less stated that an overall shortage in the Shebelli river is likely to happen when all development projects along the river sides come into operation, but the situation may improve if better requlations are imposed on the river course which are lacking (2) at present.

To start calculating the water requirement of the individual crops data should be provided, but only maize fodder has been recorded to have some estimate for water requirement, which is about 1500 m^3/month. Noting that two irrigations per month are possible. A becomes roughly, equivalent to about 1-2 l/sec at 12 hours/day irrigation. On the other hand, lucerne is another crop that needs more water. Taking these as basis, the estimates for the total requirement of water in the year are drawn accordingly. In view of such assuptions and taking into consideration the design capacities for the pumps computed on crop factor, open water evaporation and irrigation efficiencies, the peak quantities have been calculated. The irrigation system is tended to work at an average overall efficiency of about 65%, to cover an area of 900 ha. under cropping rotation at one time and 100 ha as follow land. The result is average quantity of water about 1.8 l/sec is required to satisfy maize and sorghums as well as groundnuts. Alfalfa remains for longer period on the ground, so the requirements are definitely more. Elsewhere(3) lucerne is estimated to consume about 3.25 l/sec, which might conservatively be regarded as fitting to this case. The total quantities are therefore found to be in the range 1.84-2.00 m^3/sec.

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(1) Trans- Juba Livestock Project - 1977

(2) Proposed for large scale Dryland & Irrigated Fattening Schemes (Jowhar) - 1977

(3) Trans-Juba Livestock Project - 1977

Two pumps in the capacity of 0.9-1.0 m3/sec each are needed to satisfy the demand of this cropping system during the first part of the year. This is considered as the peak demand because all land is under crop. On the second rotation the demand for water will be less, as groundnuts and grain crops will be hervested and no longer in rotation. It is essential to procure a standby pumping unit to cover the mergency cases. The same quantity of water should be carried out through a main canal transferring it to subsidiary and then to the field channels. A rough estimate is drawn out to display the proposed irrigation and drainage layout, Design ( ). Surface drainage is as well recommended in order to avoid overflooding during the rainy season, and to dispose excess irrigation waters, putting in mind that maize is sensitive to water logging. An extra pump is probably needed to fulfill the purpose, preferrably pertable.

The field is set to be divided into irrigation blocks, which can allow for lone furrow cultivation. It is well suggested to have 50-ha units as a unique division to keep allowance for easy mancavour of machinery in the fields.

Surveying the area is not available, so it is very difficult to design very accurate canalisation, as well as it is quite clear that the present irrigated design in the Afgoye area need by very soon revised and adjusted to suit the proposed project. However, on the existing information a rough layout has been drawn by CITACO (1), which can be taken as starting basis in irrigation. The tentative irrigation and drainage network can help estimating the cost of irrigation constructions.

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(1) Proposal for the establishment of a Livestock Research Centre-CITACO Technical Unit- 1974.

3.5.4. SPECIFICATIONS

Pump Station

The engine should be diesel driven, directly coupled with the pump, supplied with betteries for starting and a big capacity fuel tank, tool kit is to be supplied. Rated engine power is in the range of HP.

Centrifugel pumps should be provided to discharge about $1m^3/sec$ each, equiped with pipes and strain valves.

Canalization

The main canal will carry an amount of 2.Cm3/sec. The final design of the canal and length can be specified according to the contour. Subsidiary canals are to be scavated to feed the smaller, field channels. The capacity of 0.2,-0.4 m^3/sec. is seen to be reasonable in particuler the canal will keep enough water to irrigate about 100 ha. Open drainage canals are constructed parallel to the irrigation canals carrying variable water quantity and according to the conteurs.

IRRIGATION REQUIREMENTS

The proposed farm lies in some area of the 21 October Diary Farm, which is estimated to cover about 1200 ha. Only 200 ha. are cultivated. The requirements to reclaim the land to properly design the canalization are shown below, considering that the water is drawn from the Shebelli river from a site which is not far from the existing ones.

1) Land Levelling	1000 ha	Due to uneven levels of the area, accurate levelling is necessary.
2) Pump house	1 No.	of an area of 150 m^2.
3) Engines and Pumps	3 No.	each dischargling about 1.0m^3/sec. including a standby pump.
4) Main canal	1 No.	Approximately in the length of 2 km.
5) Subsidiary canals	20 No.s	Totalling to a length of approx, 10 km.
6) Field Channels	200 No.	Reaching on the average a length of about 40 km.
7) Drain canals	-	siving drains of different sizes, totalling about 41 km.
8) Roads	20 No.	about 10 km. raised roads.
9) Other Installations		Such as bridges and regulators.

Table (3-23) Estimated Costs

	No.	Cost Unit So.Sh.	Total
Land Levelling	1	1200/ha	1,200,000
Pump house	1	2,000/m^3	300,000
Engine & Pumps	3	200,000/unit	600,000
Canalization			
Main	2000 m	50/m	100,000
Subs	10 km	30/m	300,000
Channel	40 km	14/m	600,000
Drainage	40 km	20/m	820,000

Roads	50 km	50/m	500,000
Other Installations		-	140,000
Survey Network fees		-	40,000
TOTAL			4,600,000

Table (3-24) Cost of Irrigation Construction

I T E M	Cost So.Sh		TOTAL
	Local	Foreign	
Land levelling	480,000	720,000	1,200,000
Pump house	90,000	210,000	300,000
Engine & Pumps	180,000	420,000	600,000
Canalization	400,000	600,000	1,000,000
Drainage	330,000	490,000	820,000
Roads	300,000	300,000	500,000
Other Installations	45,000	95,000	140,000
Survey Fees	40,000	-	40,000
TOTAL	1,765,000	2,835,000	4,600,000

3. 6 Training Programmes.

3.6.1 Training Outside the Country

The object of this training is to secure complementary training for the managerial staff of the project during a training period of six months in the country from which most of the farm equipments and heifers are imported. The personnel selected should have university education and reasonable professional training corresponding to the specialities anticipated by the project. The personnel should also have knowledge of a foreign language.

Professional orientation, practical training and theoretical information will be provided on the key-points of their functions. Team work is also stimulated by exercises related to the professional realities.

By the end of the training programme, trained personnel will be able to cooperate with foreign experts and expatriates, to participate actively in various functions in order to run the project, and to take part in the recruitment, selection and training of foremen and workers. Personnel to be trained are listed below. The figures in brackets denote the number of trainees:

- Project manager(1)
- Assistants managers responsible for dairy production(2)
- Assistant manager in charge of forage crop production (1)
- Veterinarians (1)
- Assistant manager for engineering(1)

It is recommended that this programme is carried prior to the implementation of the project and in year 0.

3.6.2 Special-Purpose Training

Six month programmes are devoted to special training. The main effort will be concentrated on the key-points with a view to secure sound operational management of the project. Personnel must have university and some professional training. Seven specializations are selected and the number of trainees for each is given between brackets:-

- Technician responsible of cattle feeding (1)
- Technician responsible of reproduction and artificial insemination.(1)
- Technician responsible of milking parlors (1).
- Technician responsible of production recording, breeding and progeny testing (1).
- Technician responsible of farm machinary(1).
- Professional responsible of adminstration and marketing (1).

This programme is effected in years 0-1.

3.6.3. In-Service Training

The training will be secured on the farm by expatriates and trained local personnel. The objectives are the training of technical and operating staff of the project. The training will include practical knowledge and experience essential to the implementation and running of the project. Training should be organized with a view to avoid impeding the regular tesks. A 100 persons will be selected among the foremen, skilled laborer and drivers.

Table 4.1 Continued

	Complete Build Up And Full Operation			
	AT END OF YEAR			
HERD COMPOSITION				
Breeding cows	2970	3162	3200	3200
Weaned calves	2138	2277	2304	2304
Heifers 1 yr	1027	1030	1104	1104
Heifers 2 yr	846	1084	1084	1084
Total Animals	6981	7553	7692	7692
Total AU	4651	5060	5141	5141
PURCHASES				
Heifer 1-2 yr	-	-	-	-
Mortality				
Breeding cows	58	59	63	63
Males 3-6 ms	21	22	23	23
Females 3-6 ms	21	22	23	23
Heifers ½-1 yr.	20	21	22	22
Heifers 1-2 yr.	12	20	21	21
Total Mortality	132	144	152	152
SALES				
Cull cows	284	291	465	480
Males 6 mos	1044	1043	1116	1128
Heifers 2 yr.	-	145	420	582
Total sales	1328	1482	2001	2190
TECHNICAL COEFFICENTS				
Calves weaned %	72	72	72	72
Mortality after weaning	2	2	2	2
Culling breeding cows %	10	10	15	15
Carrying capacity AU/ha (*)	5	5	5	5
Required cultivated area ha	930	1028	1028	1028

(*) Animals will be fed on green fodder supplemented with concentrates.

4.2 Outputs

The production of the project will include:

- Milk
- Live animals for fattening or breeding
- Manure.

The basic date for the calculation of the output reflect herd projections (table 4.1) and the suggested technical coefficient (3.1). A summery of the assumptions is :

a) Milk production

- Milking cows = 80% of the breeding cows
- Days in milk = 300 days
- Yield net of calf = 3000 kg/lactation

b) Live animals

- 6-month males at an average weight of 180 kg. sold to neighbouring government-owned ranches.
- Culled cows at an average mature weight of 500 kg. 15% of the breeding cows are culled annually and transferred for finishing on neighbouring feedlots.
- 2-years heifers at an average weight of 400 kg. sold after replacement is satisfied, 90% of which for breeding purposes.

c) Manure.

$15m^3$ produced annually/AU.

Table 4.2 includes the total production of the project distributed over 20 years.

and land improvements, the local currency component is assumed to be around 38.4%. As it appears from schedule IV, the local currency component of capital cost is larger than the foreign currency component during the pre operating year. This is because of the considerable part of farm buildings and expatriates housing that will be implemented during the year. Starting from the first year of operation, and up to the fourth year the foreign currency component overtakes the local currency component to pay for the imports of the foundation stock and the required machinary and movable equipment.

5.2. Operating Costs

These operating costs are divided into three major items: Wages and Salaries, feed requirements, and dairy and forrage operation.

5.2.1 Wages and Salaries

The following schedules, schedule V, gives the required personnel for the project and their assumed salaries. It is assumed that staffing of the project will take place gradually, i.e. 20% each year starting from the pre operating year.

Schedule V
Wages and Salaries

Local Salaries			So.Sh.000
Counterpart General Manager	1(a)	So.Sh. 30,000	30
Farm Managers	5(a)	" " 20,000	100
Veterinarian	2(a)	" " 15,000	30
Assistants	15(a)	" " 10,000	150
Foremen	22(a)	" " 10,000	220
Administrative personnel	10(a)	" " 7,500	75
Artisans (including drivers)	26(a)	" " 8,500	221
Labourars	300(a)	" " 6,000	1,800
		Total per annum	2,626
Year 0 20% of staff			525
Year 1 20%			1050
Year 2 20%			1575
Year 3 20%			2100
Year 4-20 project fully staffed			2626

Expatriate Salaries and Allowances		(Housing provided on site)
General Manager Years (0-4)	1(a)	So.Sh. 200,000
Veterinary expert Year (1-2)	1(a)	" " 150,000
Forage Crop Production Expert Year (0-1)	1(a)	" " 150,000
A.1 Expert Year (1)	1(a)	" " 150,000
Total:		
Year 0		350
Year 1		650
Year 2		350
Year 3		200
Year 4		200

and up to the third year. The project will be fully staffed starting from the fourth year of operation.

As for the required expatriate personnel, these requirements are shown at the bottom of schedule V. Except for the general Manager, who is assumed to stay for five years, all the rest are experts in animal health, forage crop production, and artificial insimination, and are going to stay for one or two years.

