SOMALI DEMOCRATIC REPUBLIC
STATE PLANNING COMMISSION

MOGAMBO IRRIGATION PROJECT

Supplementary Feasibility Study

ANNEX 3
Agriculture
ANNEX 4
Livestock

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MOGAMBO IRRIGATION PROJECT

SUPPLEMENTARY FEASIBILITY STUDY

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CHAPTER 1

INTRODUCTION

1.1 Background

This annex discusses and analyses the potential for developing a cattle feedlot unit at the Mogambo irrigation project. The idea of a feedlot within the project was originally put forward in the TAMS/FINTECS Feasibility Study of 1977. In this supplementary study for the Mogambo project, however, changes to the TAMS/FINTECS cropping pattern are proposed, the most important of which relating to livestock has been the removal of fodder crops from the cropping pattern. The reason for this was a decision to maximise the production of food and import-substitution crops which would have the greatest benefit to the overall national economy. The deletion of fodder crops has not meant that the idea of a feedlot has had to be abandoned; but it has meant that alternative sources of feed have had to be considered and the design suitably modified. Field work was undertaken in Somalia during May and June 1979.

1.2 Objectives

The objective of this study was to evaluate the technical and economic feasibility of developing a livestock enterprise within the Mogambo irrigation project. Any livestock enterprise would need to fit into the overall strategy of a state farm, but, of necessity, must also relate to the present and proposed developments of the livestock and agricultural sections in the Lower Juba region. The removal of fodder crops from the cropping pattern at Mogambo has meant that emphasis has now to be placed on crop residues and by-products as the principal source of feed.

1.3 Government Policy and the National Livestock Industry

1.3.1 The Importance of Livestock in the National Economy

Livestock production is the main industry in Somalia and is the principal source of foreign exchange. In 1977 live animal export contributed 66.6% (SoSh 299.5 million) of the total export earnings of the country; meat and meat preparations provided a further 7.1% (SoSh 32.1 million) and hides and skins 5.2% (SoSh 23.6 million). Apart from its importance to export earnings, livestock production provides a livelihood for approximately 80% of the population. Most rural people derive about half their daily calorie intake from milk and meat and rely on the sale of surplus stock to purchase their other food requirements. The livestock sector stimulates investment in transport, roads and water development through both internal and external trade and contributes to a number of other related industries.

1.3.2 The Livestock Industry

The backbone of the livestock industry in Somalia is the nomadic or semi-nomadic pastoralist. In the drier north of the country camels, sheep and goats are the most important livestock types, but to the south it is cattle. Low and erratic rainfall throughout most of the country means that pastoral livestock production

is the only viable form of land use in most areas and both rainfed and irrigated cropping have a limited (but important) potential. Much of the rangeland areas are mismanaged as the erratic nature of the rainfall leads pastoralists to try and increase livestock numbers as an 'insurance' against drought. Overgrazing is frequently widespread and mortality rates are high due to disease and poor nutrition. Attempts are being made by the Government to stabilise the range production and to introduce improved range management techniques to pastoral areas. The acceptance of such methods, however, will inevitably be a slow and difficult process. The proximity of the now wealthy and traditional markets on the Arabian peninsular has meant that Somali livestock producers have had a ready and profitable outlet for surplus animals. Until recently virtually all internal and external marketing has been in the hands of private traders and even now, after the Government has become more directly involved in trading, private traders undertake the majority of transactions. Production and marketing systems operating in the country have been described in some detail in the Livestock Sector Review (Hunting Technical Services, 1976) and further marketing studies have recently been undertaken by FAO and the World Bank (FAO/IBRD, 1979).

The results of the 1975 national livestock census indicated that there were approximately 3.7 million cattle, 5.3 million camels, 9.4 million sheep and 15.5 million goats in the country. The favourable conditions which have occurred since the census suggest that numbers might have increased since then to an estimated 5.1 million cattle, 7.2 million camels, 12.8 million sheep and 20.8 million goats.

1.3.3 Government Policy

Current Government policy concerning the livestock sector has been outlined in the Three Year Development Plan for the period 1979 to 1981. The eight major points of this policy are :

(a) To raise the level of offtake and further increase exports.

(b) To reduce economic wastage from the effects of disease and drought.

(c) To study and develop more intensive systems of dairy and beef production suitable for high potential areas.

(d) To increase the supply of animals of improved breeds suitable for more intensive systems.

(e) To expand poultry production.

(f) To improve the output and quality of training of field staff.

(g) To stimulate the private sector to develop modern methods by the development of livestock extension services.

(h) To establish well managed production units in the public sector which will provide a solid base of methods and performance on which future public and private development may be planned.

The Government recognises that there is an urgent need to reduce present fluctuations in production and marketing. This will be difficult in view of a heavy dependence of the livestock industry on the distribution and amount of rainfall. The south of the country, particularly those areas bordering the Juba and Shabelle rivers, is acknowledged to have a great potential for livestock development. The future contribution of these areas is planned to be mainly in the evolution of intensive production methods and improved processing facilities for both internal and external markets.

Apart from the constraints which can be attributed to the harsh climatic environment, the Government considers that a shortage of national staff and the present lack of modern production systems which are adapted to local conditions are amongst the main problems faced by the livestock industry. To this list the consultants feel should be added a lack of reliable planning data, particularly accurate information on animal numbers, distribution, herd structure, offtake, marketing and market prices. There are a number of projects under way, or at the planning stage, which will provide valuable background information for the livestock component of the Mogambo project. These projects are discussed in more detail in Chapter 2.

1.4 Types of Livestock Enterprises Considered for Mogambo

The Mogambo irrigation project is principally a crop-production exercise and therefore any proposals on a livestock production unit must be integrated with the primary function of the project. The crops that will be grown at Mogambo will provide residues and by-products that could form the basis of a ration for the intensive feeding of livestock. The proximity of large quantities of molasses, which will be available from 1980 onwards as a by-product of the Juba Sugar project, reinforces the potential of an intensive feeding system.

The most important type of livestock in the Lower Juba area is cattle; these are also the ruminants which, so far, have been shown to be the most successful under intensive feeding systems in other parts of the world. It therefore seemed logical to consider a beef feedlot as the most suitable production system for Mogambo. Sheep and goats were ruled out as, firstly, their feedlot performance is far from certain and, secondly, there is a preference in the export markets for small stock from the north of the country. The potential for poultry production was discarded as the residues available were not suitable for poultry feeds and, also, it appears that there will be considerable future development of the poultry industry around Mogadishu. Dairying was considered to be unsuitable due to the lack of a large scale local demand for fresh milk, the technical problems that would be encountered with establishing and maintaining processing plants, the suitability of potential rations, the availability of stock and the problems of running a dairy enterprise on such a large scale.

CHAPTER 2

LOCAL EXPERIENCE IN FEEDLOTS AND OTHER LIVESTOCK ACTIVITIES

2.1 Introduction

Before discussing the technical aspects of the feedlot unit at Mogambo it is useful to review the extent of local experience in operations of this kind and to consider other projects and services which would relate to the development of a feedlot unit at Mogambo.

2.2 Feedlots

2.2.1 SOMET

Between 1975 and 1977 the Somali Meat Company (SOMET), a private company, operated a small feedlot 50 km from Mogadishu. The company fattened between 200 and 300 cattle for 3 or 4 months on a ration based on sesame stalks, sesame cake, rice straw, molasses and blood meal. Animals were bought locally and fattened stock were slaughtered at the Mogadishu abattoir. Chilled carcasses were exported by air, initially to Djibouti and subsequently to Abu Dhabi. Local sales of internal offal offset the slaughter costs; stock were purchased for between SoSh 300 to 500 each and finished chilled carcasses were valued at approximately SoSh 2 000 each. The company eventually closed down due to problems with air transport and keeping the carcasses properly chilled during administrative delays.

2.2.2 MLFR Feedlot, Modadishu

In 1972 an FAO-Somali Government project was established at 'Kilometre 7' on the outskirts of Mogadishu. This experimental feedlot was designed to evaluate the potential for fattening local cattle using rations based on crop residues and by-products. The experimental phase has now finished and the project fattens cattle for sale to the Government hotels in Mogadishu. The feedlot, which is run by the Ministry of Livestock, Forestry and Range (MLFR), has used a number of different rations, which are all mixed at its own feed-mill. The present ration is reported to be based on rice or wheat bran (72% fresh weight), sesame cake (16% fresh weight) and salt and fish-meal (12% fresh weight). Animals are either bought from local nomads and mixed farmers, or obtained from the MLFR's 21st October dairy farm and Warmahan ranch. A considerable range in daily weight gains have been recorded at the feedlot, varying from over 1 100 g for some cross bred Friesian cattle, to below 400 g for the three main local breeds of cattle, Surka, Dowara and Boran, the latter appearing to have the best performance under local feedlot conditions. It has been found that bush-bred cattle, after fattening, produce a cold dressed weight of 45 to 47% of liveweight.

2.2.3 Balad Beef Feedlot

Another scheme which is run by MLFR is the Balad beef feedlot on the Shabelle river. The construction of the feedlot and associated buildings has been completed and the land is being prepared for irrigation. The ration to be fed

will be based on maize silage, lucerne, Sudan grass and crop by-products. At full development the feedlot will finish 15 000 cattle each year, holding them for 90 days each.

2.2.4 Jowhar Fattening Scheme

The State Planning Commission (SPC) has proposed a dry land and irrigated fattening scheme at Jowhar, again on the Shabelle river. At full production the feedlot would fatten 30 000 cattle and 30 000 sheep each year on a ration based on maize and legume silage (67%), maize grain (20%) and molasses (7%). Estimated weight gains for cattle are 800 g/d during a 67 day fattening period. It is expected that cattle would enter the feedlot at an average of 250 kg liveweight and be sold for slaughter or live export at 303 kg.

2.2.5 Trans-Juba Livestock Project

The World Bank financed project has changed considerably since its original appraisal. Although the three basic components remain as :

(a) Improved markets and stock routes

(b) Grazing ranches and

(c) Irrigated fodder farm and feedlot (IFFF),

the scale of each has been reduced.

This has been due to a number of reasons including financial and managerial problems, rapidly increasing costs and, in the case of the irrigated fodder farm and feedlot, serious doubts about the suitability of some of the soils to be irrigated.

The project is being implemented by the Livestock Development Agency (LDA) of the Ministry of Livestock, Forestry and Range. The irrigated fodder farm and feedlot is located due north of the Mogambo project area and the two projects share a common boundary. Clearing and levelling of the initial 190 ha is well under way and a number of fields have already been planted to fodder maize. Construction of the feedlot pens is also proceeding. When completed the feedlot will hold 3 200 cattle at any time fattening each animal for 90 to 120 days on a ration based on maize silage and lucerne hay. The silage will be stored in bunker silos holding approximately 1 200 tonnes each. This basic ration will be supplemented with urea, molasses and mineral and vitamin supplements; silage will constitute approximately 80% of the ration.

It is proposed to buy in cattle in the 200 to 250 kg weight range and it is hoped that they will gain an average of 750 g/d. Daily intake would need to be 25 kg (fresh weight).

Animals will be kept in groups of 80 to 100 in pens measuring 37 m x 20 m; 4 m of shade would be provided over the apron of the feed bunk along the short side of each pen.

Details of the proposed systems of purchasing and selling cattle have not yet been finalised, though it is likely that the stock will come from LDA purchases and from the projects' ranch at Afmadu. It was originally intended that a large proportion of animals from the project would be slaughtered at Kismayo Meat

Factory and exported as chilled or frozen carcasses. It is, however, unlikely that this will be possible immediately as Kismayo Meat Factory (KMF) has not yet been able to exploit markets for chilled and frozen carcasses. Fattened cattle from the Trans-Juba feedlot will therefore initially either have to be slaughtered at the KMF for canning (which is very unlikely to be economic) or sold for live export, either by LDA itself or private export traders.

At the moment it is uncertain what prices the project will have to pay to obtain suitable cattle for fattening. Although project personnel are satisfied that they will be able to obtain the required 10 000 animals a year, they are acutely aware of the seasonal fluctuations in price and the nomads' reluctance to sell during a good rainy season. This problem could be overcome by careful planning and skillful use of holding grounds and the proposed grazing ranch at Afmadu. Calculations done at the time of the projects review in 1977 indicated that if they were to buy in animals at the then fixed rate of SoSh 2/50 per kg liveweight they would need to sell fattened animals at SoSh 4/00 per kg liveweight in order to break even. Current market trends indicate that it is very unlikely they would be able to purchase the type of beasts they require at SoSh 2/50 per kg and therefore the sale price is going to have to be higher than SoSh 4/00 per kg.

In 1977 it was decided to reduce the number of proposed grazing ranches from three to only one, at Afmadu. The development of the Afmadu ranch has now been delayed due to the reluctance of local nomads to give up the area. A new area of 200 km^2 is now being surveyed slightly to the north of the original one, and it is hoped that this can be developed in the near future.

The development of stock routes requires that 26 new boreholes are sunk to provide water for treking animals. Of the 11 that have so far been drilled only 6 have been successful.

The implementation of the Trans-Juba livestock project, and especially that of the IFFF, will be of great significance to the subsequent development of any feedlot at Mogambo. The IFFF will be the first operation of its sort in the Juba region and will therefore offer a valuable source of experience in the problems that would be encountered at Mogambo. The purchase and sale of stock will be of particular relevance, as will various veterinary and management aspects. Furthermore, the use of Mogambo crop residues at the Trans-Juba feedlot is a development alternative which deserves careful consideration.