It is assumed that starting from the fifth year of operation, the Somali managers and experts will be fully trained to operate the project, and their salaries will probably have to be raised to retain their services. Bonus payments on results may be appropriate, even though these have not been budgeted.

5.2.2. Feed Requirements

The major part of feed requirements will be provided from within the project, and will be considered thus as an intrafirm transection. The remaining part represents concentrates bought from outside the project, and the costs of such purchases are those that will appear in the operating costs. The costs of the two required types of mixtures, and the total cost for feed requirement appear in schedule VI.

5.2.3 Dairy and Forage Operations

These represent various items of costs related to the operation of the dairy farms, and forrage production, such as the operation of vehicles, lorries, tractors, etc,. These various cost items will be divided into seven major sub-groups:-
Agricultural, irrigation, electricity, transport, spare parts, maintenance, and veterinary and A.I. Expenses. These data are shown in schedule VIIa.

Schedule VI

Feed Requirements

Year	Mixture no.1		Mixtrue No. 2		Total Cost* So.Sh. 000's
	Quantity in tons	Cost So.Sh.000	Quantity in ton	Cost So.Sh.000	
1	39.5	33	689.9	580	613
2	76.3	64	1532.0	1,288	1,352
3	109,1	92	2214.2	1,860	1,952
4	149.1	125	3319.6	2,788	2,913
5	149.1	126	3682.4	3,093	3,219
6	159.4	134	3942.0	3,311	3,445
7-20	161.3	135	4027.4	3,383	3,518

*. These cost estimates include only direct costs of materials bought from outside. All other costs (other variable costs such as feul and repairs for machinary and irrigation, and other costs such as labor, management, depreciation, and over-heads) are included elsewhere. Inputs from manure produced in the project and used for forrage production are considered as an itra firm input, and thus, their value is not included in total cost.

Schedule Vll (a)

Dairy And Forage Operation/per annum

So.Sh. 000's

Year	Operating Cost							Total
	Agricul.	Irrig.	Electric.	Transp.	Spares	Maint	Vet.& Al	
0	-	-	-	79	602	-	-	678
1	295	295	199	179	603	775	30	2,304
2	463	295	397	244	360	1,194	33	2,986
3	631	442	596	309	505	1,544	55	4,082
4	800	590	795	337	500	1,860	67	4,949
5	800	590	795	337	500	1,860	77	4,959
6	800	590	795	337	500	1,860	86	4,968
7	800	590	795	337	500	1,860	92	4,974
8-20	800	590	795	337	500	1,860	100	4,982

Schedule Vll (b)

Overhead Costs Per Annum

- Office		
- Phone	So.Sh.100,000/per month	SO.Sh.000's
- Electricity		1,200
- Social/medical rates etc.		

Progressive build up

Year	So.Sh.000's	Year	So.Sh.000's
0	200	3	800
1	400	4	1,000
2	600	5-20	1,200

5.3 Overhead Costs

These costs cover office expenses, and other expenses such as phone, electricity, social/medical rates, etc. It is assumed here that these expenses will reach So.Sh. 100,000 per month (1.2 million per year), when the project is fully operated. It is also assumed that such expenses will increase gradually from So.Sh. 20,000 at the pre-operating year until they reach their maximum level at the fifth year of operation. These information are shown in schedule VII(b).

5.4 Total Costs

These previous information concerning the development of various cost elments through the lifetime of the project,which is assumed here to be 20 years of operation, can be summarized in the following table.

Schedule VIII

Development of Total Cost So.Sh.000's

Year	Total Capital Costs	Total Operating Costs			Overheads	Total Cost
		wages	Feed Requ.	Dairy & forrage		
0	20,779	875	-	678	200	22,532
1	22,584	1,700	613	2,304	400	27,601
2	19,419	1,925	1,325	2,986	600	26,255
3	19,898	2,300	1,952	4,082	800	29,032
4	8,922	2,826	2,913	4,949	1,000	20,610
5	-	2,626	3,219	4,959	1,200	20,610
6	-	2,626	3,445	4,968	1,200	12,004
7	-	2,626	3,518	4,974	1,200	12,318
8-20	-	2,626	3,518	4,982	1,200	12,326

5.5 Estimates of Benefits

The output of the proposed project can be classified under two items: Sales of fresh milk, and sales of live animals. As for the latter item, these sales are composed of three distinguished categories. The first category represents culled animals that are going to be sold as liveweight. The livestock Development Agency (LDA) used to fix the price of liveweight cattle at So.Sh. 2.75 per kg., but this policy was concelled in September 1977, and started to buy its cattle requirements through auctions. The auction price varies around So.Sh. 5 per k.g. and this is the price that we are going to use to determine the value of culled animals.

The second category is the sales of two years heifers for breeding purposes. These represent a high quality breed, and the assumed price for these sales is going to be So.Sh. 7,500. This price represents the import price minus the freight cost.

The third category represents the bulls (6 month calves), and we will assume that this category will be sold at the equivelent as So.Sh. 2,500 per head.

The following schedule, schedule 1X represents the expected income from sales of live animals through the assumed life span of the project.

The second item represents the sale of fresh milk, to the Mogadishu Milk Processing Plant, which is assumed to buy the whole output. The proposed project is going to deliver the fresh milk cooled to the factory.

The choice of a price for the proposed project's output of fresh milk is not an easy question. We have discussed before, in section 2.5., the status of milk prices and quality in the urban areas of Mogadishu. We do not want to repeat this discussion once more, but suffice it to say that the milk factory will have to raise the price of milk from this low official level of So. Sh. 1.4 per k.g., if it wants to preserve the manager supply of milk it obtains from local producers.

Shedule IX

Income From Sale Of Live Animals*

Year	Live Weight Of Culls		2 Year Heifers For Breeding		6 Month Males		Total income from live Animals So.Sh. 000's
	Tons	So.Sh. 000's	Head	So.Sh. 000's	Head	So.Sh. 000's	
0	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-
2	20	100	-	-	276	690	790
3	52	260	-	-	534	1335	1595
4	106	530	-	-	763	1908	2438
5	142	710	-	-	1044	2610	3320
6	146	730	129	968	1048	2620	4318
7	248	1240	378	2835	1116	2790	6865
8-20	263	1315	524	3930	1128	2820	8065

* Assumed Prices

1. Culled animals So.Sh. 5 per kg.
2. Two year old heifers for breeding So.Sh. 7,500 = (import price-freight cost).
3. Bulls (6 month calves) So.Sh. 2,500

If it seems so certain that the official price of milk is going to be raised, the question will then be by how much? A price level of So.Sh. 2 per kg of fresh milk has been suggested for long. If one considers the superior quality of the milk provided by the proposed project, in addition to the elimination of milk collection costs to the milk factory as a result of the delivery obligation of the proposed project, then a price level of So.Sh. 2.5 or even 3 per Kg is not far fetched.

In our view, a price level of So. Sh. 2.5 per kg of fresh milk (taking all various considerations into account) seems to be most justified. On the other hand, and for the sake of completeness, two additional alternatives will also be considered a pessimestic alternative which puts the price of milk at So.Sh. 2 per kg; and an optimistic one, which puts the price of milk at So.Sh. 3 per K.g.

Schedule X

Alternative Assumptions Regarding the price of Fresh Milk

		Price per K.g. So.Sh.
Alternative	1	2.5
Alternative	2	2
Alternative	3	3

These alternative prices are used to estimate the value of milk output, and the results, in addition to various other benefits are shown in schedules Xl, Xll, and Xlll respectively.

5.6. Financial (Benefit/Cost) Analysis

With the estimation of the expected benefits and costs for the project, the stage is now ready to assess its financial viability. Data from schedule Vlll, concerning total cost estimates, is used in conjunction with the estimates of total benefits contained in schedules Xl,Xll, and Xlll, to obtain three alternative cash flow statements.

Schedule XI.

Estimates of Benefits

Alternative 1 : Milk price = So.Sh.2.5 per kg.

Year	Herd Totals		Milk		Live animals*	Miscell-aneous **	Total
	Heads	AU	Tons	So.Sh. 000's	So.Sh 000's	So.Sh 000's	So.Sh. 000's
0	-	-	-	-	-	-	
1	1,348	.925	2,352	5,880	-	-	5,880
2	2,875	1,922	3,633	9,083	790	-	9,873
3	4,510	2,934	5,193	12,983	1,595	-	14,578
4	6,361	4,245	6,963	17,408	2,438	-	19,846
5	6,981	4,651	7,128	17,820	3,320	1,000	22,140
6	7,553	5,060	7,590	18,975	4,318	-	23,293
7	7,692	5,141	7,680	19,200	6,865	-	26,065
8-19	7,692	5,141	7,680	19,200	8,065	-	27,265
20	7,692	5,141	7,680	19,200	8,065	79,150	106,415

* Source : Schedule IX.

** The first item represents residual value of assets of expetriate houses in year 5. The second item represents the residual value of assets in year 20 as follows:

Residual values in year 20 :	So.Sh.000's
Cattle (According to current international prices)	48,250
Movable equipments (just over half the purchase price)	10,000
Irrigation and land development(full original cost)	4,600
Remaining fixed improvements (half original cost)	16,300
	79,150

Schedule XII

Estimates of Benefits
Alternative 2 : Milk price = So.Sh. per kg.

Year	Herd Totals		Milk		Live animals	Miscel** lenous	Total
	Heads	AU	Tons	So.Sh. 000's	So.Sh. 000's	So.Sh. 000's	So.Sh. 000's
0	-	-	-	-	-	-	-
1	1,348	925	2,352	4,704	-	-	4,704
2	2,875	1,922	3,633	7,266	790	-	8,056
3	4,510	2,934	5,193	10,386	1,595	-	11,981
4	6,361	4,245	6,963	13,926	2,438	-	16,364
5	6,981	4,651	7,128	14,256	3,320	1,000	18,576
6	7,553	5,060	7,590	15,180	4,318	-	19,498
7	7,692	5,141	7,680	15,360	6,865	-	22,225
8-19	7,692	5,141	7,680	15,360	8,065	-	23,425
20	7,692	5,141	7,680	15,360	8,065	79,150	102,575

* Source: Schedule IX.

** As in Schedule XI.

Schedule XIII.

Estimates Of Benefits

Alternatives 3 : Milk Price = Sh. 3perkg.

Year	Herd Totals		Milk *		Live animals*	Miscell-aneous**	Total
	Heads	AU	Tons	So.Sh. 000's	So.Sh. 000's	So.Sh. 000's	So.Sh. 000's
0	-	-	-	-	-	-	-
1	1,348	925	2,352	7,056	-	-	7,056
2	2,875	1,922	3,633	10,899	790	-	11,689
3	4,510	2,934	5,193	15,579	1,595	-	17,174
4	6,361	4,245	6,963	20,889	2,438	-	23,327
5	6,981	4,651	7,128	21,384	3,320	1,000	25,668
6	7,553	5,060	7,590	22,770	4,318	-	27,088
7	7,692	5,141	7,680	23,040	6,865	-	29,905
8-19	7,692	5,141	7,680	23,040	8,065	-	31,105
20	7,692	5,141	7,680	23,040	8,065	79,150	110,255

* Source : Schedule IX.

** As in Schedule XI.

Each alternative cash flow statement corresponds to one of the three alternative assumptions regarding the price of milk. Thus the cash flow statements are shown in schedules XlV, XV, and XVl which correspond to alternatives 1,2, and 3 respectively.

From the first cash flow statement (schedule XlV) which corresponds to a milk price of So.Sh. 2.5 per Kg, we can calculate the internal rate of return (IRR), which can help in assessing the financial viability of the project.

$$IRR = 10+5\left(\frac{18,857}{31,267}\right) = 10 + 5\ (.603) = 13\% \qquad 1$$

Similary, the IRR can be calculated for the two other cash flow statements (schedules XV, and XVl), those corresponding to a milk price of So. Sh. 2 and 3 respectively.

$$IRR = 5 + 5\left(\frac{42,666}{51,046}\right) = 5+5\ (.836)=9\%$$

$$IRR = 15 + 5\left(\frac{6,412}{20,348}\right) = 15 + 5(.315)= 17\%$$

Before commenting on such values concerning the IRR, it may be useful to summarize these previous results in the following schedule (Schedule XVll).

Schedule XVll

Summary of Financial Analusis

Alternative	' Assumed price for Milk (So.Sh./kg	' Value of IRR
1	2.5	13%
2	2	9%
3	3	17%

Schedule XVI

CASH FLOW

Alternative 3

So.Sh. 000's

Year	Total Costs	Total benefit	Balance	D.F. 15%	Present worth at 15%	D.F 20%	Present worth at 20%
0	22,332	-	(22,332)	1	(22,332)	1	(22,332)
1	27,601	7,056	(20,545)	.870	(17,874)	.833	(17,114)
2	26,282	11,689	(14,593)	.756	(11,032)	.694	(10,128)
3	29,032	17,174	(11,858)	.658	(7,803)	.579	(6,866)
4	20,616	23,327	2,711	.572	1,551	.482	(1,307)
5	12,004	25,668	13,664	.497	6,791	.402	5,493
6	12,239	27,088	14,849	.432	6,415	.335	4,974
7	12,318	29,905	17,587	.376	6,613	.279	4,907
8	12,326	31,105	18,779	.327	6,141	.233	4,376
9	12,326	31,105	18,779	.284	5,333	.194	3,643
10	12,326	31,105	18,779	.247	5,638	.162	3,042
11	12,326	31,105	18,779	.215	4,037	.135	2,535
12	12,326	31,105	18,779	.187	3,512	.112	2,103
13	12,326	31,105	18,779	.163	3,061	.093	1,746
14	12,326	31,105	18,779	.141	2,648	.078	1,465
15	12,326	31,105	18,779	.123	2,310	.065	1,221
16	12,326	31,105	18,779	.107	2,009	.054	1,014
17	12,326	31,105	18,779	.093	1,746	.045	845
18	12,326	31,105	18,779	.081	1,521	.038	714
19	12,326	31,105	18,779	.070	1,315	.031	582
20	12,326	110,255	97,929	.061	5,974	.026	2,546
					6,412		-13,936

These results show that the proposed project seems to be financially sound. Even at the price of milk assumed in alternative 2, So.Sh. 2 per Kg, the IRR looks reasonable especially for project of this nature. The financial viability of the project is much more clear cut for alternatives 1 and 3, even though we are much convinced with the assumption of alternative 1.

Finally, it should be noted that we have limited ourselves here to the financial analysis of the project, which is concerned primarily with the revenue earning considerations of the project, to the exclusion of other important aspects that are included in the economic analysis of the project. In this latter type of analysis, the concern is directed towards determining whether the project is likely to contribute significantly to the development of the economy as a whole, and thus we are not concerned only with financial feasibility. We have mentioned before that there are various secondary and intangible benefits from the project such as improved training, improved quality of cattle population, etc. But the identification and valuation of these benefits in such a way that can be used in economic analysis is rather difficult in Somalia, where basic and more essential date are lacking.

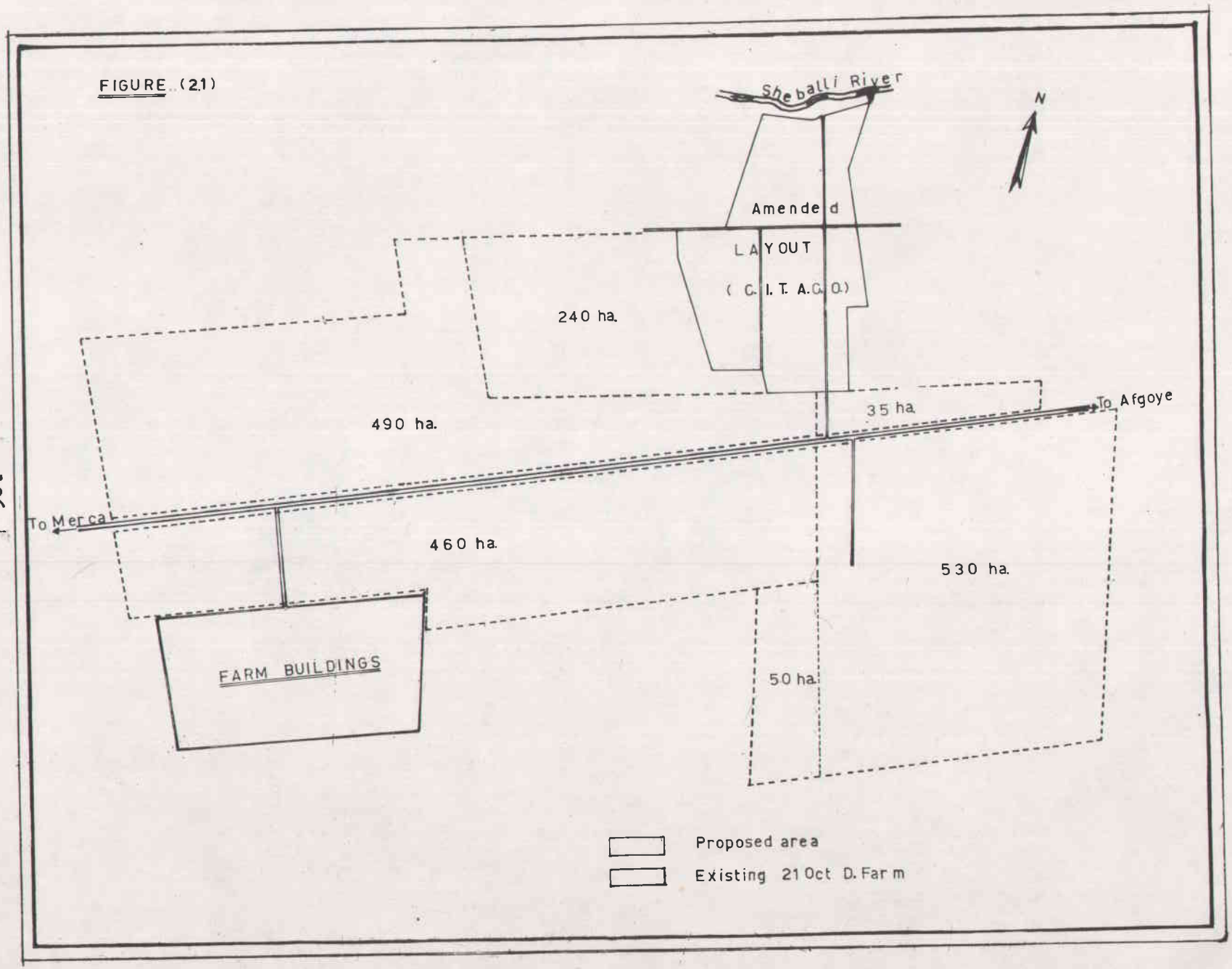
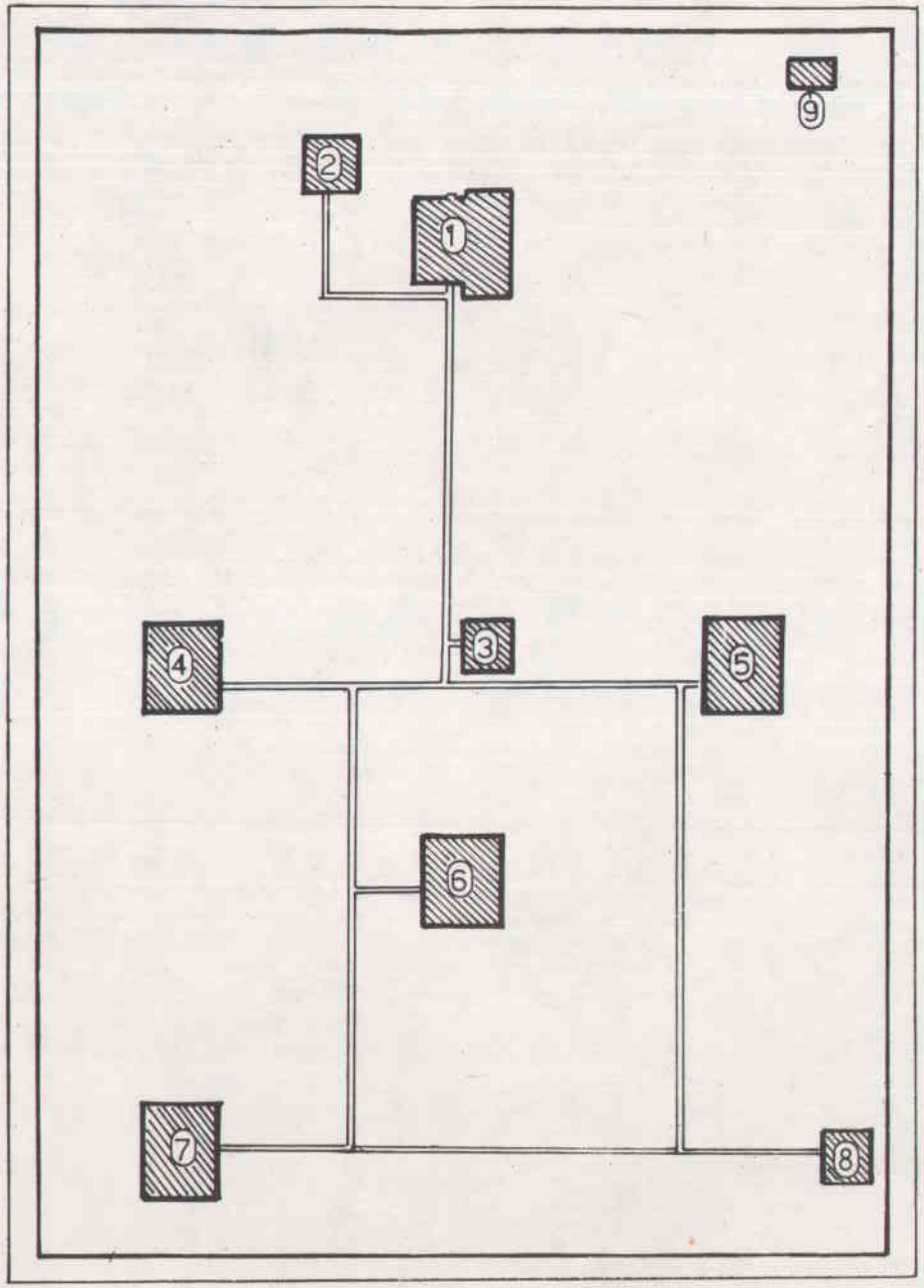


Fig. (2.1) : Proposed Project Area



PROVISIONAL LAYOUT

PROJECT PREMISES

① Central building

② StaffLiving Colony

③ Workers camp

④ Dairy Farm (1)

⑤ " " (2)

⑥ " " (3)

⑦ " " (4)

⑧ Artificial Insem.

⑨ Manure & Furnace pit

FIGURE (3.1)

Fig. (3.1) : Provisional Layout Project Area .