2.2.6 Other Feedlot Proposals

The consultants are aware of other proposals which if implemented, would contain a feedlot component. One is the Genale-Bulo Marerta project, which was prepared by MMP (1978a) for the Ministry of Agriculture. One development option presented in this report concerned the establishment of feedlots at village centres within the irrigation scheme and also the development of a small feedlot on the proposed pilot farm. The ration that would be fed was based on a mixture of irrigated fodder crops, maize stover and sesame cake. The report concluded, however, that the establishment of a relatively low cost village livestock improvement and extension scheme would be preferable to the high capital and administrative cost of feedlots. The Genale-Bulo Marerta project differs from Mogambo in that it has been designed for smallholders rather than as a state farm.

In a draft report prepared by MMP (1978b) for Libsoma the potential for establishing a feedlot at the Afgoi-Mordile irrigation project has been discussed. The production systems at Afgoi-Mordile have many similarities with those proposed for Mogambo; the most important being that they are both to be operated as large scale farms, rather than settlement projects, and will provide a considerable amount of crop residues and by-products. The cropped area at Afgoi-Mordile, approximately 3 250 ha, is considerably less than the 6 400 ha proposed for Mogambo. The proposed rations are based on maize stover and cobs, groundnut and sesame cake, rice straw and bran molasses. Rom Aginex have put forward initial plans to develop a feedlot for 30 000 cattle and 30 000 sheep in the Afgoi/Balad area. The proposals are not given in great detail, but it appears that it will be necessary to import large quantities of feed.

2.3 Other Relevant Activities

2.3.1 Livestock Development Agency (LDA)

The LDA has overall responsibility for the development of the livestock industry in the Juba area and is the implementing agency for all components of the Trans-Juba livestock project. The headquarters of LDA is in Mogadishu, though there is a regional office in Kismayo. The primary activity of LDA in the area has been livestock marketing, but with the implementation of the Trans-Juba project the agency is also becoming involved in production. The main activities of LDA are discussed elsewhere in this report under the headings of the Trans-Juba livestock marketing.

2.3.2 Regional Veterinary Services

The Ministry of Livestock, Forestry and Range's veterinary department run their regional service from headquarters in Kismayo. There is a shortage of staff at all levels, particularly professional staff. The regional service has recently been strengthened by the arrival of a number of expatriate veterinarians provided under the German (FDR) technical assistance programme to Somalia. These veterinarians have established a diagnostic laboratory in Kismayo covering bacteriology, parasitology and pathology and also assist with general veterinary work, with an emphasis on diagnostic and therapeutic activities, and planning throughout the region.

The veterinary department provides a vaccination programme against contagious bovine pleuro pneumonia (CBPP), rinderpest, anthrax and haemorrhagic septicaemia. The single most important disease in cattle is considered to be trypanosomiasis and **T. congolense, T. virax** and **T. brucei** have been identified on blood slides. The main vector is the tsetse fly (**Glossina pallidipes**), but it is possible that tabanid flies may also spread the disease by mechanical transmission. Foot and mouth disease is prevalent, but occurs in a mild form in most animals. Tick infestation is high throughout the area; there are 6 dips in the region but none of them is operating at the moment, though a number of livestock owners do use hand sprays. There is a relatively high incidence of theileriosis, but the specific protozoan has not yet been identified. Brucellosis is widespread and contagious caprine pleuro pneumonia is increasingly a problem. Cysticercus and echinococcus infection are probably the most important internal parasites. At the moment there are no quarantine facilities in the region.

2.3.3 Kismayo Meat Factory (KMF)

The KMF was established in 1969 and is currently run by the Ministry of Industry, though in the past few years it has changed a number of times between this ministry and MLFR. The present single shift capacity of the factory is approximately 60 000 cattle per year, killing between 200 to 230 animals per day. A summary of the factory's production during 1974 to 1977 is given in Table 2.1. The greatest number of cattle processed during the last ten years was 53 000 in 1972.

The factory is not operating at present, but, when it does start again, stock will be provided by LDA. At one stage KMF was purchasing it own slaughter stock, but this has now stopped.

The factory has freezing facilities, which are not used, and sufficient chilled storage capacity for two days of slaughter (approximately 450 carcasses). Plans to increase and improve these facilities have not yet been implemented, though the importance and potential benefits of developing chilled or frozen carcass export as opposed to live animal export are fully realised. Kismayo Meat Factory is currently discussing, with the Government of Iran, the possibility of exporting chilled beef and lamb carcasses. The amount of beef would be approximately 175 tonnes each week. If the beef contract was awarded to KMF with the existing facilities it would be necessary to slaughter 230 cattle each day for a six day week and dispatch chilled carcasses from Kismayo every other day. This would work the factory at its present full capacity and, without any extensions, it would be unable to process the lamb carcasses. The price of the beef, which is still under discussion and far from finalised, is estimated to be around US $ 1 800 per tonne of carcass (FOB Kismayo).

The management of Kismayo Meat Factory is considering expanding the scope of enterprises to include other food processing activities including the preparation of tomato paste and tinned fish. No details of any such expansion have yet been prepared but, if it was ever implemented, it has been suggested that the KMF should change its name to become the Kismayo Food Processing Plant.

The future scale and nature of operations at Kismayo Meat Factory are of direct relevance to the development of the proposed livestock unit at the Mogambo irrigation project. If the factory was able to develop a profitable export market for high quality chilled beef it would provide a useful outlet for finished animals from Mogambo. The implementation of the Mogambo feedlot might also affect the canning operations of KMF. This point, which was initially raised by the World Bank's 1977 review mission to the Trans-Juba livestock project, argues that the development of feedlots in the Juba area would cause competition between the feedlots and KMF for similar types of animals. If the Trans-Juba and Mogambo feedlots were successful they would reduce the potential supply of canning grade animals to KMF by as much as 20 000 head a year. This, and other similar problems discussed elsewhere in the report, underlines the need for overall co-ordinated planning within the livestock and other related sectors for the area.

TABLE 2.1

Summary of Production by Kismayo Meat Factory

	Unit	1974	1975	1976	1977
Nr cattle processed	head	50 300	46 000	41 000	33 525
Total liveweight	tonnes	10 870	11 260	9 882	7 526
Total carcass meat	tonnes	4 766	4 923	4 453	3 217
Tinned stewing steak	350 g tins	9 934 000	13 363 000	10 648 000	6 636 000
Tinned corned beef	340 g tins	1 695 000	1 069 000	508 000	237 000
Other tinned products	tins	748 000	-	-	-
Sausages	tonnes	0.3	0.1	-	-
Tallow	tonnes	94	125	77	28
Skins	tonnes	531	420	366	265
Meat and bone meal	tonnes	107	139	109	60
Average liveweight	kg	216	244	241	224

CHAPTER 3

CROP RESIDUES AND AVAILABLE NUTRIENTS

3.1 Introduction

The basis for the feedlot ration to be fed at Mogambo would be crop residues and by-products. The project therefore has one basic difference with the Trans-Juba livestock project feedlot which is planning to feed a ration based on irrigated fodder; maize and lucerne.

All the three crops to be grown at Mogambo, rice, maize and cotton, produce useful residues or by-products, though all the residues are not necessarily well suited to fattening cattle under intensive feedlot conditions. Sesame was considered for inclusion in project crops but was later rejected because of poor returns. However sesame cake is included in the rations examined for this project, but if sesame cake was used it would have to be purchased.

3.1.1 Rice

The residues and by-products from rice production are rice straw, rice bran and rice hulls. Of these rice bran is by far the most valuable source of animal feed. The rice produced at Mogambo, however, will not be polished and rice bran will therefore not be available. Both rice straw and rice hulls are of low digestibility and are not particularly well suited to feedlot rations, where a high level of food intake is required to obtain good weight gains. In the absence of other fibrous residues both these could be used as a basis for a ration. At Mogambo, however, there should be large quantities of maize stover (which is more digestible) and it is not proposed that either rice straw or hulls would be used in the ration. In view of the large quantity of rice straw that will be available in Somalia it is recommended that the Government undertakes trials to develop the use of this residue in livestock rations.

3.1.2 Maize

Maize stover is the most important residue from this crop and, although somewhat bulky, is a very useful, relatively high fibre base for a feedlot ration. Before the stover is fed to cattle it should be cut and hammer milled to increase digestibility.

Maize cobs are not suitable for inclusion in a feedlot ration where other feeds are available as they are difficult to digest. Maize will be dried on site, but sold directly to the Agricultural Development Corporation (ADC) for processing and distribution.

3.1.3 Cotton

Cotton seed is the only residue of this crop which can be used as livestock feed. Unprocessed cotton seed should only be fed in limited amounts due to a high content of toxic gossypol. Pressed crushed cotton seed, the residual cake which is left after the oil has been extracted, does not have such a high

gossypol content and is an extremely useful feed, being rich in both protein and energy and highly digestible. Cotton seed cake will only be available in any significant quantity if an oil mill and pressing plant is established in the Juba area.

3.2 Cropping Pattern and Estimated Yields

Details of the proposed cropping pattern and all aspects of agricultural production are given in Chapter 7 of the Main Report and Annex 3.

Expected yields and total areas at full development are given in Table 3.1.

TABLE 3.1

Estimated Crop Yields and Areas at Full Development

	Crop	Area (ha) Gu	Area (ha) Der	Yields (tonnes/ha)
Basin	Paddy rice	3 300		4.0
	Maize		2 300	4.0
Levee	Upland rice	1 000		3.5
	Maize		2 000	4.0
	Cotton		1 100	2.5

The relationships between the total yield of the end agricultural product and the relevant crop residues and by-products are well established (Table 3.2). These relationships have been used to estimate the total amounts of residues available in terms of both fresh weight (Fw) and dry matter (DM) (Table 3.3).

It should be pointed out that no arrangements have been made for oil extraction by the project. If cotton seed cake is to be locally available it will be necessary for a local oil press to be built with a capacity of about 1 000 tonnes/year. If no mill and extraction plant is constructed the raw materials will have to be taken to Mogadishu and no residues would be available in the area. If no concentrate cake is available it will not be possible to produce a suitable feedlot ration.

TABLE 3.2

Relationships between Crop Yields and Residue and By-product Production

Residue	Yield	Availability (%)	Dry matter (%)
Maize stover	100% of grain yield	60	90
Cotton seed cake	40% of seed cotton	95	93

TABLE 3.3

Estimated Annual Production of Crop Residues at Full Production

	Available fresh weight (tonnes)(1)	Available dry matter (tonnes)
Maize stover	10 300	9 300
Cotton seed cake	1 000	950

Note : (1) To the nearest 100 tonnes

3.3 Opportunity Grazing

All irrigation schemes offer a certain amount of opportunity and stubble grazing. The most valuable opportunity grazing comes from the grass and herbs growing along the canals and waterways. Both rice and maize stubbles can also offer grazing to livestock, and rice stubbles can be particularly useful if the stubble is left for a ratoon growth. The grass and weeds growing along water ways will be of little use to the feedlot, but would be a valuable source of fodder to livestock owners in the project villages. There is a well established tradition in Somalia of hand-feeding livestock - illustrated by the considerable urban livestock population in Mogadishu, all of which is hand fed - and it is therefore likely that livestock owners would be willing to make good use of this source of fresh forage. Livestock owners in the villages could also use the stubble grazing and fallow areas. This, however, will need to be carefully controlled.

3.4 Available Nutrients

There are a number of different ways of calculating the nutritional value of animal feeds. The three that will be used in this report are; total digestible nutrients (TDN), digestible protein (DP) and estimated net energy (ENE). These are defined as follows :

(a) Total Digestible Nutrients

The normal proportion of the feed that can be expected to provide useful nutritional value to livestock.

% TDN = (% of digestible protein) + (2.25% of digestible fats and oils) + (% of digestible nitrogen-free extract) + (% digestible crude fibre).

(b) Digestible Protein

The proportion of the feed which is composed of nitrogenous compounds expected to provide useful nutritional value to livestock.

(c) Estimated Net Energy

The amount of heat per unit of feed that can be expected to be generated by the feed during metabolism within the animal: usually expressed as mega joules (MJ) per 100 kg of dry matter feed.

3.4.1 Nutrients from Mogambo Project

The nutritional values of each main residue are shown in Table 3.4. Values of molasses and maize grain are also included as these will be considered as potential additions to the feedlot rations discussed in Chapter 5. In order to obtain an estimate of total nutrient production from utilisable residues at Mogambo the nutritional values given in Table 3.4 have been applied to total dry matter and fresh weight production levels (Table 3.3); the results of these calculations are given in Table 3.5. Of the total amount of TDN, 89% comes from maize stover. The cotton cake seed would produce 64% of the DP but only 21% of the ENE.

TABLE 3.4

Values used in Calculation of Nutritional Values

Feed	DM (%)	TDN (% Fw)	DP (% Fw)	ENE[2]
Maize stover	90	50	2.0	250
Maize grain	88	83	6.9	720
Concentrate cake[1]	94	71	35.0	660
Molasses	73	54	0.0	517

Notes: (1) A mixture of cotton seed cake and sesame seed cake.

(2) Megajoules per 100 kg DM.