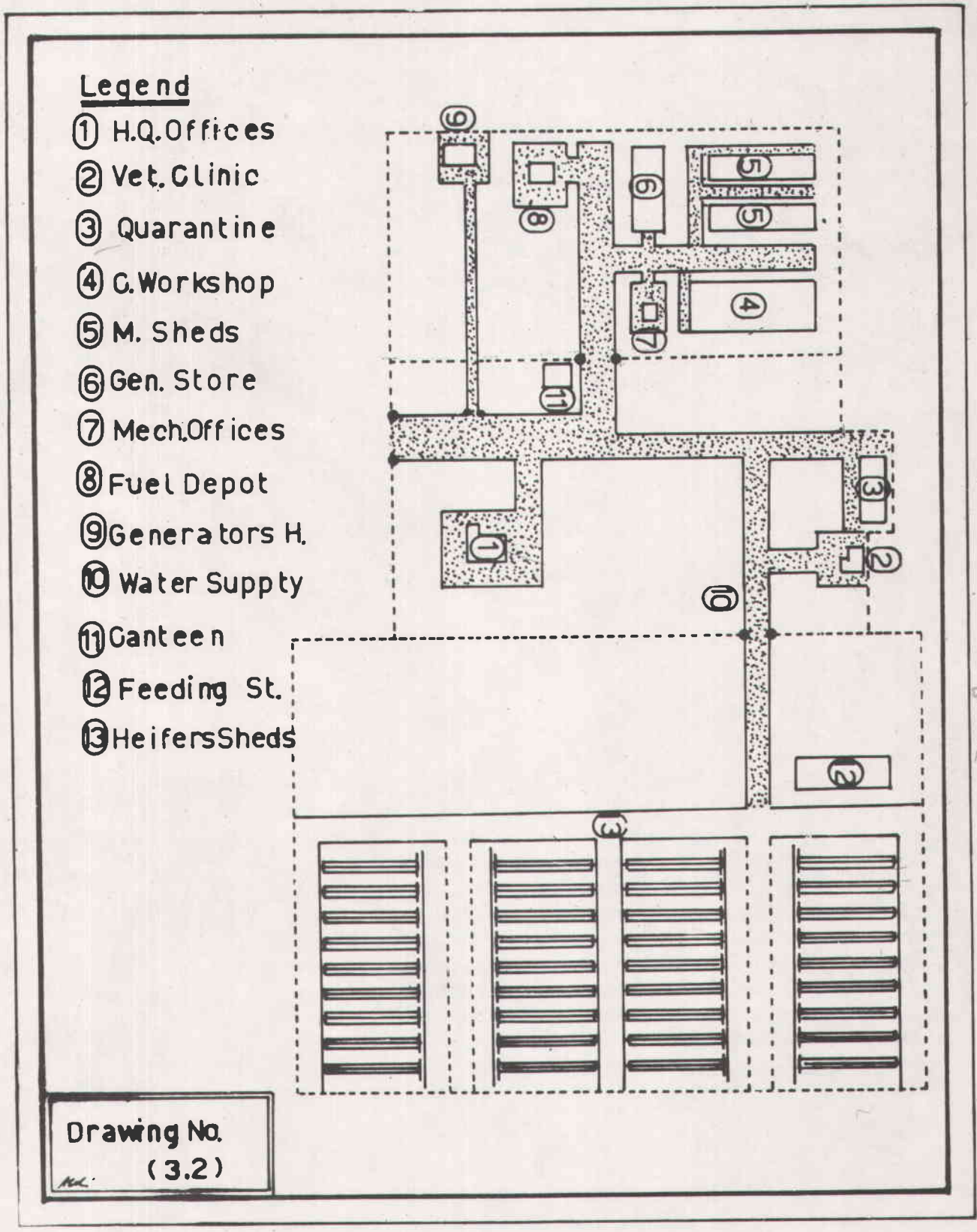
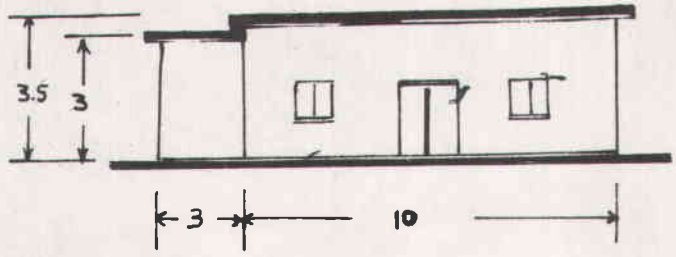
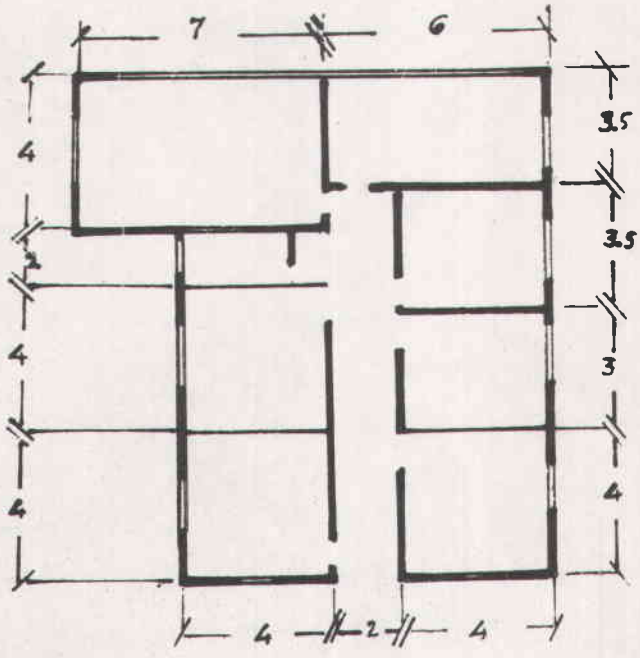


Fig. (3.2) : Outlines of the Project Comonents





OFFICES

Drawing No. (3.3)