TABLE 3.5

Estimated Annual Nutrient Production from Crop Residues and By-products

	TDN (tonnes)	DP (tonnes)	ENE (MJ x 10^6)
Maize stover	4 650	200	23.25
Cotton seed cake	700	350	6.27
Total	5 800	550	29.52

3.4.2 Nutrients from Other Sources

The most important off-farm source of nutrients would be by-products from the Juba Sugar project (JSP) at Marere. By 1980 the project expects to be producing 20 000 tonnes of sugar and 70 000 tonnes by 1983. Of the three potential sources of nutrition, cane tops, bagasse and molasses, only molasses will be available; the cane will be burnt before harvesting thereby reducing the amount of tops available and most of the bagasse will be used on site as a fuel for boilers. If molasses yield is taken as half that of sugar yield (5% of cane yield) there will be 10 000 tonnes of molasses available in 1980 and 35 000 tonnes in 1983. JSP is discussing the marketing of the molasses with an international trading company which specialises in this commodity, they hope to export it, loading into bulk tankers at Kismayo. If the Mogambo feedlot was to buy molasses from JSP it would have to pay the world market price (FOB Kismayo), less the JSP transport costs from Marere to Kismayo. The transport costs are currently (May 1979) estimated at SoSh 150 per tonne. Molasses would be beneficial as it increases the palatability of a ration and encourages a high level of food intake.

Maize grain is another potential high-energy feed. It is debatable whether, in a country like Somalia where cereals for human consumption are in short supply, maize should be used as cattle feed, but it would be available in relatively large amounts on the farm. Compared with the other sources of energy, maize grain is an expensive source of energy. As mentioned in the introduction (Section 3.1) sesame cake was included in the rations but if used it would have to be purchased.

There are facilities within Somalia for the preparation of both fish meal and meat and bone meal, the latter being available at Kismayo Meat Factory, when operating. Both these feeds are very high in protein but are usually only fed in relatively small amounts.

Vitamin and mineral premixes for use in feedlot rations have to be imported and consequently are expensive. As with the animal by-products, however, these are only fed in small amounts.

3.5 Cost of Residues and Other Nutrients

The estimated prices of the residues and other nutrients which might be used in the Mogambo project are shown in Table 3.6. These have also been related to the nutritional value of each feed so that comparisons can be made between the cost of a given amount of nutritional value.

Maize stover has been given a nominal cost of SoSh 50 per tonne. This would cover the costs of removing the stover from the fields to the feedlot store and other incidental handling costs. Unlike the areas around Mogadishu there is no market for excess maize stover at Mogambo. The concentrates have been priced at the same level as cash purchases at the oil mill in Mogadishu; credit purchases are more expensive, currently SoSh 1 300 per tonne. Maize has been priced at the price at which it would have been sold to ADC.

Maize stover is the cheapest source of both TDN and ENE; it is also a relatively cheap source of DP. Stover, however, is a bulky feed of relatively low digestibility and the amount that can be fed has therefore to be limited. The concentrate cakes provide the cheapest source of protein and molasses the cheapest energy.

TABLE 3.6

Cost of Potential Feeds (SoSh)

Feed	Source	Cost per tonne	Cost per tonne TDN	Cost per tonne DP	Cost per tonne 1 000 MJ ENE
Maize stover	(3)	50	100	2 500	22.5
Sesame cake	(5)	800	1 127	2 030	128.0
Cotton seed cake	(5)	800	1 111	2 353	128.0
Molasses	(2)	310	573	-	80.6
Maize grain	(1)	750	904	10 870	120.0
Fish meal	(4)	2 550	3 591	4 757	-
Meat and bone meal	(6)	1 500	2 308	3 676	-
Vitamin and minerals	(6)	55 000	-	-	-

Notes : (1) ADC, Kismayo March 1979.

(2) FOB World market value less SoSh 150 transport cost to Kismayo.

(3) Nominal cost to cover transport from fields to feedlot.

(4) MLFR feedlot purchase price and SoSh 0.55 per kg transport to Mogadishu.

(5) Cash price at Mogadishu oil mill for concentrate cake.

(6) MLFR feedlot purchase price.

CHAPTER 4

NUMBERS OF CATTLE, OFFTAKE AND MARKETING

4.1 Introduction

This chapter will discuss available data on the number of animals in the Lower Juba area and relate this to offtake and marketing information. The number, availability, type and purchase price of cattle is a vital part of any feedlot study, as are the possible markets into which finished animals can be sold. A successful feedlot needs to have ready access to a reliable supply of cheap, unfinished cattle and needs to be able to sell fattened stock into a market which is willing to pay a premium for the increased weight and improved carcass quality of feedlot fattened animals.

It is not sufficient to consider merely the total number of animals which are present in the area. Herd structure is important as there is a national ban on the live export of females, therefore only males can be used if the animals are to be sold onto the live export market.

4.2 Livestock Population

4.2.1 National Situation

The results of the 1975 national census undertaken by the State Planning Commission indicated that there were approximately 3.7 million cattle, 9.4 million sheep, 15.3 million goats and 5.3 million camels in the country. This survey was undertaken during the 1973 to 1975 drought and it is likely that populations have increased since then due to years of good rainfall and improved range production. If it is assumed that all species have increased at the compound rate of 8% each year, the current 1979 estimate would be 5.1 million cattle, 12.8 million sheep, 20.8 million goats and 7.2 million camels. There are no data to substantiate this assumption but, in view of the improved environmental conditions, it is considered to be reasonable.

The majority of small stock (sheep and goats) and camels are found in the more arid north of the country, while cattle tend to be concentrated in the south. The distribution of livestock by regions, giving 1975 SPC figures and 1979 estimates is shown in Table 4.1.

4.2.2 Local Livestock Population

Changes in administrative boundaries have somewhat complicated the interpretation of the 1975 census data. At the time of the census no data were collected for what is now the Middle Juba (Juba Dhexe) region. This region is formed from Saakow, Gelib and Boale Districts. Saakow District having been transferred from Gedo region and Gelib coming from Lower Juba region. Boale appears as a new district and no data are available specifically for this district in the 1975 census.

TABLE 4.1

Population of Livestock in Somalia by Region

Region	Numbers '000							
	Cattle		Goats		Sheep		Camels	
	1975	1979	1975	1979	1975	1979	1975	1979
W. Galbeed	145	197	3 076	4 185	2 242	3 050	606	824
Togdheer	44	60	902	1 227	917	1 248	320	435
Sanaag	74	101	664	903	1 521	2 069	205	279
Bari	15	20	2 095	2 850	1 388	1 888	240	326
Nugal	12	16	611	831	223	303	155	211
Mudug	340	463	2 744	3 733	1 136	1 545	751	1 022
Galgadud	218	296	1 734	2 359	588	800	395	537
Hiran	170	231	1 159	1 577	287	390	461	627
Middle Shabelle	366	498	720	979	325	442	236	321
Mogadishu	22	30	19	26	6	8	1	1
Lower Shabelle	419	570	200	272	90	122	293	399
Lower Juba	1 036	1 409	177	241	81	110	297	404
Gedo	528	718	725	986	500	680	784	1 067
Bay	255	347	192	261	55	75	362	492
Bakool	100	136	274	373	79	107	192	261
TOTAL	3 744	5 094	15 292	20 805	9 438	12 840	5 298	7 208

Note: 1979 figures calculated on 8% compound annual increase.

The three regions from which the Mogambo feedlot would draw animals are Lower and Middle Juba and Gedo; these cover both the east and west banks of Juba river and the lower reaches of the Shabelle river. The district livestock populations from the 1975 census have been used to estimate the present populations in the three regions; a compound annual 8% increase in herd size has been assumed for these calculations (Table 4.2). The estimates show that the number of cattle in the three regions may have increased from 1.5 million in 1975 to a little over 2 million in 1979. Calculations done by Hunting Technical Services (1977) for the Inter-Riverine Agricultural Study, and based on the 1975 census data, indicate that Afmadu and Badade have the highest cattle densities (1979 equivalent of 39 and 38 animals per km^2, respectively); densities were also high in Gelib (34 per km^2) but low in Lugh (5.5 per km^2), Dolo (4.5 per km^2) Bardheere (4.9 per km^2) and Bulo Hawa (3.5 per km^2).

Data collected during the national census indicate that between 4 and 7% of the cattle herds are adult males, while between 54 and 58% are adult females.

These calculations are based on the results of ground surveys undertaken during the 1975 national census. There are now relatively cheap, fast and efficient methods of counting livestock populations available through the use of aerial survey techniques. Such techniques not only supply estimates of the total number of each livestock type, but also provide information on distribution, movement and the location of animals in relation to vegetation and water sources. Aerial

surveys, which are now used extensively in many parts of Africa for providing planning and monitor base data, have the advantage that they are easy to repeat and can therefore be used to determine seasonal changes and movements. The consultants consider that the use of such surveys in the Juba valley and neighbouring areas would provide essential information which will be needed if the development of the livestock industry in southern Somalia is to achieve its full potential.

4.3 Potential Offtake

There is very little reliable information on herd offtake. World Bank estimates for total purchases from both sides of the Juba river indicate that between 70 000 and 100 000 cattle are marketed each year. This represents an annual offtake of between 3.5% and 5%. The total potential commercial offtake from each district in the three regions has been calculated at 3 levels; 3%, 5% and 8% (Table 4.3). These calculations indicate that, depending on the offtake rate, between 63 800 and 170 200 cattle might be available. If Gedo region is excluded, being a considerable distance to the north of the Mogambo project, the total is reduced to between 47 000 and 125 360. The single most productive district is Afmadu (the largest and with the second highest cattle density).

TABLE 4.2

Local Cattle Population by District

Region	District	Cattle 1975 (Nr)	1979 Estimate
Lower Juba (Juba Hoose)	Badade	167 800	228 290
	Kismayo	60 400	82 173
	Jamama	53 300	72 514
	Afmadu	579 300	788 131
	Total	860 800	1 171 108
Middle Juba (Juba Dhexe)	Boale	?	?
	Saakow	115 700	157 408
	Gelib	175 300	238 494
	Total	291 000	395 902
Gedo	Bardheere	62 700	85 302
	Elwak	100 000	136 049
	Garba Hare	187 100	254 547
	Bulo Hawa	26 500	36 052
	Dolo	6 500	8 843
	Lugh	29 100	39 590
	Total	411 900	560 385
Total for three regions		1 563 700	2 127 395

Note: 1979 figures calculated on 8% compound annual increase.

TABLE 4.3

Potential Commercial Offtake

Region	District	3%	5%	8%
Lower Juba	Badade	6 849	11 414	18 263
	Kismayo	2 465	4 109	6 574
	Jamama	2 175	3 626	5 801
	Afmadu	23 644	39 406	63 050
	Total	35 133	58 555	93 688
Middle Juba	Boale	-	-	-
	Saakow	4 722	7 870	12 593
	Gelib	7 155	11 925	19 079
	Total	11 877	19 795	31 672
Gedo	Bardheere	2 559	4 265	6 824
	Elwak	4 081	6 802	10 884
	Garba Hare	7 636	12 727	20 364
	Bulo Hawa	1 082	1 803	2 884
	Dolo	265	442	707
	Lugh	1 188	1 979	3 167
	Total	16 811	28 018	44 830
Total for three regions		63 821	106 368	170 190

These estimates are for the gross offtake in the different regions and do not take into account the fact that, if the Mogambo project was to fatten animals for live export, only males could be used. This would immediately reduce the utilisable offtake estimate for the three regions to between 32 000 and 85 000; and the estimate for Lower and Middle Juba regions to between 23 500 and 62 700. In terms of possible monthly supplies these figures represent an average of 2 670 to 7 080 for all three regions and 1 960 to 5 225 for the two southern regions. There will, however be problems with assuring regular monthly supplies as the majority of producers, the pastoralists, are reluctant to sell stock during the rains. Those that are prepared to sell at this time will only do so if the price is considerably higher than the dry season prices.

In an analysis of 1975 market data presented in the Livestock Sector Review (HTS, 1976) it was shown that the overall national offtake for cattle was 5.8%; the World Bank/FAO 1979 Study used a higher figure of 6.8%. In terms of each of the three regions 58% offtake represents the following numbers of cattle from the 1979 estimated population.

Lower Juba	67 924	
Middle Juba	22 962	90 886
Gedo	32 502	
Total	123 388	

Domestic demand was 3.6% for cattle (2.4% for municipal slaughter and 1.2% for private slaughter) leaving 2.2% available for live export and processing. The number of cattle available would be:

Lower Juba	25 764	
Middle Juba	8 710	34 474
Gedo	12 328	
Total	46 802	

The total of 46 800 falls within the 32 000 to 85 000 range calculated earlier for the three regions and the 34 474 total for Lower and Middle Juba is within the 23 500 to 62 700 total calculated for these two regions alone. It can be seen that an increase of just a few per cent in offtake rates can have a significant effect on the total number of animals available.

4.4 Anticipated Demand for Cattle

Having estimated approximately how many animals might be available on the commercial market it is now necessary to determine the extent of the present and future demand in the area for animals of this type.

The most important potential consumer at the moment is Kismayo Meat Factory. There is, however, uncertainty about the nature and scope of KMF's future activities which makes it difficult to predict the number and type of animals the factory would require. If KMF is to continue with canning operations it will require lower grade animals than if it develops a chilled carcass export market. The full capacity of KMF is approximately 60 000 animals each year. If, therefore, the factory was to run at full capacity it would require just about all the animals available at 3% commercial offtake and, if lower rates of commercial offtake are achieved, it may even run short of animals. If the KMF continues with its canning operations any feedlot in the area would be directly competing with the factory for animals. On the other hand, if the factory was to develop the export of carcasses, it would require better quality animals than canning grade and the development of feedlots in the Juba area would be complimentary to KMF activities. The future development of KMF will therefore have direct relevance on the supply of animals. This will be especially sensitive if commercial offtake rates are less than 4 or 5%. If offtake rates are not greater there could be a shortage of suitable animals.