Abdin

Fig. (3.3) : Project Offices

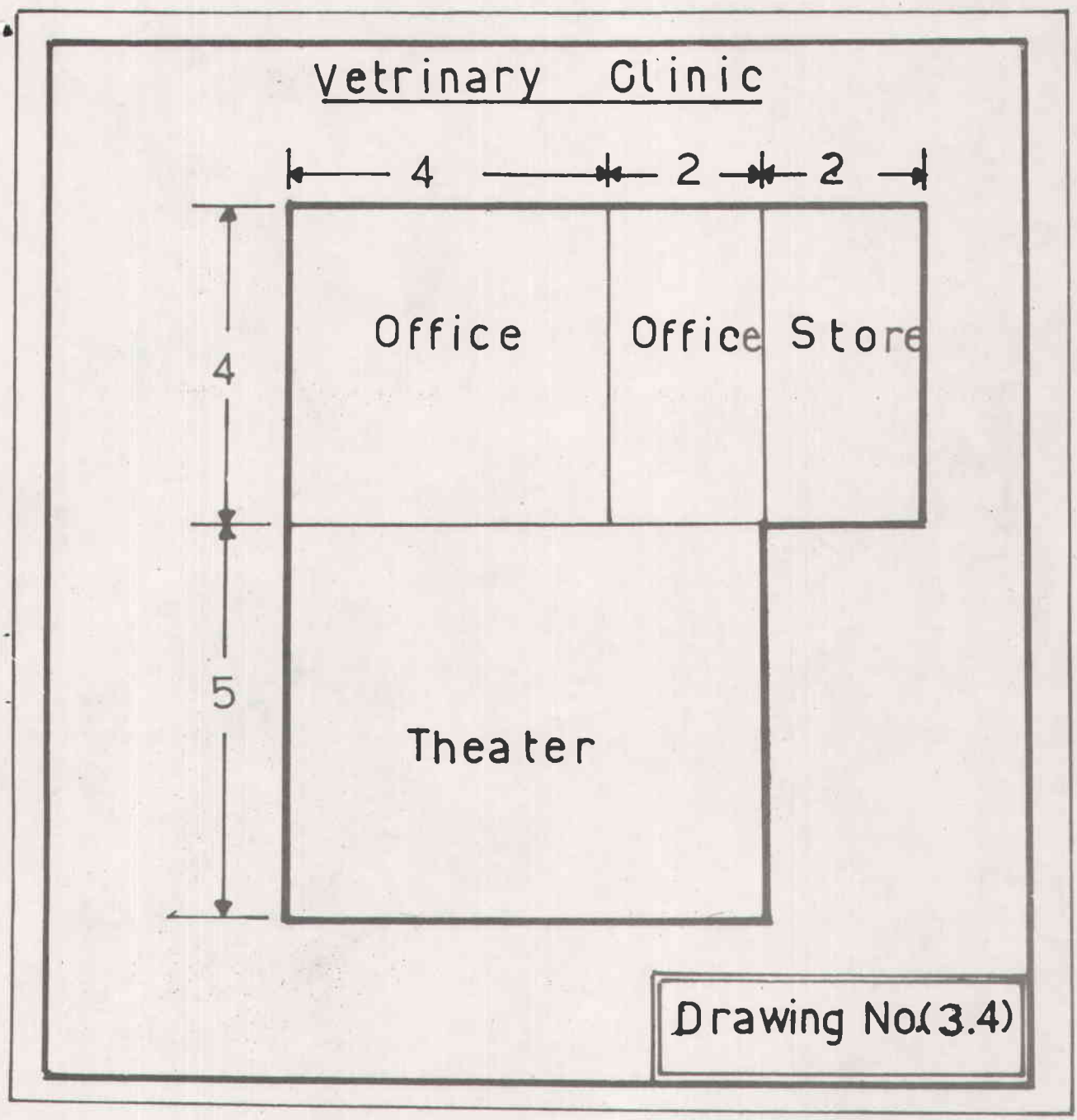


Fig. (3.4) : Veterinary Clinic

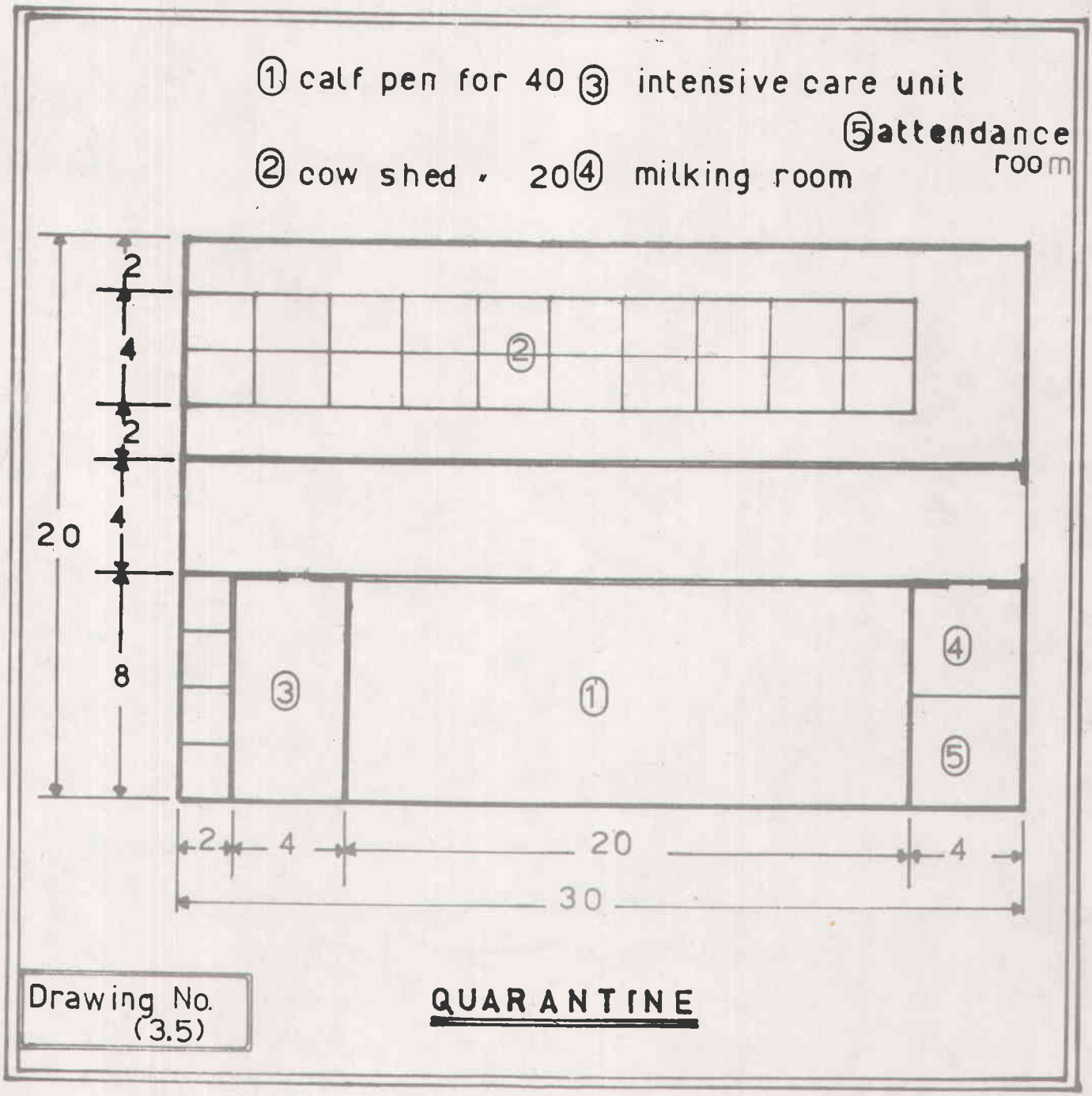
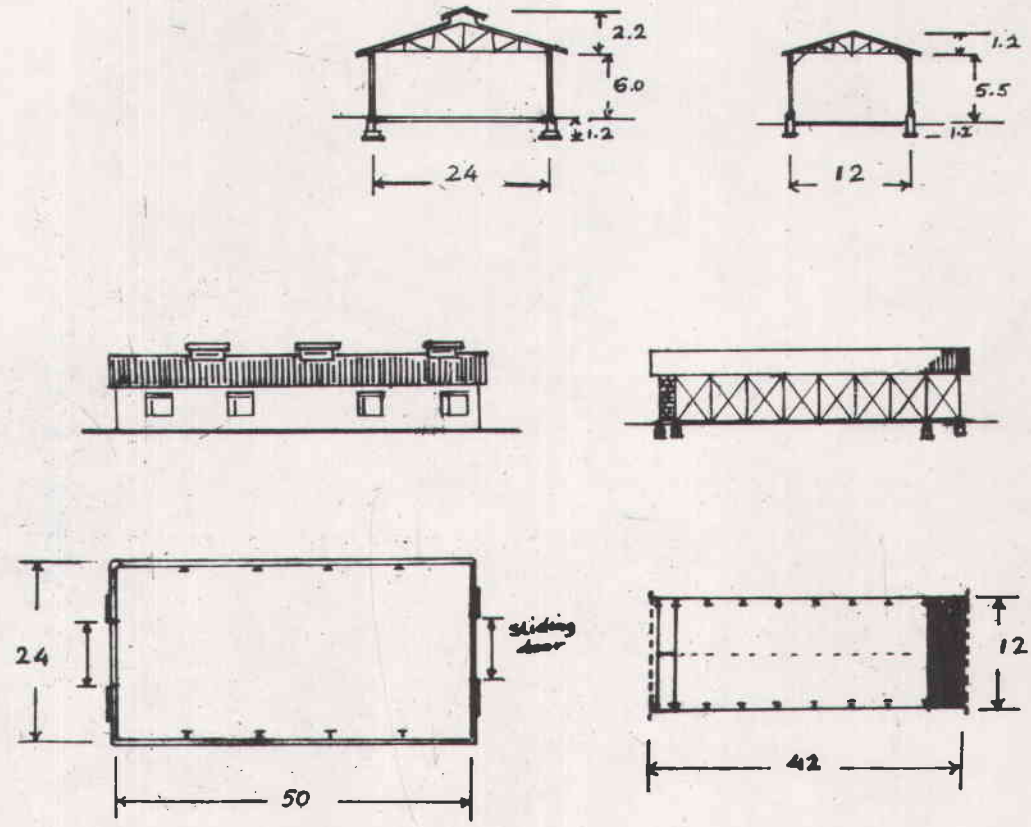


Fig. (3.5) : Quarantine



WORKSHOP & MACHINERY SHEDS

Drawing No.(3.6)

Fig. (3.6) : Workshop And Machinery Sheds

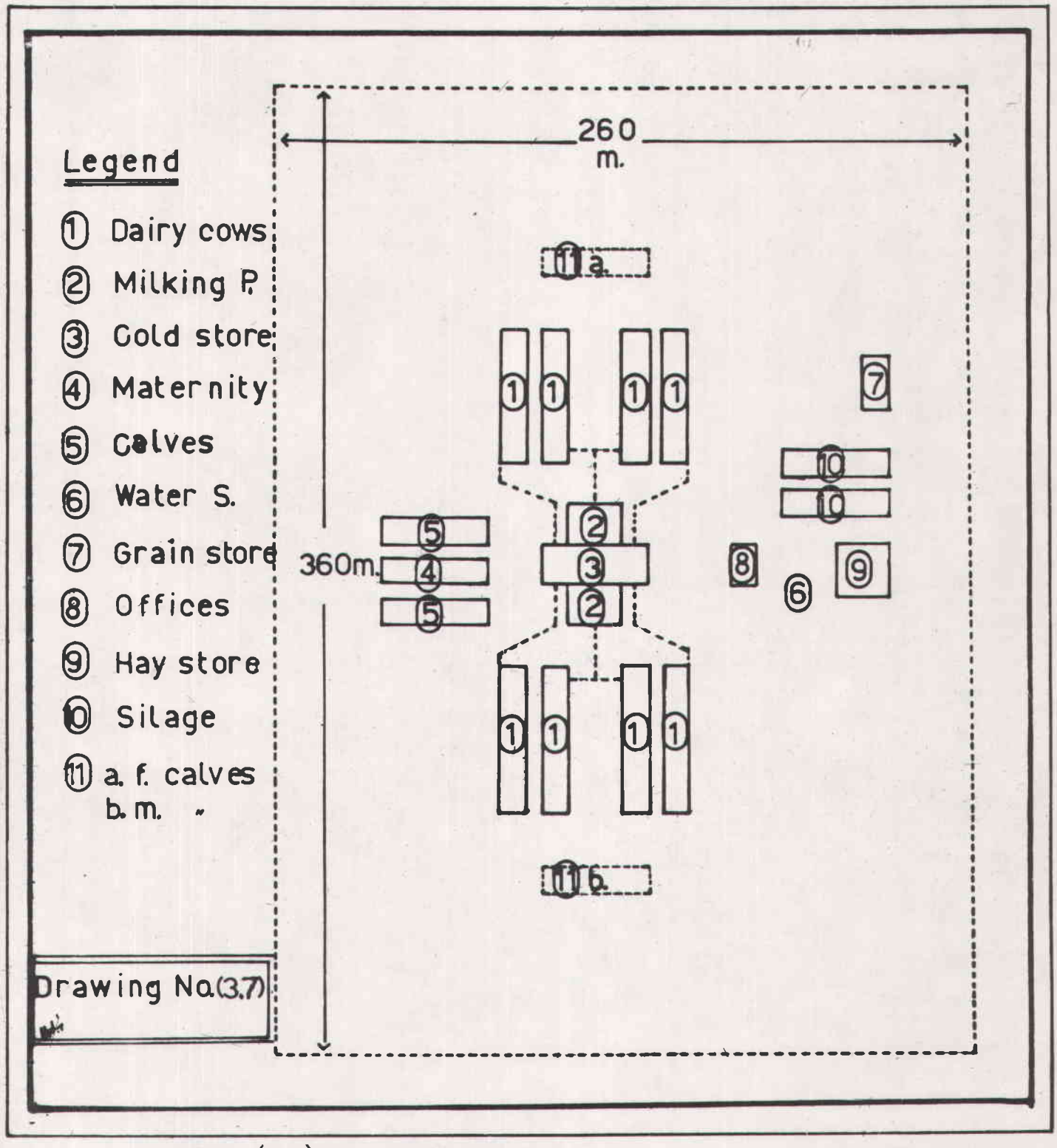
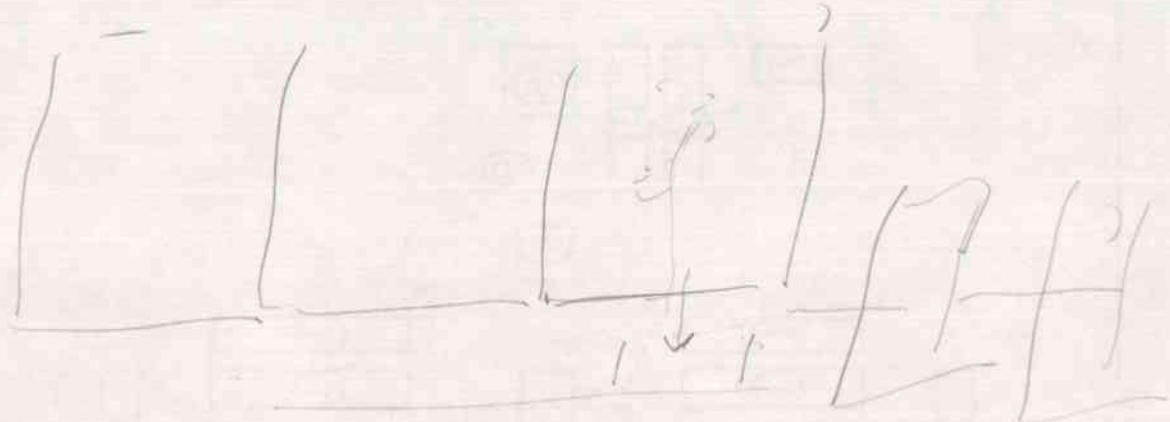