When completed the Trans-Juba irrigated fodder farm and feedlot (IFFF) will need approximately 10 000 to 14 500 cattle each year and, depending on the ration finally selected, the Mogambo project feedlot could require about 10 000 animals each year. These two feedlots might therefore have a capacity of as many as 24 500 cattle each year.

Compared with the Port of Berbera in the north of the country the live animal export trade from Kismayo is small and in most years numbers less than 10 000 cattle per year. In 1976 however, LDA recorded over 26 000 cattle as being exported from Kismayo (Table 4.4). The total number of cattle required for live export and feedlots might be 34 500 head per year; domestic demand (at 3.6% of total herd) would be 20 200, therefore total demand would be 54 700 cattle per year without KMF requirements; 114 700 including the KMF operating at full capacity and 84 700 if KMF was operating at only half capacity. It has been assumed in these calculations that animals from the Trans-Juba grazing ranch will be sent either through the feedlots, through the KMF or marketed as part of the 10 000 animals going for live export.

4.5 Seasonality of Supply

The eventual implementation of the grazing ranches and holding grounds proposed for the Trans-Juba project should do much to help reduce the seasonality of numbers and price of available animals. The original proposals for both ranches and holding ground development have been modified and reduced and it is unlikely that there will be any significant reduction in the seasonal functions of supply and prices in the immediate future. If the livestock production potential of the Juba valley is to be fully realised it will be essential to reduce the level of these fluctuations. A feedlot, such as the one considered for the Mogambo irrigation project, cannot be operated on a seasonal basis, only buying animals during the dry season when prices are low. It needs to operate all through the year to justify the high capital investment in buildings and sophisticated equipment. There is therefore a need to establish an effective 'buffer' system between the primary producer and the market, whether the market is direct live export or processing, or is reached via the intermediary stage of a feedlot. Such a buffer could be established through the development of well managed grazing ranches and holding grounds. The ranches would be a service to both the producer and the purchaser; they would help the pastoralists find a reliable market for surplus animals during the dry season when they are perhaps needing to sell animals to buy cereals to supplement their reduced milk supply, and they would stabilise the supply to the various outlets.

TABLE 4.4

Live Animal Exports from Somali Ports

(Nr of animals)

	Mogadishu		Berbera		Kismayo	
Year	Cattle	Sheep	Cattle	Sheep	Cattle	Sheep
1974	1 350	3 000	28 954	567 536	9 250	2 000
1975	2 485	38 045	25 903	679 897	4 400	4 630
1976	2 050	14 500	30 180	323 441	26 155	7 765
1977	700	1 400	45 780	419 008	8 476	7 423
1978	500	n.a.	61 211	n.a.	15 200	n.a.

Source: LDA

Although the development of holding grounds is the most obvious conventional solution to this problem, in practice it may be much more difficult to implement. The experience of the Trans-Juba livestock project and other range development projects in Somalia and elsewhere in Africa has shown that nomadic people are frequently, and understandably, reluctant to see areas over which they have traditional grazing rights being fenced and developed for holding grounds. The alternative solution would be the development of co-operative or group ranches, but these too have many problems and would need to be planned with great care and thorough preparation. A 'buffer' system which is based on the nomadic producers themselves would, in the long run, be preferable to the more formal holding grounds. It would involve considerably lower costs and involve the producers more directly with the national livestock industry.

The existing holding grounds at Gelib and Kismayo have a planned carrying capacity of 3 000 animals a year each. The Gelib holding ground has considerable problems with bush encroachment and the Kismayo one is severely overgrazed. With the completion of the Trans-Juba project's Afmadu holding ground the annual 'buffer' carrying capacity would be 12 000 head which, if each animal was held for an average of four months, would give a turnover of 36 000 cattle. This would be sufficient to meet the needs of the two feedlots, but inadequate for the needs of KMF if it was to work at full capacity.

4.6 Livestock Marketing

The livestock marketing systems in the south of the country are not as sophisticated or well developed as those in the north. This must primarily be due to the north's greater proximity of the Arabian export markets which has encouraged the evolution of an effective, traditional internal and export marketing system.

The Livestock Development Agency (LDA) of MLFR has the primary responsibility for livestock marketing in the Juba valley area. Although at one stage all private trading was officially banned, this ruling has now been relaxed and private traders are allowed to operate under licence. The main livestock markets (Figure 4.1) are at Elwak, Afmadu, Beles, Godani, Dujuma, Gelib (holding ground), Kismayo and Badade; it is planned that the LDA's Trans-Juba livestock project will establish new markets at Busar, Fafadun, Shappi, Bardheere, Mascati, Gelib (town) and Soia. The LDA have three mobile market teams which are based on Afmadu, Badade and Hadwuen.

Data on LDA purchases in the Trans-Juba area (Table 4.5) show that the greatest number of animals they have marketed during any year was 37 214 during 1977. The low figure for 1978 was due to the fact that KMF was buying its own stock rather than using the LDA, which had previously been supplying KMF.

TABLE 4.5

LDA Cattle Purchases in Trans-Juba Area

Year		Nr of cattle traded	(%)	Total value (SoSh)	Average value (SoSh)
1975	Males	11 187	32	5 742 463	513.32
	Females	23 728	68	10 453 526	440.56
	Total	34 915	100	16 195 989	
1976	Males	18 649	87	12 295 530	659.31
	Females	2 818	13	1 237 110	439.00
	Total	21 467	100	13 532 640	
1977	Males	23 027	62	14 477 647	628.72
	Females	14 187	38	6 468 723	455.96
	Total	37 214	100	20 946 370	
1978	Males	3 279	92	2 683 355	818.35
	Females	300	8	211 763	705.88
	Total	3 579	100	2 895 118	

Source: LDA Mogadishu

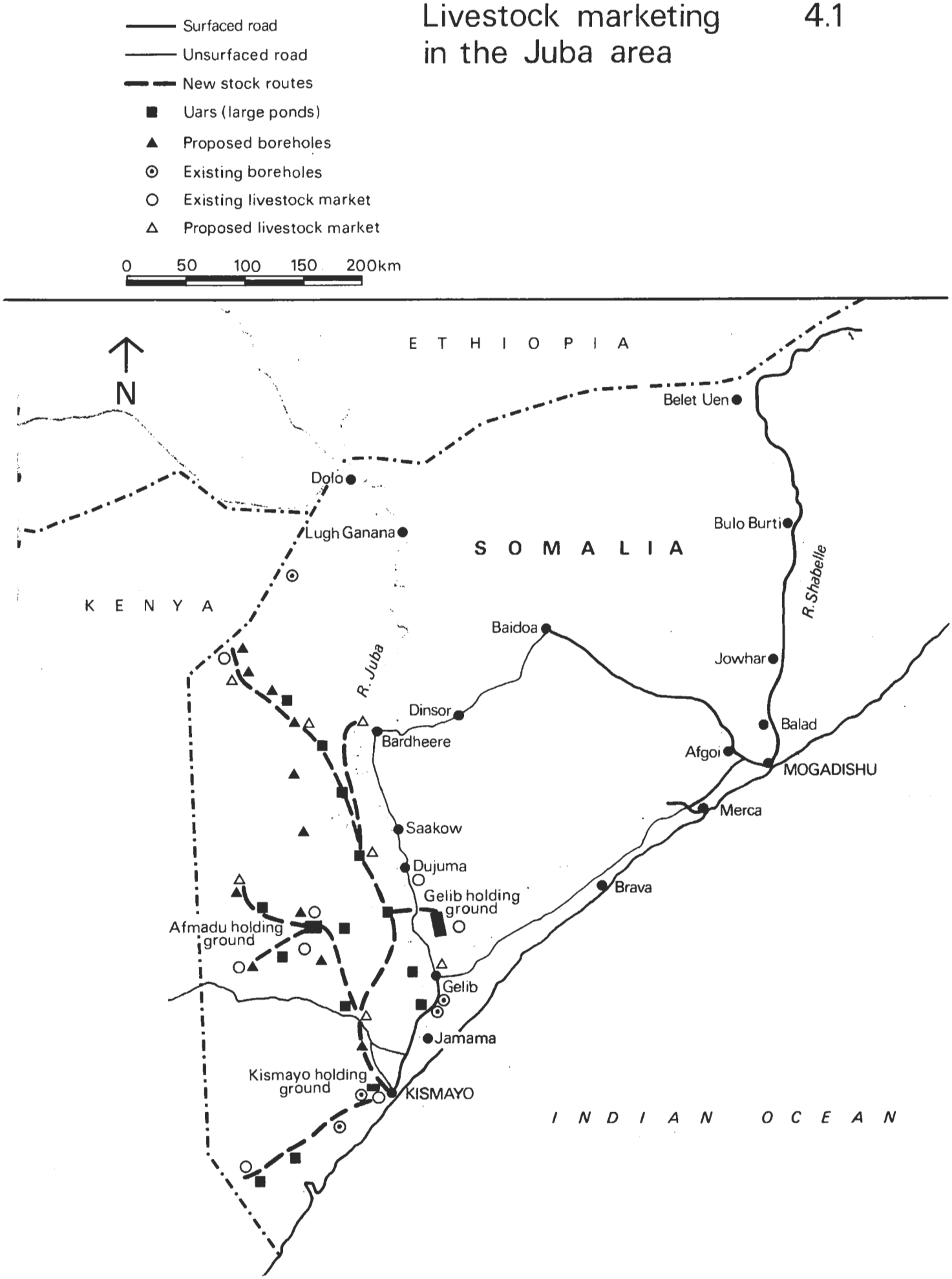
The assessment of the numbers of animals which might be needed in the Lower Juba area, given in Section 4.4, shows how important it will be to develop efficient feeding systems and the possible need to supply export markets on a regular and reliable basis make it essential that internal purchasing and movement of stock is properly organised. Unless regular supplies of suitable animals can be guaranteed it would be unwise for KMF to undertake the contract to supply Iran with 175 tonnes of carcass beef, which is currently being discussed and also difficult to justify the capital outlay that would be required for the Mogambo feedlot.

If the livestock population figures are reasonably accurate there certainly should be sufficient animals to satisfy the requirements of the KMF, Trans-Juba livestock project feedlot and a Mogambo project feedlot. The aim of the marketing system should be to increase offtake rates and to stabilise the seasonal fluctuations in prices and supply.

The Trans-Juba livestock project's feedlot is expected to start fattening cattle sometime during 1979. Although the final details of the purchase and marketing of cattle for this feedlot have not yet been determined, it is likely that they will obtain cattle through the LDA and will send finished animals either to KMF or for live export via LDA. Experience gained during the implementation of this project will be invaluable to the Mogambo feedlot, Trans-Juba will have been operating for several years and will have encountered, and have had to solve, many of the potential difficulties outlined in this report. It will therefore be essential that the implementing agency follows the development of the Trans-Juba feedlot very closely and has access to the monitoring and evaluation data that will come from the project.

Livestock marketing in the Juba area

4.1



4.7 Cattle Prices

The range of information available on local and export prices collected during May 1979 is shown in Table 4.6. Prices have risen considerably since October 1978 when the consultants undertook a similar survey for the Afgoi-Mordile Feedlot Study (MMP, 1978b).

Local purchase prices have risen by 20 to 30% during the six month period while the value of export quality stock has risen by approximately 10%.

In terms of administration and organisation the most obvious source of supply and outlet for the Mogambo feedlot would be the LDA for supply and KMF for outlet (the animals to be sold on the export market as chilled carcasses). An analysis of the prices that would be required and offered, however, is not very encouraging. Discussions with LDA officials indicate that they would be unable to offer animals at less than SoSh 5.33 per kg liveweight; this is what it costs them in terms of purchase from the producer and marketing costs. On the other hand it is unlikely that, if the KMF finalises the carcass export contract currently under discussion at US $ 1 800 per carcass tonne, the KMF would be able to offer more than SoSh 5.40 per kg liveweight. This price assumes that the KMF takes no profit and is merely covering slaughter costs from the sale of the fifth quarter. It is very unlikely that the price differential of seven cents per kilogram would be sufficient to cover the cost of feedlot production.

An analysis of possible margins (Table 4.7) shows these to be lowest for stock bought from LDA and then sold on to KMF (SoSh 447 per beast). This margin is SoSh 267 per beast less than that for an animal bought for a high price in the open market and sold at a low export value, and less than half the margin if the animal was bought relatively cheaply on the open market and sold at a high export price.

Livestock prices, like the numbers available on the market, vary considerably in the season. The basic reason for this variation is the requirements of the nomadic producers. As the dry season progresses the milk yields of their cattle drop and they may have to sell an animal to be able to buy cereals to supplement the family's diet. If the dry season is severe, they will have to sell more animals but as all the other pastoralists are doing the same thing there is a surplus of sale stock and the price therefore drops. During a prolonged drought the rate of sale increases still further as the pastoralists try to get animals on the market before they die of starvation. Once it rains, however, milk yields start to pick up and the need to sell is reduced. The pastoralists know their animals' condition will improve and are now reluctant to part with surplus stock. As the market supply is consequently reduced the price rises. Prices remain high throughout the wet season until the range lands start drying out and milk yield drops.

TABLE 4.6

Cattle Prices

		Price SoSh/kg liveweight*	Source
Local purchase price	(a)	4.80	(4)
	(b)	4.33	(5)
	(c)	3.80 to 4.00	(6)
	(e)	3.50 to 4.20	(9)
	(f)	4.00 to 5.00	(10)
	(g)	4.49	(11a)
		4.73	(11b)
Export price (FOB Kismayo) or local value of finished animal	(a)	5.90 (FOB Kismayo)	(1)
	(b)	6.25 (chilled carcass equivalent Mogadishu)	(2)
	(c)	5.40 (FOB Kismayo)	(3)
	(d)	5.67 to 6.24 (FOB Kismayo)	(7)
	(d)	4.00 to 5.33	(8)

Note: * Where necessary carcass values have been converted to liveweight at 50% killing out. Conversion rate: SoSh 6.00 = US $ 1.00

Sources: (1) IBRD/FAO Livestock Marketing Study (1979) (US $ 286 per animal FOB Kismayo = $ 338 CIF Jeddah)

(2) Estimated contract price for private supplier to Mogadishu wholesaler

(3) Proposed, but not finalised, price for KMF contract to Iran (US $ 1 800 per carcass tonne)

(4) Estimated average buying price for KMF; 250 kg animal at SoSh 1 200

(5) Official LDA price for Grade I (estimated 300 kg) animal

(6) Official LDA price for grade II (average 250 kg) animal

(7) LDA estimate for live export value (US $ 260 per animal minimum price; 275 kg minimum liveweight)

(8) Price range under discussion for LDA to supply (possibly for canning) stock to KMF

(9) Estimated purchase price, Gelib holding ground

(10) Local purchase price, Mogambo village

(11) (a) Average LDA purchase price for 250 kg animal.

(b) Average price plus SoSh 60 LDA profit

TABLE 4.7

Calculations of Possible Margins*

	Purchase price (SoSh/kg liveweight)	Purchase price (220 kg)	Sale price (SoSh/kg liveweight)	Sale price (300 kg)	Margin per animal (SoSh)
1	5.33	1 173	5.40	1 620	447
2	5.33	1 173	5.90	1 770	597
3	5.33	1 173	6.25	1 875	702
4	4.80	1 056	5.40	1 620	564
5	4.80	1 056	5.90	1 770	714
6	4.80	1 056	6.25	1 875	819
7	4.30	946	5.40	1 620	674
8	4.30	946	5.90	1 770	824
9	4.30	946	6.25	1 875	929

Notes:		Buy from:	Sell to:
	1	LDA	KMF
	2	LDA	Export value low
	3	LDA	Export value high
	4	Free market high price	KMF
	5	Free market high price	Export value low
	6	Free market high price	Export value high
	7	Free market low price	KMF
	8	Free market low price	Export value high
	9	Free market low price	Export value high

* margins represent difference between purchase and sale price; no over costs have been included in these calculations

CHAPTER 5

ANIMAL NUTRITION, PRODUCTION AND MANAGEMENT

5.1 Introduction

The Mogambo feedlot would be based on the crop residues and by-products from the agricultural cropping and local bush-bred, unfinished cattle. Successful and profitable feedlot production systems are very sensitive to changes in the prices of the raw materials (feeds and cattle) and also to the changes in daily liveweight gains of the animals being fattened. Daily gains depend on both the type of ration being fed and the type of animal being fattened. Young, immature animals grow faster than older animals but need to be held in a feedlot longer as it would take time for them to reach a weight at which they could be marketed. Older animals do not grow so quickly but, if they are put into the feedlot as fully grown but lean animals, they are capable of considerable weight gains during the period of 'compensatory growth'. Once the compensatory growth period is finished (i.e when the leanness has been filled out) their daily weight gains will drop. Adult cattle which are well filled out generally show poor weight gains. In many ways the ideal type of animal for the Mogambo feedlot would be big-framed but lean adult bulls and steers. These animals can achieve a high rate of food intake, even on a relatively fibrous ration.

As yet there are insufficient research data on the growth rates of different aged and conditioned local cattle being fed relatively high fibre rations. The rations that have been used at MLFR's Km 7 feedlot have contained large quantities of milling offals (rice + wheat bran), which are not generally available thoughout the country. It is possible that there will be a change in emphasis at the Km 7 feedlot and that work with more common residues, using different types of animals may be undertaken. This, however, is not certain and the proposals for Mogambo therefore contain plans for initial feeding trials and a pilot development phase.

5.2 Type of Stock and Nutritional Requirements

5.2.1 Type of Stock and Growth Rates

The type (breed), age and size of an animal has a direct effect on the amount of food it requires, the type of food that suits it best and the management techniques which should be employed to ensure maximum production.

The dominant cattle breed in the Juba area is the East African Boran. This zebu (**Bos indicus**) animal is large-framed long-legged animal well adapted to semi-arid range lands. Work by FAO in Kenya and at the Km 7 feedlot in Mogadishu has shown that Boran cattle can achieve reasonable weight gains under intensive feeding systems. It is therefore proposed that the majority of animals used in the Mogambo feedlot should be of this type. There are no exotic or half-bred stock in the area and, to the best of the consultant's knowledge, there are no immediate plans to introduce exotics to the south of the country.

Until more is known about the production coefficients of different ages of animals it is not possible to recommend which specific age category would be best at Mogambo. It is however likely that full grown, but lean, cattle should be well suited to the feedlot conditions. Using this assumption as a basis for planning it has been assumed that the average liveweight of stock at purchase would be 230 kg, and, after 90 days they would leave at over 290 kg liveweight. Production estimates are summarised in Table 5.1.

TABLE 5.1

Production Estimates of Cattle

	90 days	120 days
Average weight at entry	230 kg	230 kg
Average daily weight gain	700 g	700 g
Average weight at exit	293 kg	314 kg
Average total weight gain	63 kg	84 kg

The estimated daily weight gain of 0.7 kg per day is lower than the maximum gains which have been recorded at the Km 7 feedlot in Mogadishu. It is also, however, slightly higher than many recorded gains. It is unlikely that a large scale commercial operation would be able to achieve the maximum gains obtained under research conditions. This would be particularly true for a feedlot where the relatively large number of animals required for commercial operations would mean that a certain number would not be ideally suited to maximum production. It is unlikely that the feedlot, or its buying agent, would be able to purchase animals on an individual basis. Although this would be the ideal, it is probable that cattle would be purchased in groups, some of which would gain at 1 kg per day in the feedlot but others would not do so well.

5.2.2 Nutritional Requirements

Calculations of nutritional requirements (Table 5.2) have been based on an animal weighing 260 kg liveweight. At the assumed level of DM intake (2.5% of body weight) new animals weighing 220 kg would require only 5.50 kg DM per day, while finished animals weighing 290 kg would require 7.25 DM per day. Total dry matter intake depends not only on the size of the animal but also on the palatability, water content and digestibility of the ration. Total intake is limited by the rate of passage of ingesta through the digestive system. A high fibre ration has a slower rate of passage and therefore depresses intake.

The high fibre content of maize stover (31% crude fibre) as compared with 6% for sesame cake, 11% for cotton seed cake or 12% for rice bran would lead to a slow rate of passage and consequently to a low level of dry matter intake. It is therefore necessary to limit the quantity fed. Untreated rice straw has an even lower digestibility than maize stover and is not therefore considered to be a useful component of a feedlot ration.

TABLE 5.2

Estimated Nutritional Requirement of Cattle in Feedlot

Average body weight	260 kg
Estimated dry matter intake:	
(a) as % of body weight	2.5 %
(b) dry matter	6.5 kg per day
Estimated daily requirement per beast:	
(a) TDN	4.58 kg
(b) DP	0.47 kg
(c) ENE	30 MJ
Estimated annual requirement per beast	
(a) DM	2 372 kg
(b) TDN	1 672 kg
(c) DP	171.5 kg
(d) ENE	10 950 MJ
DP : TDN ratio	1 : 9.7

For the purposes of these calculations fixed intake have been assumed. In practice it would probably be beneficial to offer the ration ad lib, gauging by experience how much should be fed but ensuring that feed would always be available.

It is estimated that approximately 2.4 tonnes DM would be required for an animal year.This is the equivalent of 0.58 tonne DM per beast per 90 day feeding period or 0.78 tonne DM for a 120 day period.

5.3 Possible Feedlot Rations

Maize stover, sesame cake and cotton seed cake can be combined to provide suitable feedlot rations. It should be stressed though that unless the Government or a private firm builds an oil mill in the area it is unlikely that the cotton seed concentrate cake will be available. The proximity of large amounts of molasses at the Juba Sugar project means that a cheap source of energy is also available. These four have been combined in different proportions to calculate the feeding values of six different rations. The feeding values of five other rations have also been calculated using a small amount of maize grain as an additional supplement (Table 5.3). In addition, two rations containing urea have been included. Urea content has been limited to 2% because (a) at this level the protein requirements are satisfied, (b) higher contents aggravate the shortage of energy in the ration and (c) urea toxicity is avoided. All rations have been based on a requirement of 2 370 kg DM for each animal year. An animal year requirement is defined as the amount of food required to feed one animal of an average liveweight of 260 kg for one year. In practice, of course, no animals would stay in the feedlot for as long as one year, but the concept is useful for determining feed requirements and relating them to feed availability.

TABLE 5.3

Possible Feedlot Rations

		DM (%)	DM (kg/ animal year)	TDN (kg)	DP (kg)	ENE (MJ)	Fw (kg/ animal year)	Cost (SoSh/ animal year)
1	Maize stover	60	1 422	790	32	3 555	1 580	79
	Cake	20	474	358	176	3 128	504	403
	Molasses	20	474	350	-	2 450	649	201
	Total		2 370	1 498	208	9 133	2 733	683
2	Maize stover	60	1 422	790	32	3 555	1 580	79
	Cake	10	237	179	88	1 564	252	202
	Molasses	30	711	526	-	3 676	974	302
	Total		2 370	1 495	120	8 795	2 806	583
3	Maize stover	50	1 185	658	26	2 962	1 317	65
	Cake	20	474	358	176	3 128	504	403
	Molasses	30	711	526	-	3 676	974	302
	Total		2 370	1 542	202	9 766	2 795	770
4	Maize stover	50	1 185	658	26	2 962	1 317	65
	Cake	30	711	537	264	4 693	756	605
	Molasses	20	474	350	-	2 450	649	201
	Total		2 370	1 545	290	10 105	2 722	871
5	Maize stover	40	948	526	21	2 370	1 053	53
	Cake	30	711	637	264	4 693	756	605
	Molasses	30	711	526	-	3 676	974	302
	Total		2 370	1 589	285	10 739	2 783	960
6	Maize stover	40	948	526	21	2 370	1 053	53
	Cake	20	474	358	176	3 128	504	403
	Molasses	40	948	701	-	4 901	1 299	403
	Total		2 370	1 585	197	10 399	2 856	859
7	Maize stover	50	1 185	658	26	2 962	1 317	65
	Cake	20	474	358	176	3 128	504	403
	Molasses	20	474	350	-	2 450	649	201
	Maize grains	10	237	223	19	1 706	269	201
	Total		2 370	1 589	221	10 246	2 739	870

TABLE 5.3 (cont.)

		DM (%)	DM (kg/ animal year)	TDN (kg	DP (kg)	ENE (MJ)	Fw (kg/ animal year)	Cost (SoSh/ animal year)
8	Maize stover	50	1 185	658	26	2 962	1 317	65
	Cake	10	237	179	88	1 564	252	202
	Molasses	30	711	384	-	3 676	974	302
	Maize grains	10	237	223	19	1 706	269	201
	Total		2 370	1 444	133	9 908	2 812	770
9	Maize stover	40	948	526	21	2 370	1 053	53
	Cake	20	474	358	176	3 128	504	403
	Molasses	20	474	384	-	2 450	649	201
	Maize grains	20	474	447	37	3 413	539	404
	Total		2 370	1 715	234	11 361	2 745	1 061
10	Maize stover	40	948	526	21	2 370	1 053	53
	Cake	15	356	268	132	2 343	378	302
	Molasses	25	592	438	-	3 061	811	124
	Maize grains	20	474	447	37	3 413	539	404
	Total		2 370	1 679	190	11 187	2 781	883
11	Maize stover	40	948	526	21	2 370	1 053	53
	Cake	10	237	179	88	1 564	252	202
	Molasses	30	711	384	-	3 676	973	302
	Maize grains	20	474	447	37	3 413	539	404
	Total		2 370	1 536	146	11 023	2 817	961
12	Maize stover	45	1 067	592	24	2 666	1 185	60
	Molasses	33	782	579	-	4 044	1 071	332
	Maize grain	20	474	447	37	3 413	539	404
	Urea	2	47	-	141	-	50	143
	Total		2 370	1 618	202	10 123	2 845	839
13	Malze stover	40	948	526	21	2 370	1 053	53
	Cake	8	190	143	70	1 251	202	162
	Molasses	30	711	526	-	3 676	974	302
	Maize grains	20	474	447	37	3 413	539	404
	Urea	2	47	-	141	-	50	143
	Total		2 370	1 642	269	10 710	2 818	1 064

Total fresh weight (Fw) requirements range from 2 733 kg to 2 856 kg per animal year for the various rations. Costs show a much greater variation, from SoSh 583 to SoSh 1 282 per animal year. In order to assess the suitability of each ration in relation to the nutritional requirements of the animals to be fattened, the amounts of TDN, DP and ENE provided by each ration have been compared with the average nutritional requirements shown in Table 5.2. The results (Table 5.4) are expressed in terms of a percentage deviation from the required amount, a negative percentage indicating a shortfall and a positive percentage indicating availability in excess of requirements.