Fig. (3.7) : Dairy Farm Unit



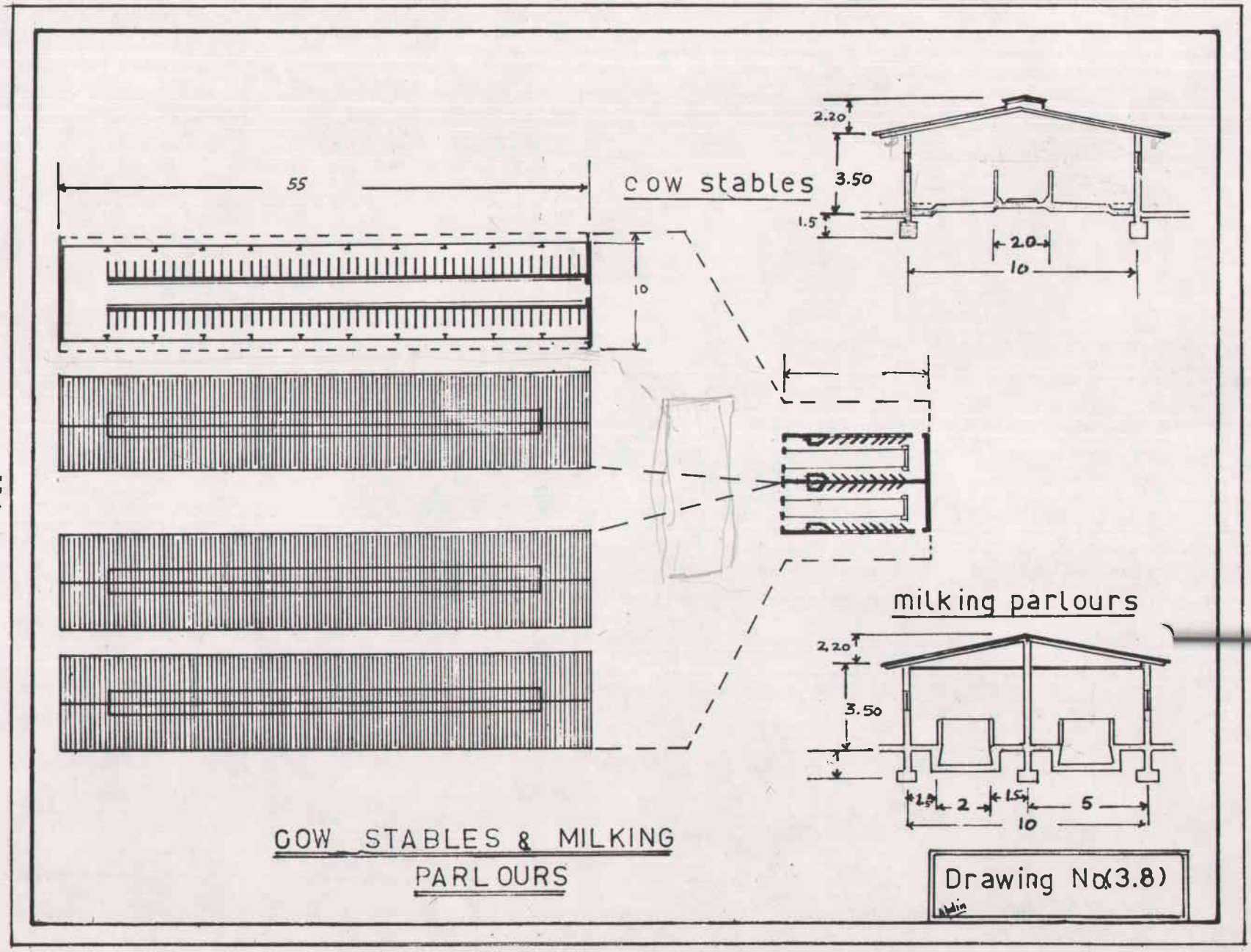


Fig. (3.8) : Cow Stables and Milking

Figure (3.9)

VALUE-IMPORT AGR. IMPLEMENTS

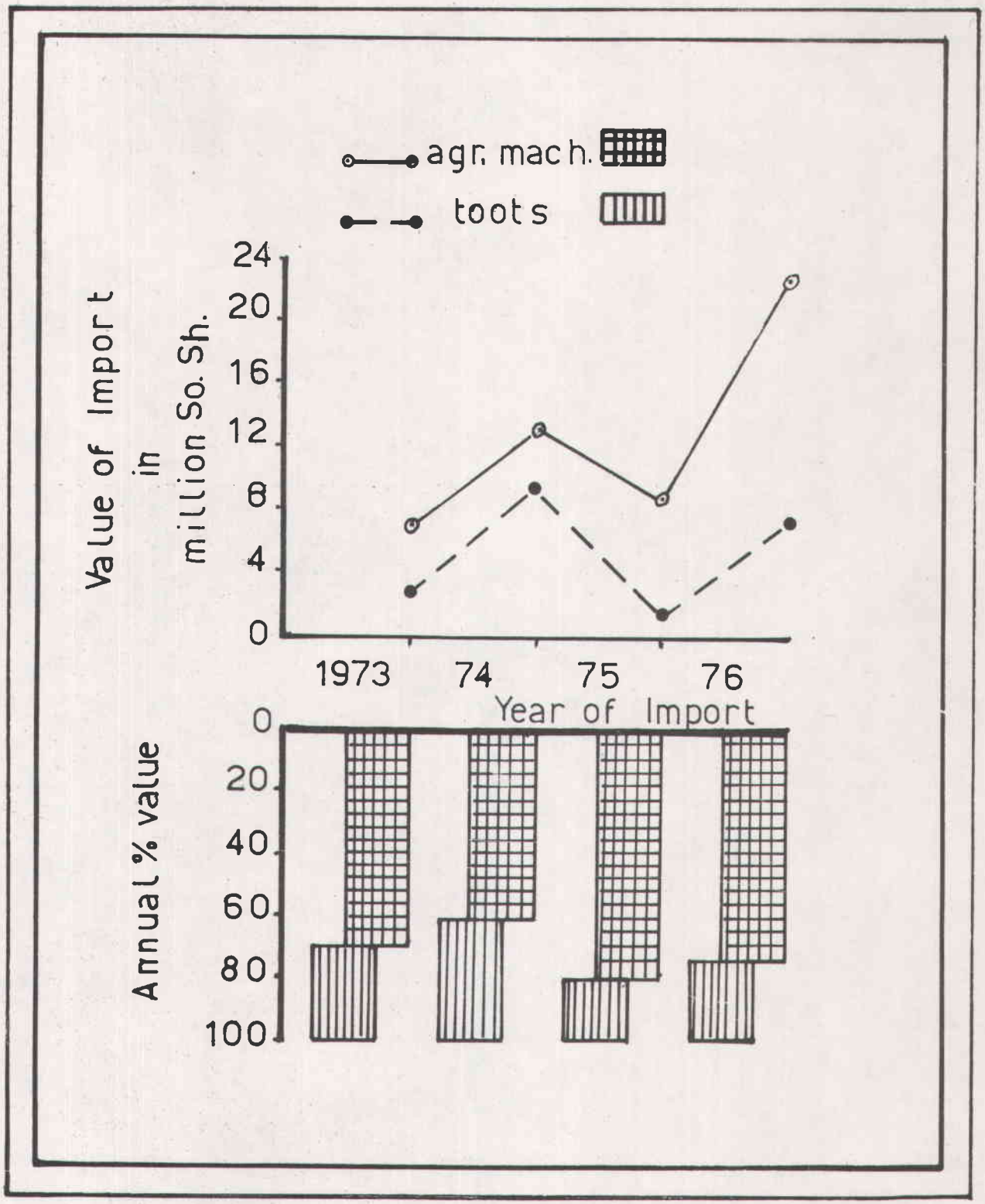


Fig. (3.9) : Value of Imports of Agricultural Implements

Figure (3.10).