TABLE 5.4

Comparison of Feedlot Rations' Nutritional Value and Price per Animal Year

Ration Nr	Percentage deviation from required			Cost per animal[1] (SoSh)
	TDN	DP	ENE	
1	-10.4	+21.3	-16.6	683
2	-10.6	-30.0	-19.7	583
3	-7.8	+17.8	-10.8	770
4	-7.6	+69.1	-7.7	871
5	-5.0[2]	+66.2[2]	-1.9[2]	960[2]
6	-5.2[2]	+14.9[2]	-5.0[2]	859[2]
7	-5.0[2]	+28.9[2]	-6.4[2]	870[2]
8	-5.1	-22.4	-9.5	770
9	+2.6	+36.4	+3.7	1 061
10	+0.4[2]	+10.8[2]	+2.2[2]	1 010[2]
11	-8.1	-14.9	+6.7	961
12	-3.2	+17.5	-7.5	839
13	-1.8	-56.4	-2.2	1 064

Notes: (1) Less vitamin and mineral supplement

(2) Selected rations for feedlot trials

5.3.1 Total Digestible Nutrients (TDN)

All rations apart from 9 and 10 fail to supply sufficient TDN. Rations 9, 10 and 11 include 20% DM as maize grain. Ration 11, the only other one to contain 20% grain contains less concentrate cake (10% DM) than the other two. Of the rations without any grain supplement 5 and 6 have the smallest shortfall of TDN.

5.3.2 Digestible Protein (DP)

Most rations provide considerably more DP than is actually required. The three rations with shortfalls (rations 2, 8 and 11) contain only 10% DM as cake, all other rations provide cake at 15% DM or more. Rations 4 and 5 have gross surpluses of DP and and are the only ones to contain 30% DM concentrate cake.

5.3.3 Estimated Net Energy (ENE)

The three rations providing 29% DM grain (rations 9, 10 and 11) are the only ones to meet ENE requirements. Ration 5, which does not contain grain, has only a very small shortfall of ENE and rations 4, 6 and 7 are all less than 8% deficient in ENE.

5.3.4 Costs

In terms of costs the rations can be split into three groups

(a) Less than SoSh 700 per Animal Year

Rations 1 and 2 cost less than SoSh 700 per animal year and contain 60% DM maize stover. Neither of these rations are able to supply the required amounts of TDN or ENE. Ration 1 meets DP requirements but ration 2 does not. It is unlikely that either of these rations would produce a satisfactory growth rate.

(b) SoSh 700 to SoSh 1 000 per Animal Year

Rations 3, 4, 5, 6, 7, 8 and 11 cost between SoSh 770 and SoSh 961 per animal year. All except 11 are low in TDN and except for 11 also in ENE; of the cheapest rations, 8 is seriously short of DP as well as TDN and ENE. Ration 11 is also low in DP, and 3 is short of TDN and ENE.

(c) Over SoSh 1 000 per Animal Year

Ration 9 costs SoSh 1 061 per animal year and fulfils all the nutritional requirements. Ration 10 costs SoSh 1 010 and also fulfils nutritional requirements.

Of the eleven possible rations considered four were selected that might be used in simple feeding trials; rations 5, 6, 7 and 10. The different weight gains achieved using each ration in preliminary feeding trials would provide information to determine the final ration. The biggest price difference between any two of the four selected rations is SoSh 101 for a whole animal year.

A vitamin and mineral mix would be added to all rations at the rate of 0.1% of the total freshweight. This would effectively increase the cost of all rations by SoSh 55 per tonne.

It should be pointed out that the addition of maize grain to the ration means the diversion of a valuable human food to livestock production. This in itself is contrary to one of the arguments used to justify the exclusion of fodder crops from the agricultural rotation. However, until the techiques required to enable the feeding of large quantities of molasses (over 40% DM) are developed in Somalia, it appears that some grain supplement must be fed if the nutritional requirements are to be realised.

5.4 Number of Animals and Quantities of Feed

There is not an unlimited amount of crop residues and by-products and the scale of any potential feedlot at Mogambo would be limited by the quantities available. The requirements also depend on which ration is used and how many animals of what size are fattened.

Estimated feed requirements have been calculated using four selected rations (rations 5, 6, 7 and 10) (Table 5.5). These rations have been selected on the grounds of their abillty to supply most of the nutritional requirements. A target of 5 000 animal years was used. This would produce between 14 000 and 14 500 fattened animals/year, if the ration was used equally in 90 and 120 day fattening periods. A mixed duration system is proposed due to the likelihood of the feedlot needing to purchase mixed mobs of cattle some of which would be better suited to a shorter fattening period while others would do better on the longer feeding period. The throughput in fact would be 85% of the total theoretical throughput based on the feed requirements of individual animals. This would allow for delays in the purchase of stock, repairs, maintenance and many other minor problems which the feedlot would inevitably face.

TABLE 5.5

Annual Feed Requirements for 5 000 Animal Years on Selected Rations

Ration	Maize stover	Concentrate cake	Molasses	Maize grains	Total
	tonnes freshweight per year				
5	5 252	3 772	4 688	-	13 712
6	5 254	2 515	6 482	-	14 251
7	6 562	2 511	3 234	1 345	13 652
10	5 250	1 885	4 055	2 695	13 885

A comparison with Table 3.3 shows that the requirements for maize stover would be well below production estimates. All rations would require more concentrate cake than would be produced by the project alone. It would therefore be necessary either to reduce the scale of the operation or to purchase the deficit from outside the project. Based on ration 10 and quantities of oil cake which could be available from the cropping area at Mogambo, the target was set at 10 000 fattened animals per year.

5.5 Rate of Development

A feedlot, as with any other agricultural venture, needs to be developed in a series of carefully planned stages. The rate of development of the feedlot unit at Mogambo would not be tied to the rate of agricultural development, though it obviously should not develop at a rate which is faster than the rate of increase in the quantities of crop residues and by-products.

It is proposed that a three phase approach is adopted for the development of the Mogambo feedlot.

Phase I	-	Initial feeding trials
Phase II	-	Pilot feedlot
Phase III	-	Commercial development

5.5.1 The Constraints

The gradual phased approach outlined above is considered necessary for a number of reasons, the most important of which is the fact that commercial feedlot production is a new venture in Somalia and a number of possible constraints exist. The most important are:

(a) limited numbers of suitably trained staff and lack of local knowledge and experience in commercial feedlot production under Somalia conditions;

(b) uncertainties about some vitally important technical parameters which could make the difference between the feedlot being a viable economic proposition or not;

(c) possible problems with the supply of sufficient numbers of suitable stock for fattening;

(d) the establishment of profitable markets for feedlot finished cattle.

Although there are a number of proposals for feedlot projects in Somalia only the small operation at Km 7 has been operating for any length of time. Both the Balad and Trans-Juba feedlots should be operational before the end of 1979 and these will provide useful experience of local problems. These new feedlots will have their own staff requirements and will need to train local personnel; it is unlikely that any surplus trained and experienced staff will be available. It will therefore be necessary for the Mogambo project feedlot to undertake its own training programme if it is to be sure of having suitably experienced staff for full scale commercial development. Unlike the Balad and Trans-Juba operations the Mogambo feedlot would not be using irrigated fodder crops. It would therefore be necessary to develop feeding and management systems which are suited to the ration. All of this would take time and it would be important that the need for thorough training and careful preparation should not be sacrificed for the sake of rapid development.

Experience in other countries indicates that Boran cattle are able to make efficient use of high fibre rations of the sort that would be fed at Mogambo. Theoretical calculations also suggest that reasonable daily weight gains might be achieved with certain rations if fed to the right sort of animals. However, as the economic viability of the feedlot would depend entirely on cattle accepting the rations offered and then being able to convert the ration into economic weight gains, it is vital that these assumptions are verified under local conditions. Rations of this sort have not been used before in Somalia (the

work at Km 7 having made much more use of milling offals than the proposed Mogambo rations) and it would be unwise to commit the funds required for a large scale investment in a commercial operation on the basis of theoretical calculations.

The supply of animals has been discussed in Chapter 4. As far as this aspect is concerned the proposed Mogambo feedlot is fortunate in having the Trans-Juba feedlot so close. The Trans-Juba feedlot will be using the same sort of animals as Mogambo and will therefore have to pioneer effective systems for the supply of stock. There is no doubt that there are sufficient animals in the area to supply the KMF, Trans-Juba and Mogambo; the uncertainty is how many of these cattle will come onto the market at different times of the year and how much they will cost. The gradual development of the Mogambo feedlot would allow sufficient time for this problem to be faced. The experience of the Trans-Juba project in this field should be one aspect that would need careful appraisal before deciding on the move from Phase II (pilot feedlot) to Phase III (full commercial development) at Mogambo.

The same argument is true for the sale of finished stock. If a feedlot is to be economic it is necessary that profits come from premiums paid for the higher quality of the carcass of finished animals as well as from an overall increase in liveweight. At the moment there is little indication that such a premium would be paid for Somali cattle. The high prices currently obtained for Somalia livestock in the live export trade are mainly due to traditional consumer preferences for Somali animals. This preference is more related to flavour than carcass quality. A minimum carcass quality is required by the consumer, but no premium is paid for quality significantly above the minimum. The market outlets used by the Trans-Juba feedlot will be a useful guide to possible markets for the Mogambo feedlot.

5.5.2 The Build-up of Numbers and Rate of Development

The proposed build-up of livestock numbers is shown in Table 5.6, Phase I, the initial feeding trials would take place during year 1. The feeding trials would test the selected rations on cattle of different age groups over different fattening periods. The feeding trials are described in greater detail in the following chapter.

The animals would be required during year 2 as the results of Phase I would be evaluated during this period and, if encouraging, work could start on the construction of the Phase II pilot feedlot on site at Mogambo. The pilot feedlot could start operations in year 3 and during years 3, 4 and 5 would hold 300 cattle at a time and need to purchase 1 050 cattle each year.

Early in year 4 the work of the pilot feedlot would be appraised and results compared with those of the Trans-Juba feedlot. A decision should then be made whether to proceed to Phase III full scale commercial operations. If Phase III is approved as being technically and economically viable, construction could start towards the end of year 4 and commercial production start in year 5. During years 5 and 6 the commercial operation could increase in size until full development is reached at the start of year 8. At full development, assuming ration 10 is used, there could be 5 000 cattle on hand and the feedlot could have an annual turnover of about 10 000 animals.

TABLE 5.6

Build-up in Livestock Numbers

Year	1	2	3	4	5			6 & 7	From year 8
Phasing (2)	Phase I Feeding Trials (8 months) →		← - - - - - Phase II Pilot Feedlot →				← - - - - - Phase III →		
					Pilot	Comm.	Total		
On hand	-	-	300	300	300	600	900	2 500 (3)	5 000
Annual purchase	240	-	1 050	1 050	1 050	1 750	2 800	7 250	10 200
Mortality (1)	42	-	52	21	21	35	56	145	200
Annual sales	798	-	998	1 029	1 029	1 715	2 744	7 105	10 000
Comments:	Feeding trials at Km 7 feedlot. Crop residues to be locally purchased.	Assessment of Phase I and if usable, construction of pilot feedlot (Phase II).	Start of operation of pilot feedlot.	Pilot feedlot in operation; evaluation of Phase II, decision on Phase III; start of construction of commercial feedlot (Phase III).	Continuation of pilot feedlot; construction of commercial feedlot, start commercial operations.			Commercial feedlot at half development.	Commercial feedlot at full development.

Notes: (1) Mortality: 5% years 1 and 2, 2% year 4 onwards
(2) Dotted line indicates construction period
(3) Assumed ration 10 (Table 5.3) used

CHAPTER 6

FEEDLOT DESIGN, IMPLEMENTATION AND MANAGEMENT

6.1 Introduction

It is proposed that the feedlot component of the Mogambo irrigation project would be developed in three phases. Towards the end of each phase the technical results should be carefully assessed and related to other non-project developments in the area. The economic viability of the next phase would then be appraised and a decision made on whether to proceed or not. The consultants realise that this process would mean that the initial rate of development would be relatively slow. However, for reasons which have already been discussed, this is felt to be a more suitable approach than the rapid expansion of feedlot activities based on limited technical data and insufficient numbers of trained staff. It is readily admitted that the development rates outlined in Table 5.6 are conservative and, if any aspects of the earlier phases showed outstanding promise, it should be possible to accelerate the rate of subsequent development.

One possible way in which implementation could be speeded up would be if the Phase I feeding trials were to start ahead of the rest of the project. It is generally agreed that there is an urgent need for trials of this sort in Somalia and the results would be useful to the overall development of the national livestock industry as well as specifically to the Mogambo project. Facilities at the Km 7 feedlot in Mogadishu were designed specifically for this sort of work and only a few relatively minor repairs and modifications would be required. The successful completion of the feeding trials before the start of the main development of the Mogambo project could bring all subsequent activities forward by eighteen months, provided an oil mill and pressing plant are installed near the project site.

In this chapter outlines for the three phases will be presented (Sections 6.2, 6.3 and 6.4) and then details for the pilot and commercial feedlots discussed.

6.2 Phase I: Initial Feeding Trials

6.2.1 Objectives

These trials are designed to determine the levels of dry matter intake and rates of weight gain which could be obtained using the four selected rations. The trials would also evaluate the significance of the age and condition of animals on weight gains and the relative merits of 90 and 120 day fattening periods.

6.2.2 Experimental Design

The basic experimental design of the trials is shown in Table 6.1. Four different rations would be fed to three different age groups of cattle. Each group would contain ten cattle and separate groups would be fattened, under each treatment, for both 90 and 120 day periods. A total of 240 cattle would be required. Cattle would be slaughtered at the end of each trial to enable an analysis of carcass quality to be undertaken.

TABLE 6.1

Design for Feeding Trials: Number of Animals and Feed Requirements

Ration (1)	Age group (years)	Fattening period (days)	Number of animals	Number of animal months	Feed requirements (tonnes Fw)				
					Maize stover	Concentrate cake	Molasses	Maize grain	Total
5	2-3	90	10	30	-	-	-	-	-
	2-3	120	10	40	-	-	-	-	-
	3-5	90	10	30	-	-	-	-	-
	3-5	120	10	40	-	-	-	-	-
	5	90	10	30	-	-	-	-	-
	5	120	10	40	-	-	-	-	-
			60	210	18.42	13.23	17.05	-	48.70
6	2-3	90	10	30	-	-	-	-	-
	2-3	120	10	40	-	-	-	-	-
	3-5	90	10	30	-	-	-	-	-
	3-5	120	10	40	-	-	-	-	-
	5	90	10	30	-	-	-	-	-
	5	120	10	40	-	-	-	-	-
			60	210	18.42	8.82	22.72	-	49.96
7	2-3	90	10	30	-	-	-	-	-
	2-3	120	10	40	-	-	-	-	-
	3-5	90	10	30	-	-	-	-	-
	3-5	120	10	40	-	-	-	-	-
	5	90	10	30	-	-	-	-	-
	5	120	10	40	-	-	-	-	-
			60	210	23.04	8.82	11.36	4.70	47.92
10	2-3	90	10	30	-	-	-	-	-
	2-3	120	10	40	-	-	-	-	-
	3-5	90	10	30	-	-	-	-	-
	3-5	120	10	40	-	-	-	-	-
	5	90	10	30	-	-	-	-	-
	5	120	10	40	-	-	-	-	-
			60	210	18.42	6.62	14.20	9.43	48.67
Total			240	840	78.30	37.49	65.33	14.13	195.25

6.2.3 Management of Trials

There are two options as to where the trials should take place, either at the Trans-Juba livestock project's feedlot or MLFR's feedlot at Km 7 outside Mogadishu. The staff of both these feedlots have indicated a willingness to co-operate with the trials.

The Trans-Juba option has the benefits of being able to ensure that the animals used in the trials would be of the same type as those to be fattened at Mogambo and a readily available supply of molasses from the Juba Sugar project (after 1980). The disadvantages of Trans-Juba include the fact that it has been designed as a commercial feedlot and is not particularly well suited to this sort of experimental work and that the machinery and staff will be busy feeding a commercial ration which is based on silage and there would be many complications in milling, mixing and feeding the rations required for the trials.

The MLFR feedlot at Km 7 was specifically designed for trials of this nature and, apart from a limited amount of repairs and modifications, should be able to undertake the trials without too much difficulty. The feedlot is not currently being used and the new manager who has recently returned from overseas training has expressed great interest in assisting with the proposed trials. The disadvantages of using the Km 7 facilities are possible difficulties in getting enough Boran cattle of suitable age and condition and uncertainty about the availability of molasses. It is probable that it will be possible to purchase the relatively small amount of molasses that would be required from the Jowhar sugar project. These points, however, must be clarified before the trials start, if Km 7 is selected as the best site. In view of the better facilities, and the relevance of the eventual results to overall feedlot development in the country, the consultants consider the Km 7 site would be preferable.

Upon arrival at the site of the trials the cattle in each age group should be randomly selected for both ration and feeding period treatment. Alternatively, for the initial experiments, the animals could be selected at random, regardless of age groups. All animals should be ear marked on arrival, and weighed every week. There is insufficient space at the Km 7 feedlot to take all the animals required for the trials at once and they would have to be split into two sets of four months each. One advantage of this is that it would simplify the mixing and feeding arrangements as only two different rations would be fed at any one time.

All rations should be fed ad lib, though daily records must be kept of the amount eaten and unused food removed every day and replaced with a fresh mix. Water should also be available ad lib in each pen.

If the trials are undertaken at Km 7 the majority of the work could be supervised by the feedlot manager, who has relevant training and experience in trials of this sort. He would be advised and assisted, however, by an animal production specialist who would monitor progress, analyse the results and prepare the final report on the trials. The specialist, who should be hired as a consultant to the Mogambo project, would be required for a total of eight months during the trials. Of these eight months five should be spent supervising and monitoring and three analysing data and writing the report. The final report should include an appraisal of the technical parameters used in the current report and recommend modifications to the subsequent phases that are necessary in light of the experience acquired during Phase I.

Apart from co-operating with the current feedlot manager the animal production specialist will work with an animal production graduate who would be under training for the post of assistant feedlot manager for the subsequent phases of the Mogambo feedlot. Involvement in the initial feeding trials would provide a valuable practical introduction to the principles of intensive feeding systems.

6.2.4 Cattle and Feed Requirements

A total of 240 cattle would be needed. These should all be Boran animals typical of those found in the Juba area. Ideally a verbal history of each animal (date of birth, location of birth and subsequent movements) should be obtained, but it is unlikely this would be possible. It would however be necessary to obtain an estimate of the age of each animal purchased so that the correct numbers of each age group could be purchased. This should be done by an inspection of the incisors of the lower jaw. The approximate groupings should be :

Permanent incisors (Nr)	Approximate age (years)
1	2 - 3
2 & 3	3 - 5
4	> 5

The amount of feed required during the trials would be :-

	Fresh weight tonnes
Maize stover	78.3
Concentrate cake	37.5
Molasses	65.3
Maize grain	14.1
Total	195.2

The specific requirements for each ration are shown in Table 6.1. It would be necessary to feed approximately 800 kg of ration each day if trials are conducted on only two rations at any one time.

At the end of each trial finished cattle would be sold to local butchers. The income from these sales would help to repay some of the cost of the feeding trials.

6.2.5 Analysis and Evaluation of Results

Careful analysis and evaluation of results would be required at the end of the feeding trials. The data for each ration should be used to determine the weight gains of each age group and to decide whether economic commercial production would be possible at Mogambo. At the same time the progress of the Trans-Juba and Balad feedlots should be monitored, with special attention being paid to the supply of animals, the existing markets and the prices of finished cattle. All this information would then be used to decide whether it is advisable to continue to Phase II of the feedlot.

6.2.6 Further Need for Trials

If irrigation development continues in Somalia there will be an increasing amount of crop residues available for livestock feeding. Although maize stover is probably the most suitable high fibre base for rations there will also be large quantities of rice straw available. It is therefore suggested that, in its capacity as a Government research centre, the Km 7 feedlot should investigate the potential of this roughage, using straw treated with sodium hydroxide or other compounds to improve its feeding values. The results of this work would be of great value to a number of proposed irrigation schemes.

6.3 Phase II: The Pilot Feedlot

6.3.1 Introduction

The pilot feedlot would be developed on site at Mogambo. It would constitute an initial training and development stage in preparation for the subsequent full scale commercial operation during Phase III. The pilot feedlot should be of sufficient size to allow the development of operational procedures and management systems which could be used in Phase III. Implementation of the pilot phase would represent a firm commitment by the Mogambo project to go ahead with feedlot development and it would, in effect, be the first step towards full scale commercial development.

6.3.2 Design and Location

The design of the pilot feedlot should be as simple as possible in order to reduce construction and maintenance costs. Cheap local materials should be used where possible. The design of the pens and food store facilities should be the same as those that would be used for commercial production. It is possible, however, that the layout used for the pilot might be modified by the time commercial production starts due to design improvements made during Phase II. Cattle would be held in pens, each containing 100 animals. Details of the design and layout of the pens and feeding systems are discussed later in this chapter.

The pilot feedlot would be built approximately 0.5 to 1.5 km to the south-west of the project's administrative headquarters. An elevated site, with well draining soils should be selected. The siting of the pilot area must be such that it can simply be enlarged to accommodate the Phase III facilities.

6.3.3 Cattle and Feed Management

The type of animal purchased and the ration used would be determined by the results of the feeding trials. It should be remembered, however, that it is unlikely that at full commercial development it would be possible to obtain animals all from one age group and the pilot feedlot should therefore use animals from different age groups, while making every effort to obtain a relatively high proportion of the most profitable group.

For the purposes of planning it has been necessary to make some assumptions about the fattening period. A compromise has been assumed where half the ration would be fed to cattle for 90 days and half for 120 days (Table 6.2). A total of 1 050 head would need to be purchased each year.

Feed requirements would depend on which ration was finally selected (Table 6.2). For the purposes of these calculations it has been assumed that ration 10 is used. Of the four recommended potential rations this is the only one which meets all the nutritional requirements (Table 5.4). Total annual requirement would be 835 tonnes and daily milling capacity should be 2.3 tonnes.

TABLE 6.2

Pilot Feedlot: Number of Animals and Feed Requirements

1. Number of animals on hand

(i)	Animals in 90 day pens on hand	150
(ii)	Animals in 120 day pens on hand	150
(iii)	Total animals held in pilot feedlot	300

2. Number of animals purchased year

(i)	Animals purchased for 90 day fattening/year	600
(ii)	Animals purchased for 120 day fattening/year	450
(iii)	Total of animals purchased/year	1 050

3. Feed requirements

(i) Number of animal months per year:

(a)	- on 90 day period	1 800
(b)	- on 120 day period	1 800
(c)	Total animal months	3 600

(ii) Feed options

	Maize stover	Concentrate cake	Molasses	Maize grain	Total
		(tonnes Fw/year)			
Ration 5	316	227	292	-	835
Ration 6	316	151	390	-	857
Ration 7	395	151	195	81	822
Ration 10	316	113	243	162	834

6.4 Phase III: The Commercial Feedlot

6.4.1 Introduction

Assuming that no serious problems are encountered during Phase II, it is proposed that the pilot feedlot is expanded to a full commercial feedlot, Phase III. The decision to start on Phase III would be taken in the middle of year 4 and the build up of numbers would start the following year.

6.4.2 Design and Location

This would essentially be the same as for Phase II, but modifications may be necessary due to experience gained during the pilot phase.

6.4.3 Cattle and Feed Requirements

At full development, using ration 10, the feedlot could hold 5 000 animals at any one time and would have an annual throughput of about 10 000 animals. This requirement would put heavy demands on the local livestock purchasing systems and would also necessitate the development of a large and effective market for finished animals.

The total annual feed requirements at full development would be :-

	Fresh weight (tonnes)
Maize stover	3 350
Cake	1 200
Molasses	2 580
Maize grain	1 710
Total fresh weight	8 840

A daily milling and mixing capacity of 30 tonnes would be needed to operate the feedlot.

6.5 Feedlot Design and Layout

Each group of 100 cattle would be held in a pen of 1 064 m^2 (Figure 6.1). Two pens would be built back-to-back and four adjoining pens would have a common water supply. Each pen would have 280 m^2 of shade provided by coconut thatch or maize stover on wire frames. Shade is not recommended over the feed bunk areas since this would encourage animals to lie in this area, fouling it and preventing other animals from feeding. Both the feed bunks and water troughs would be protected by a concrete apron, 3 m wide around the water troughs and 2 m wide along the feed bunk. The feed bunks (Figure 6.2) should be made of reinforced concrete and the water troughs of lined blockwork.

There are a number of options available for the selection of materials that could be used for the barriers between each pen. The barriers, which should be 1.5 m high could be made from :

(a) Locally Cut or Imported Poles

Uprights with approximately 20 cm diameter spaced 2 m apart, with 3 horizontal poles of 10 cm diameter at 50 cm intervals. The poles should be treated against termites, either with a pressurised creosote spray or in heated old sump oil. The horizontal would be secured to the uprights by thick gauge fencing wire. If suitable local poles are not available mangrove poles could be imported from Kenya.

(b) Concrete Uprights and Tubular Metal Horizontals

Locally made reinforced precast concrete uprights 150 mm square and 3 horizontal 50 mm tube steel pipes at 50 cm intervals.

(c) Solid Concrete Blockwork Walls

Using standard blocks made on site.

The pilot feedlot would require 4 pens to be built, which would ensure that there was one space. At full commercial development the feedlot would need 56 pens, which would mean that there were 6 spare pens. Spare pens are needed to allow for repairs and maintenance and the removal of sick animals from the main groups. The rate of construction of the feedlot pens in shown in Table 6.3.

The pilot feedlot would need a small handling area which would be equipped with a plunge dip, crush and weigh scale. A larger handling area should be constructed at the start of Phase III and would have an additional crush and weigh scale, cutting gates, holding pens and loading ramp.

The total area required for Phase II, including office, feed stores and feed handling facilities would be 3.2 ha. Phase III would take up approximately 20 ha (see Figure 6.3).

Lack of proper drainage is a potential problem and the final selection of a site for Phases II and III must be done with great care. The feedlot should be sited on free draining soils in an area which should have a 4 or 5% natural slope.