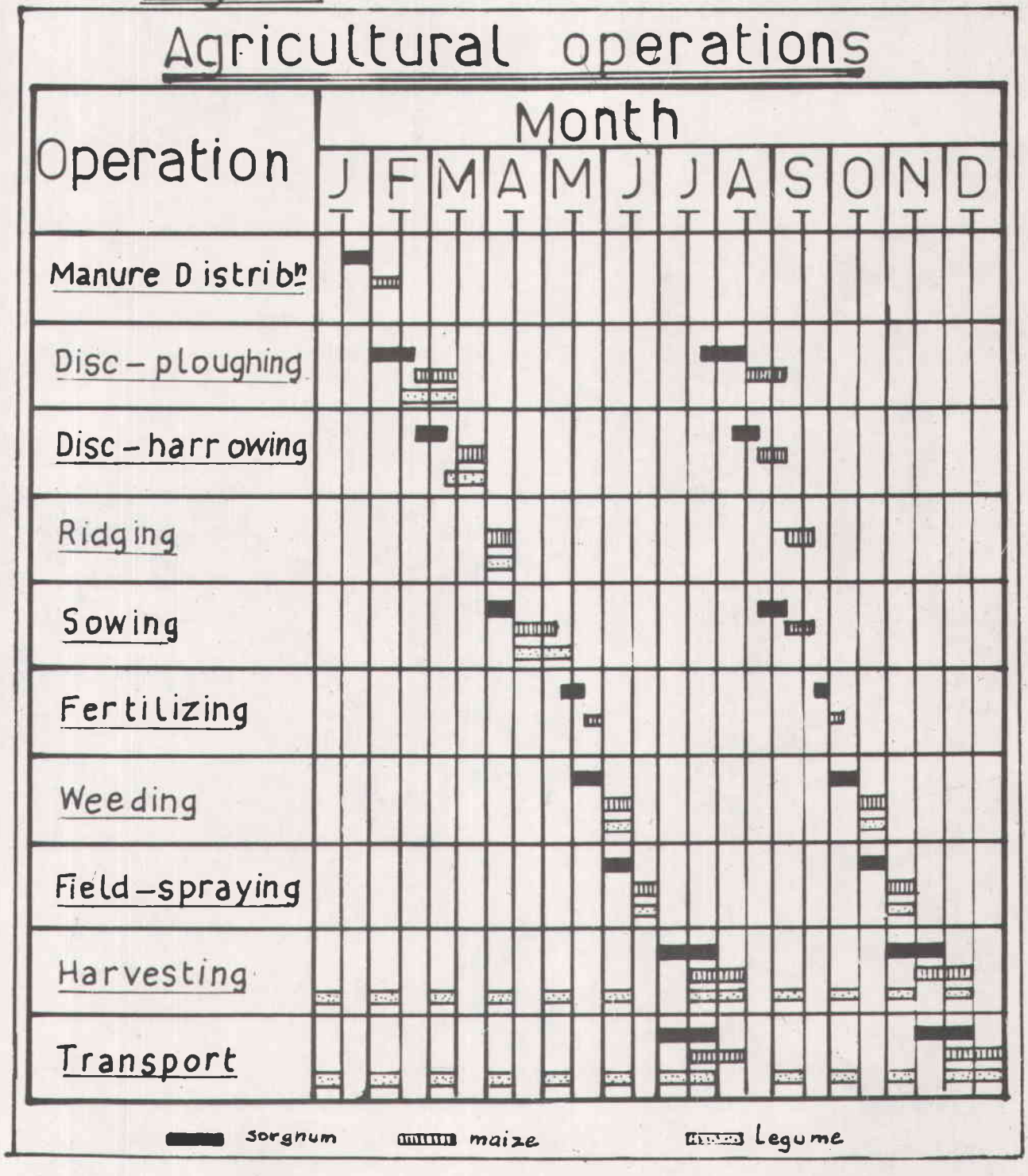


Fig. (3.10) : Agricultural Operations

Figure (3.11). ➡ Sorghum ➡ maize ⟹ Legume

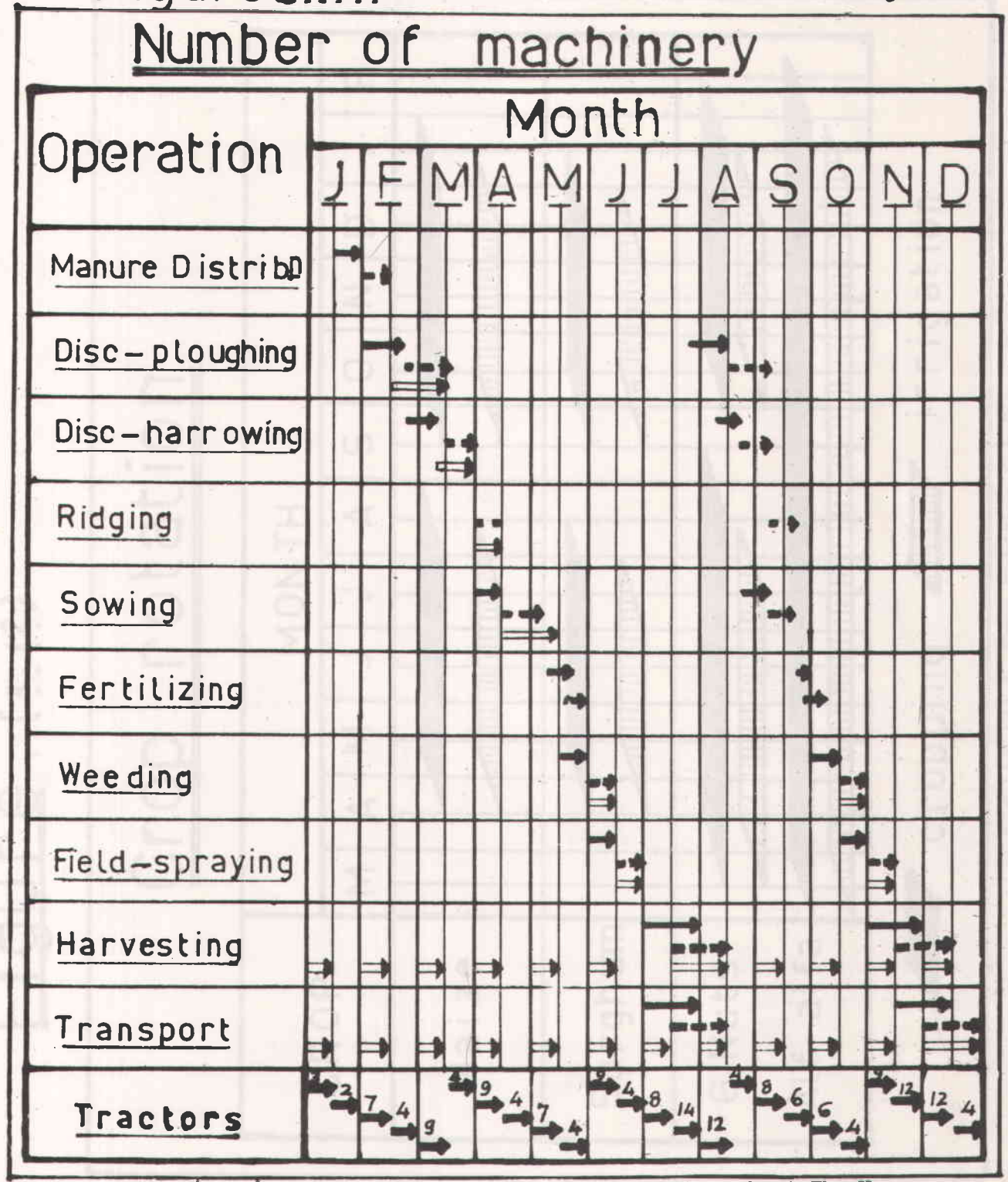


Fig. (3.11) : Number of Machinery Required Throughout The Year

Crop Rotation
MONTH
J F M A M J J A S O N D
Crop
Maize
Soybean
Groundnut
Jute

Figure (3.5)

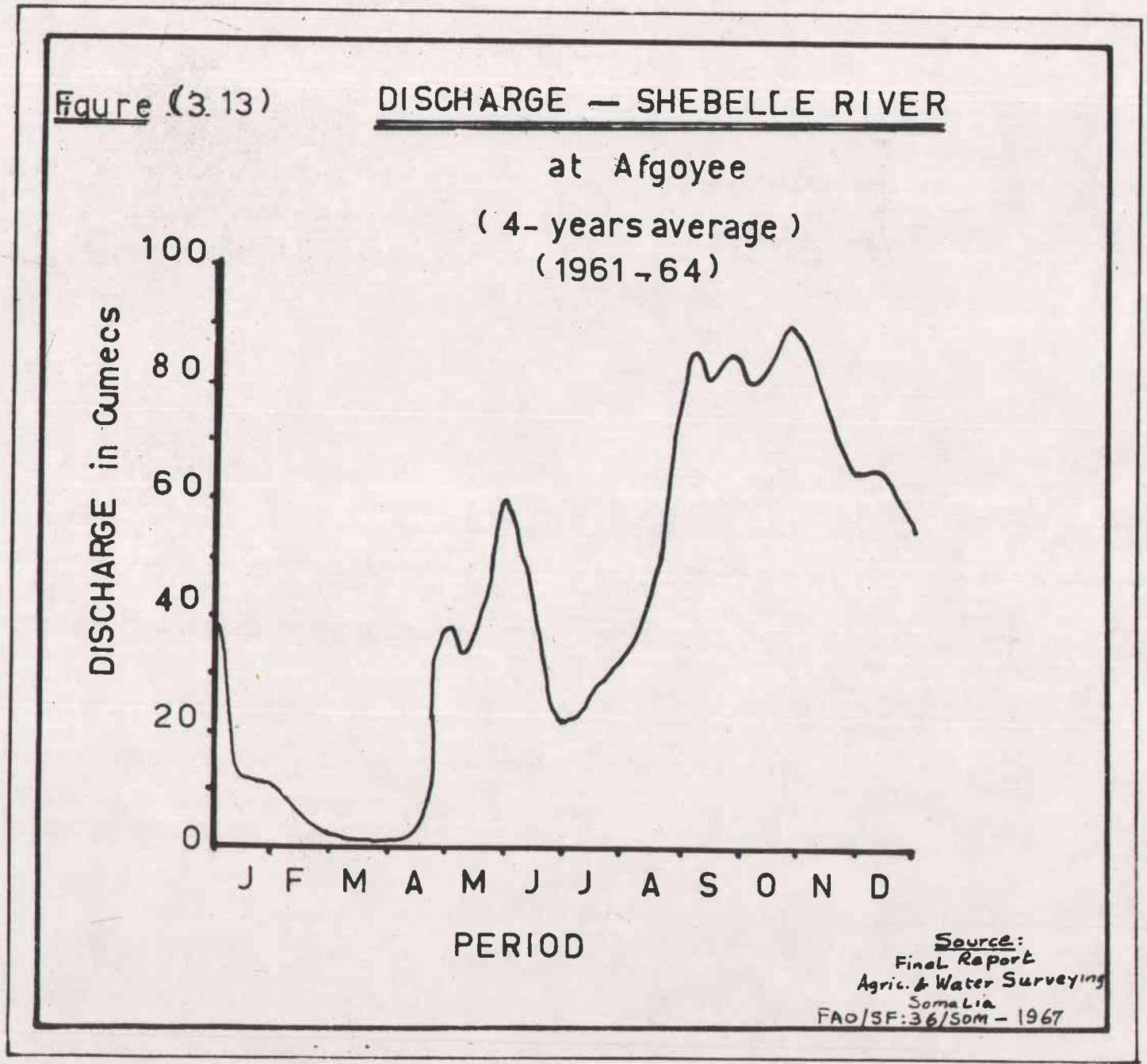


Fig. (3.13): Discharge of Shebelle River at Afgoi Area

Figure (3.14)

Irrigation Areas
(1964-65)

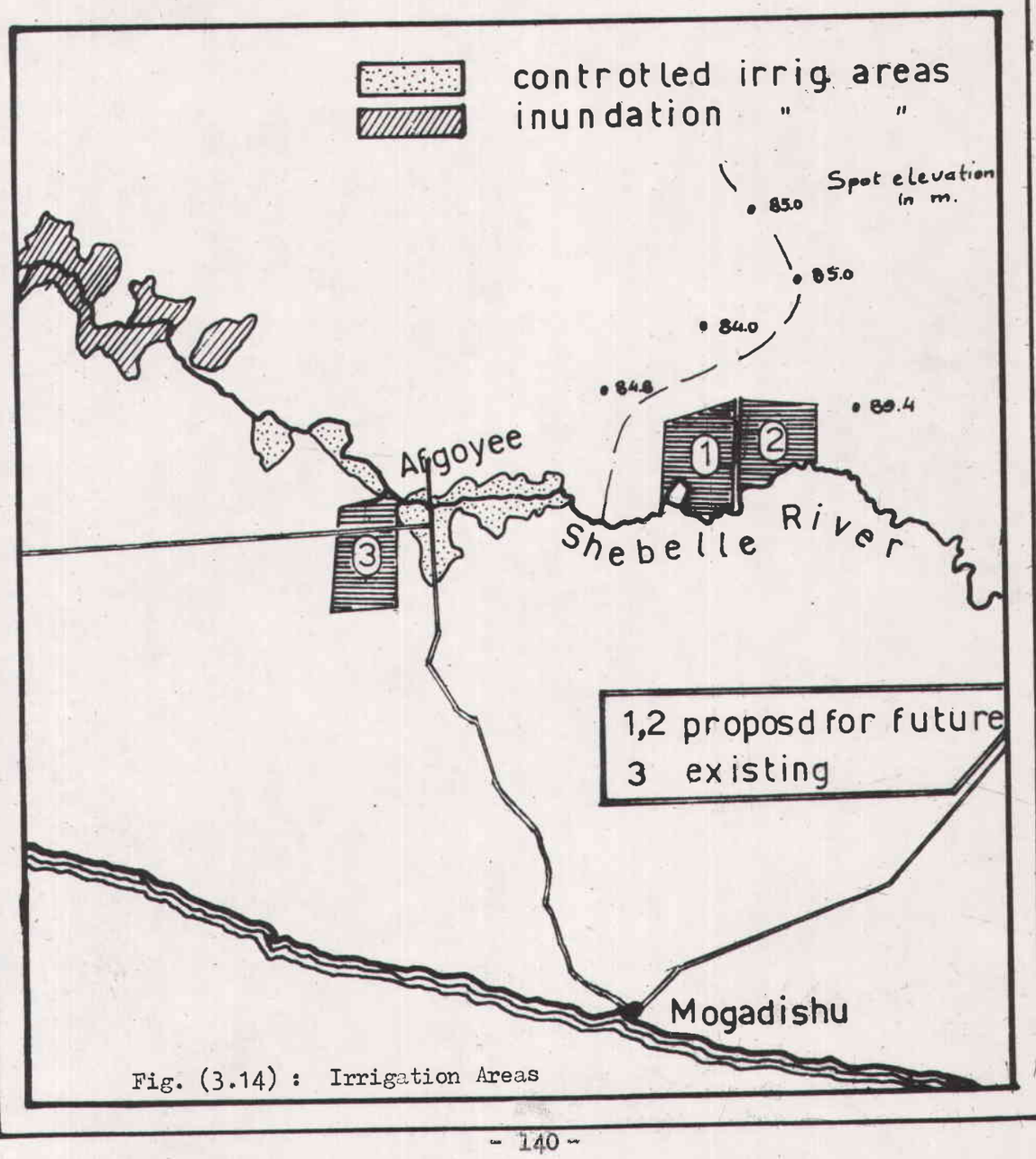
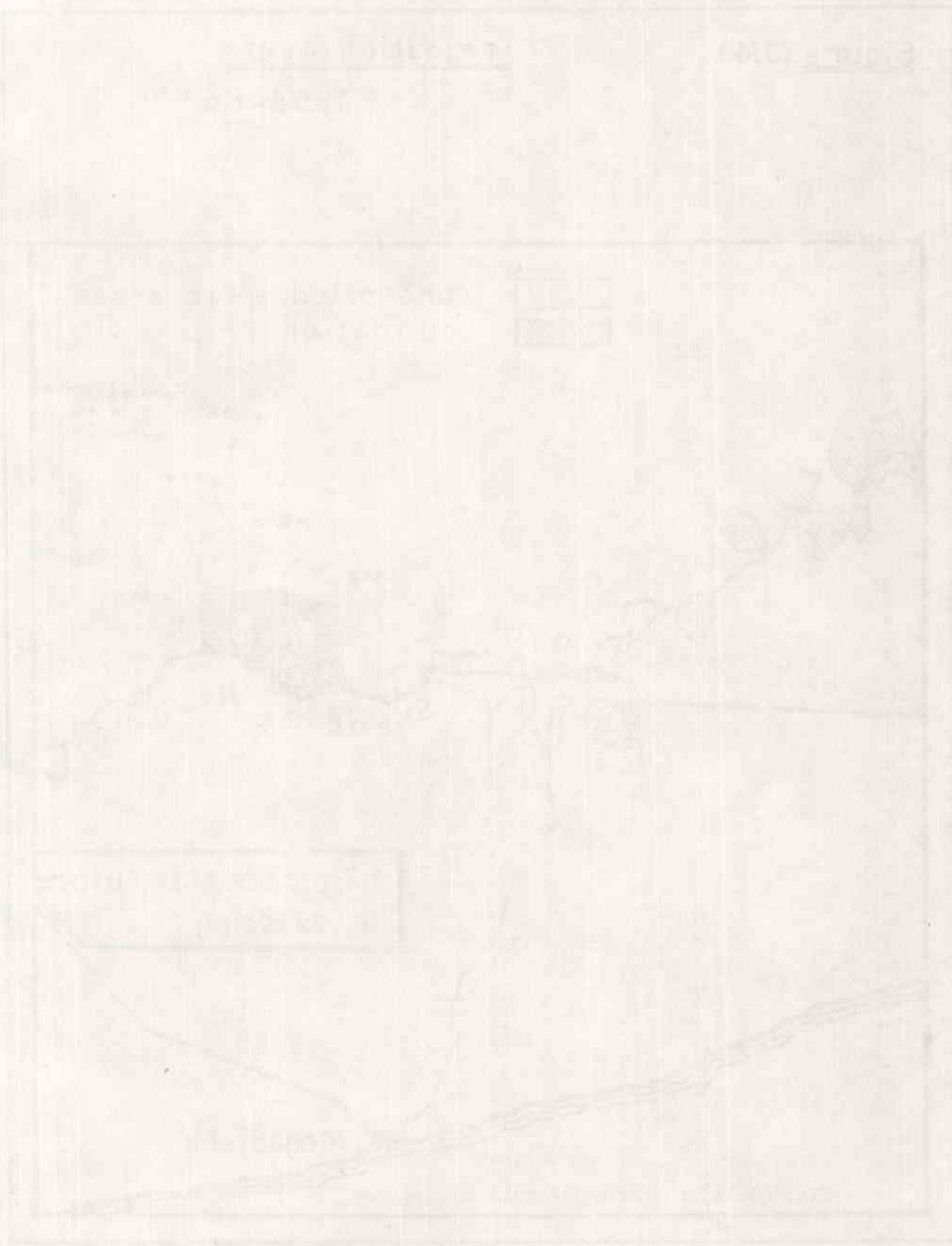


Fig. (3.14) : Irrigation Areas



ANNEX 11.

ARTIFICIAL INSEMINATION (AI) SERVICES

Development in the frozen semen (FS) techniques made it possible to choose from a wide variety of bulls, longterm storage and transportation are easy and economic because a large number of doses can be kept in a minimum space. This technique will be used in inseminating the breeding stock in the project. Imported FS from a large number of different bulls would lead to maximum improvement in the stock and avoid inbreeding depression in production traits.

Where progeny testing is required, AI service has an added advantage over the traditional breeding programme. It would make possible the use of small herds and cattle households for testing among bulls under variable environmental conditions. These bulls can be used in improving local breeds by crossing or upgrading. The project can significantly contribute to the overall improvement of the dairy stock in the government-owned dairy farms and small herds, at an average distance of approximately 50km surrounding the AI-centre, by extending its AI-service to them. The basic equipments needed for an AI network using RS-techniques are:

- Laboratory equipments for semen processing.
- Liquid Nitrogen storage, transfer and handling equipments.
- Containers for freezing and storage of semen.
- Containers to transport semen to sub-centres and inseminator's bases.
- Field Equipments.

- Young bulls for testing will be selected from the project's young stock on their dam's yield and their own growth rate.
- A proportion of the cow population will be used for testing a large number of young bulls (3), when they are 18 month at the rate of 100/bull (4) .
- Services from sampled bulls is restricted untill results of the progeny test are known.
- Bulls are avaluated on the basis of their daughter's milk yield and the 10 superior bulls are kept at the main AI-centre and are brought back to service on the whole population.
- AI-bulls are replaced at an annual rate of 20%.

Bulls so tested can also be used as stand by bulls for the project's breeding stock to ensure against shortage in imported frozen semen.

The assessment of such a policy under actual environmental conditions should be made by continuous and accurate recording supervised by a central recoding authority. When sufficient information are available, breeding programme based on good performance records is curried out to develop the type of dairy animal adapted for Somali conditions. Adoption of such approach would require complete cooperation with all institutions concerned with dairy cattle production.

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(3) Number of tested young bulls can be calculated for the optimum rate of improvement if the proportion of cows population used in testing is identified.

(4) Low fertility among cows and high mortality among calves are considered.

ANNEX IV

CALCULATIONS OF THE PROJECT OUTPUTS (1)

PRODUCTS	PROJECT YEARS 1	2	3	4	5	6	7	8-20
Milk Production								
Breeding cows (heads)	784	1514	2164	20901	2970	3162	3200	3200
Milking cows (heads)	627	1211	1731	2321	2376	2530	2560	2560
Milk Yield Net Of Calf (tons)	2352	3633	5193	6963	7128	7590	7680	7680
Live Animals								
Culled Cows (heads)	-	39	104	212	284	291	465	480
Culled 2-yrs heifers (heads)	-	-	-	-	-	74	42	48
	-							
Live weight of culled cows (tons)	-	20	52	106	142	140	238	240
Live weight of culled heifers (tons)	-	-	-	-	-	6	10	23
Total Live Weight (tons)	-	20	52	106	142	146	248	263
Breeding 2-yr. heifers (heads)	-	-	-	-	-	129	378	524
6-month males (heads)	-	276	534	763	1044	1048	1116	1128
Total Breeding Animals (heads)	-	276	534	763	1044	1177	1494	1652
Manure Production								
Total Au	925	1922	2934	2545	5651	5060	5141	5141
Total Manure Production ($1000m^3$)	14	28	44	64	70	76	77	77

(1) Based on table 3.1, table 4.1 and assumptions given in section 4.3.

ANNEX 1V CALCULATIONS OF THE PROJECT OUTPUTS (1)

PRODUCTS	PROJECT YEARS 1	2	3	4	5	6	7	8-20
Milk Production								
Breeding cows (heads)	784	1514	2164	20901	2970	3162	3200	3200
Milking cows (heads)	627	1211	1731	2321	2376	2530	2560	2560
Milk Yield Net Of Calf(tons)	2352	3633	5193	6963	7128	7590	7680	7680
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	-							
Live weight of culled cows (tons)	-	20	52	106	142	140	238	240
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Total Live Weight (tons)	-	20	52	106	142	146	248	263
Breeding 2-yr.heifers(heads)	-	-	-	-	-	129	378	524
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Manure Production								
Total Au	925	1922	2934	2545	5651	5060	5141	5141
Total Manure Production ($1000m^3$)	14	28	44	64	70	76	77	77

(1) Based on table 3.1, table 4.1 and assumptions given in section 4.3.

ANNEX V ARABIC ABSTRACT

دراسة الجدوى الفنية والاقتصادية
لاقامة مزرعة حديثة لانتاج اللبن فى منطقة مقديشو
بجمهورية الصومال الديمقراطية

قامت المنظمة العربية للتنمية الزراعية بدراسة قطاع الانتاج الحيوانى فى جمهورية الصومال الديمقراطية(١). وقد أكدت هذه الدراسة على ضرورة انشاء مشروع كبير لانتاج اللبن فى منطقة " مقديشو "، عاصمة الصومال. فمصدر الالبان الرئيسى فى هذه المنطقة هو فائض الانتاج المتبقى لدى صغار مربى الماشية بعد كفاية احتياجات أسرهم. كما أن صنع اللبن فى مدينة " مقديشو " الذى انشى عام ١٩٦٥ بسعة انتاجية كاملة قدرها ٢٠ طنا فى اليوم - يغذى المدينة بكميات محدودة من اللبن المبستر ومنتجات الألبان. ولم تصل طاقة العمل بالصنع الى اكثر من طاقته القصوى منذ انشائه وحتى الآن بسبب نقص كميات اللبن المتاحة له، رغم انه الصنع الوحيد فى القطر كله الذى يملك معدات متكاملة الى حد كبير لتعبئة اللبن الطازج وتصنيعه.

وقد بلغ تعداد السكان فى مدينة " مقديشو" ٣٧٠٦٧١ نسمة(٢)، كما قدر معدل الاستهلاك اليومى من اللبن ٠ر٠ الى ٥ر٠ لترا من اللبن فى اليوم الواحد. أى أن استهلاك اللبن اليومى لمدينة مقديشو يبلغ حوالى ١٥٠ طنا. وتوفير هذه الكمية من اللبن أمر بالغ الصعوبة، فانتاج اللبن فى مدينة " مقديشو" وضواحيها غير كاف وغير نظيف ويصعب تجميعه ونقله. كما أن حجم الانتاج متذبذب الى حد كبير. ويمكن تلخيص المشكلة فى أن اللبن - تحت الظروف الحالية لمربى الماشية وأسلوبهم فى رعاية حيواناتهم - لا يعتبر سلعة مستديمة كما أن تربية ماشية اللبن ورعايتها لا تتبع فيها الأصول الفنية أو الاقتصادية فى معظم الأحوال.

---

(١) تنمية قطاع الانتاج الحيوانى فى جمهورية الصومال الديمقراطية. (١٩٧٨) (باللغة الانجليزية)

(٢) تقدير هيئة التخطيط (١٩٧٥)

(السنوات ١ـ٤) ـ وخلال هذه المرحلة يتم استيراد عجلات الفريزيان الحوامل (عمر ١ ـ ٢ سنة ،مع مدة حمل ٣ـ٧ شهور) بمعدل ٨٠٠ عجلة سنويا تشكل الحجم الكامل لقطيع التربية فى مزرعة واحدة . ويراعى أن تستكمل المزرعة فى السنة السابقة لاستيراد حيواناتها . وقد صممت عمليات البناء والاستزراع بحيث تكفى المشروع لسعة تحميل قدرها ٢٥٠٠ وحدة حيوانية فى نهاية السنة ٢٠ ، ولسعة التحميل الكاملة له فى نهاية السنة ٤ ،وهى السنة التى ينتهى عندها الاستيراد . ويفضل تنظيم مواعيد الاستيراد بحيث تصل الحيوانات الى "الصومال " خلال أشهر مايو ،يونيو ،يوليو لتصادف هى ومواليدها ظروفا جوية حسنة خلال المراحل الحرجة من حياتها .

ـ المرحلة الثالثة (ابتداء من السنة ٥) ـ وتتضمن هذه المرحلة عملية بناء القطيع التى تستغرق ثلاث سنوات حتى يصل الى تركيبه الكامل فى السنة ٧ ، ثم يثبت الانتاج والمبيعات والمعاملات الفنية من نهاية السنة ٨ وطوال السنوات التالية .

وقد اقترحت الدراسة برنامجا لتدريب الكوادر الفنية المحلية خارج البلاد خلال السنة صفر ، كما يشمل تدريبا اثناء الخدمة على العمليات المزرعية ،يستمر طوال فترة المشروع. كذلك شمل البرنامج تدريبا على بعض العمليات الخاصة كالتلقيح الصناعى والحليب الآلى وغيرها من العمليات التى تحتاج لمهارات عالية ، وتدريبا توجيهيا للكوادر العليا لرفع قدراتها على التنظيم والاداء . وسيدار المشروع بواسطة الكوادر المحلية المدربة تحت اشراف خبراء أجانب لفترة محدودة فى بدايته . وقد حددت الدراسة التخصصات والخبرات المطلوبة والفترات التى يجب الاستعانة بها خلالها .

وقد قدرت قيم احصائية للمعاملات الفنية اللازمة لقياس ديناميكية القطيع وانتاجيته باستعمال البيانات المتوفرة فى مزرعة ٢١ أكتوبر الحكومية فى منطقة " انجوى " ،وهى المنطقة التى سيقام فيها المشروع المقترح . وقورنت التقديرات

الصناعى بالسلالات المتفوقة والتوزيع المستمر للعجلات والعجول الفريزيان التى سوف تستعمل فى تدريج الماشية المحلية . وقد حدد المشروع فى ملاحقه الفنية الملامح الرئيسية لهذه المشروعات.