TABLE 6.3

Rate of Construction of Feedlot Pens

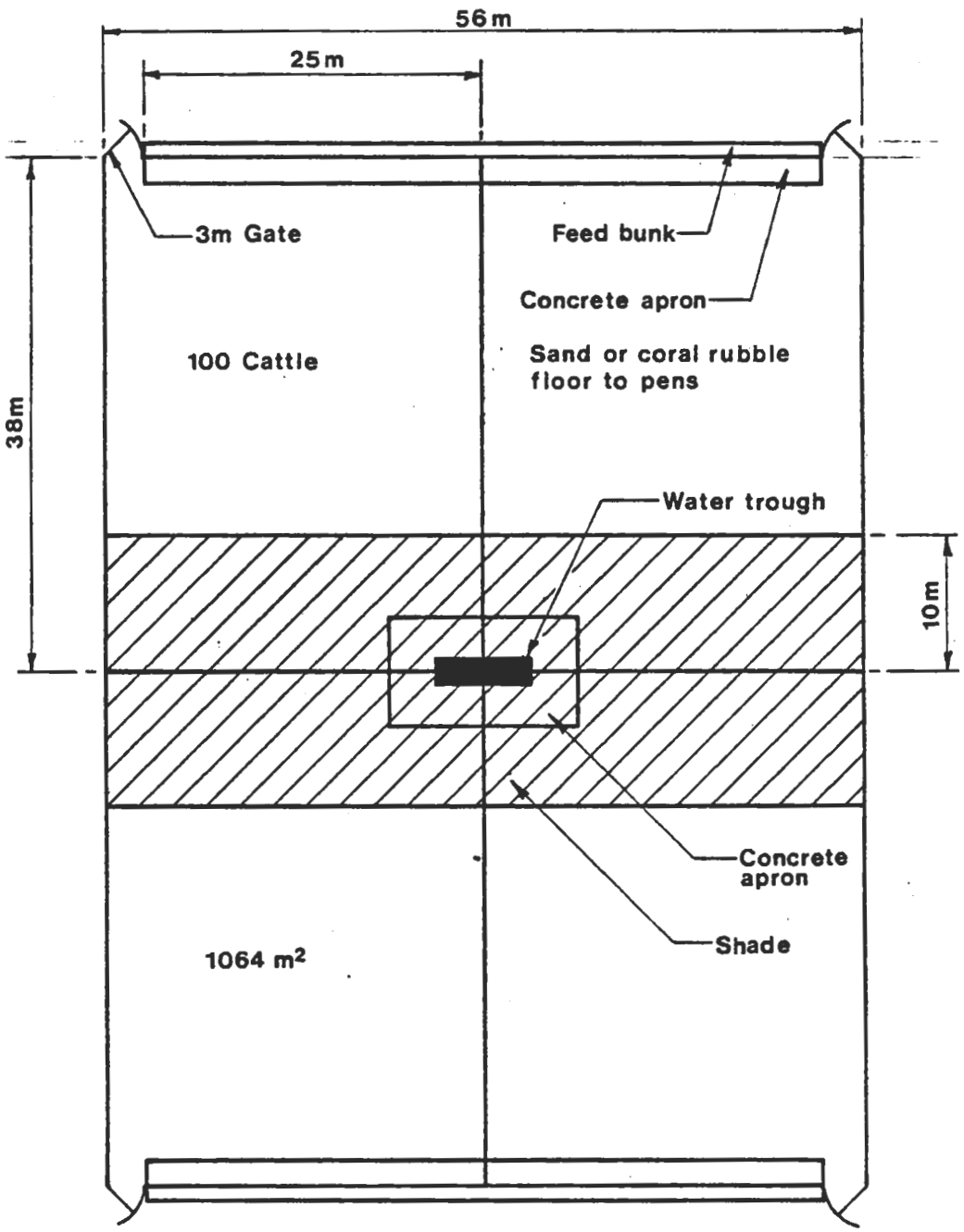
Year	Total pens required (Nr)	Pens built (Nr)	Feed bunk (m)	Internal fencing (m)	Water trough units	Gates (Nr)	Shade (m^2)
2	4	4	100	366	1	4	1 080
3	4	0	0	0	0	0	0
4	4	0	0	0	0	0	0
5	14	10	250	655	3	10	2 700
6	28	14	350	1 021	4	14	3 780
7	56	28	700	2 042	8	28	7 560

6.6 Management of Fodder and Feeding

6.6.1 General

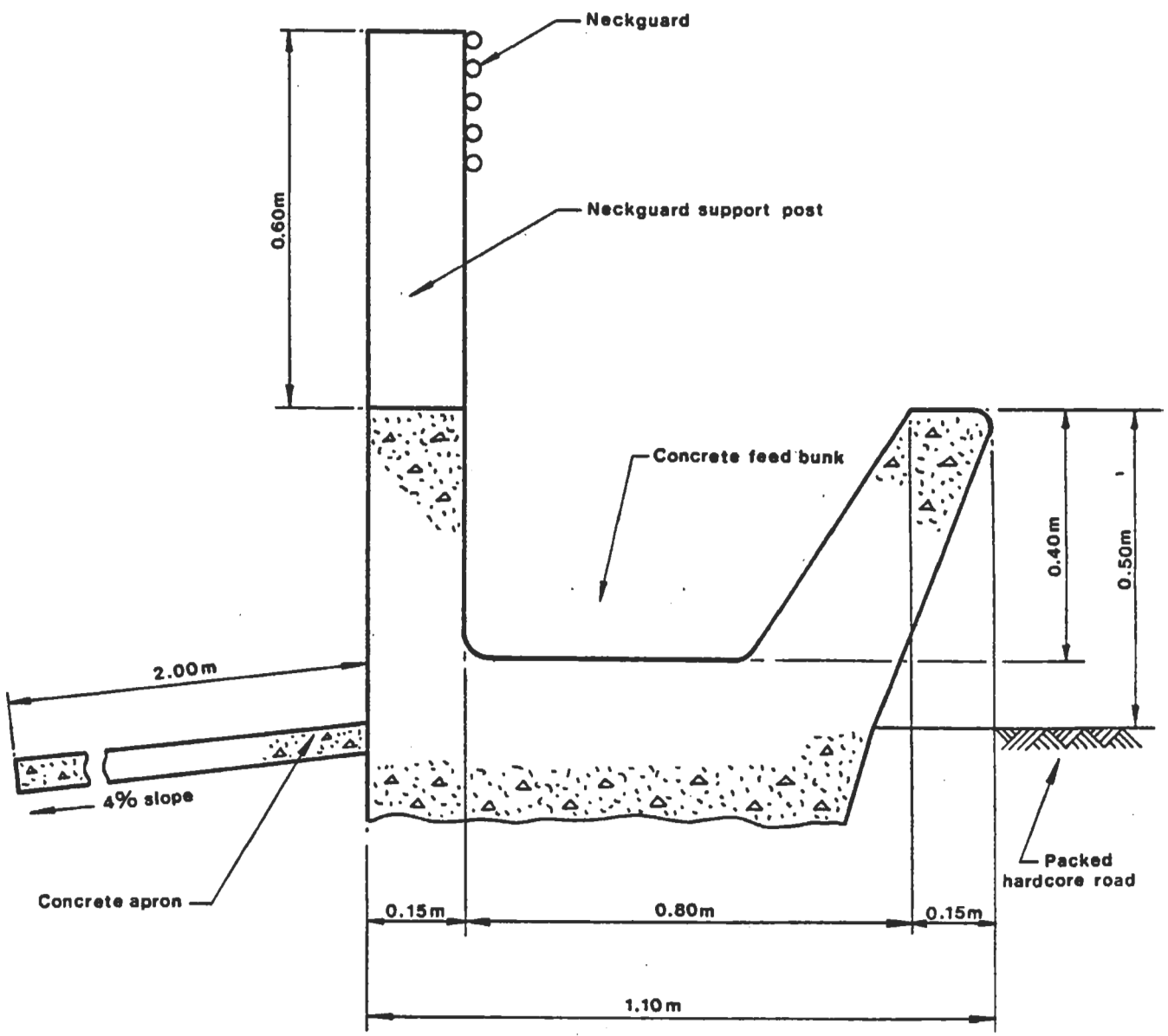
The Phase II pilot feedlot would mix and feed just under 2.5 tonnes rations/day and at full development Phase III would be feeding 24 tonnes/day. The exact amounts of each feed needed would depend on the final ration. All rations, however, contain a relatively large proportion of maize stover and it would be

Feedlot pens 6.1



Approximate scale 1:500

Feed bunk design 6.2

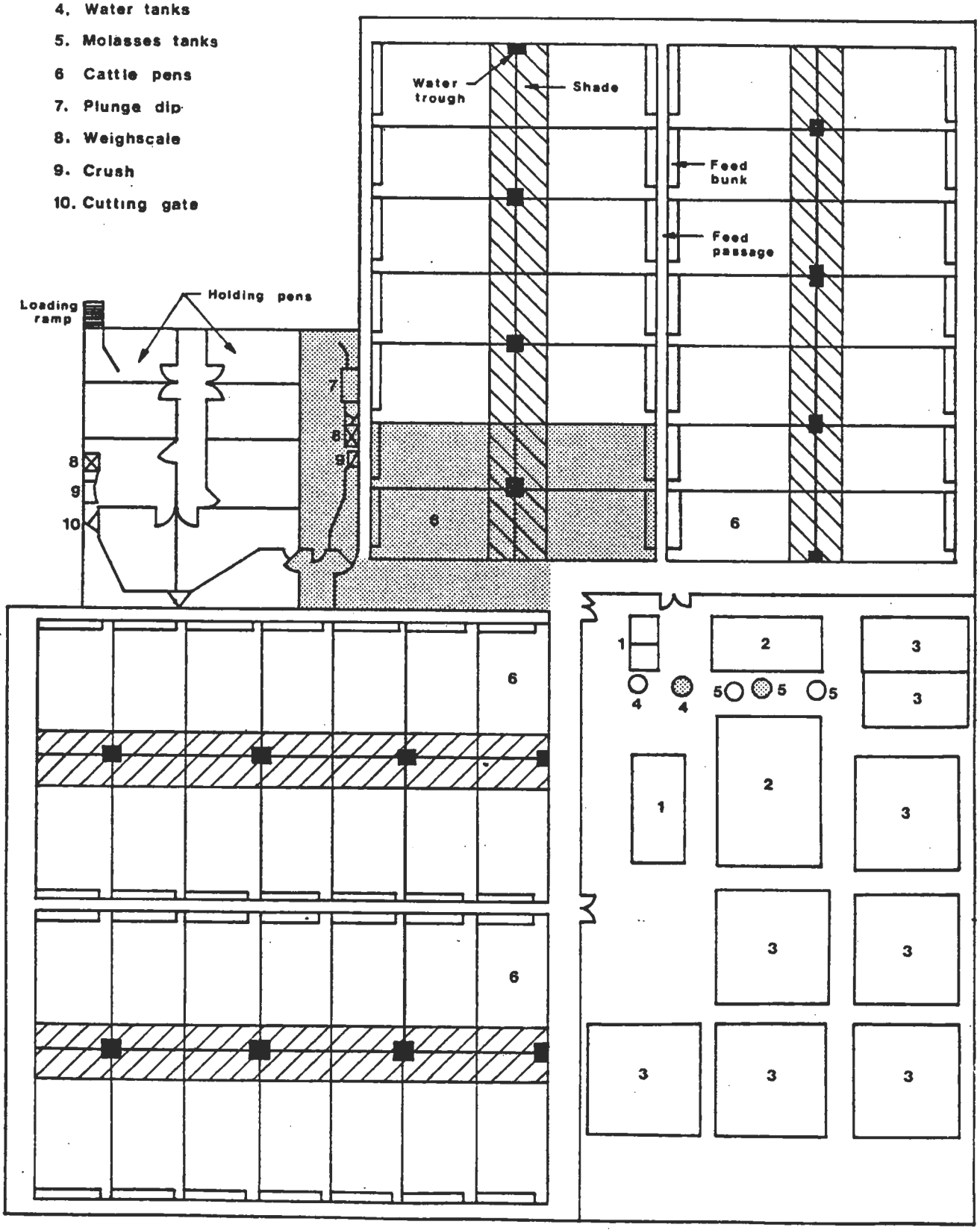


Feedlot layout phases II and III

6.3

Phase II

1. Office and stores
2. Silos and mixing sheds
3. Stover ricks
4. Water tanks
5. Molasses tanks
6. Cattle pens
7. Plunge dip
8. Weighscale
9. Crush
10. Cutting gate



Not to scale

necessary to ensure that this is hammer milled and chopped and thoroughly mixed with the more nutritious and palatable components of the diet. If this is not done there is a danger that cattle would select one part of the ration in preference to others and might not achieve the total daily dry matter intake necessary for rapid and economic growth. The feasibility of hammer milling the large quantities of maize stover involved would be determined during the pilot phase.

6.6.2 Storage

The marked seasonality in the supply of residues and by products means that the feedlot will need extensive storage facilities. This is particularly so for maize stover. Both molasses and concentrate cake will not require such extensive storage as facilities exist at the processing plants of these by products.

Maize stover is a bulky residue and the 3 350 tonnes needed every year will take up considerable space. The low cost of stover makes it uneconomic to spend a lot of money on sophisticated storage systems. It is therefore proposed that the stover is stored after each harvest in hand built ricks covered by a large tarpaulin. This will lead to a certain amount of wastage, but the use of expensive silos can not be justified for this residue. If losses are very high it may be necessary to investigate the use of insecticides to kill the termites and other pests. It would, of course, be essential to ensure that insecticides used were not toxic to ruminants, were cheap and did not reduce stover palatability.

The daily requirement for molasses at full development would be 5.7 tonnes. In order to allow for unseen problems the feedlot should have storage capacity of 100 tonnes. The project would need to run a molasses tanker between the feedlot and the Juba Sugar project at Marere every day in order to keep the storage capacity full.

Over 3 tonnes of concentrate cake would be fed each day. Although there will be storage capacity at the oil mills the feedlot should have a reserve capacity of 100 tonnes which, like molasses, should be constantly maintained. Maize grains requirements would be just under 5 tonnes/day at full development and there should be a reserve storage capacity of 200 tonnes at the feedlot.

6.6.3 Preparation and Feeding of Rations

The maize stover should be fine chopped and hammer milled before being mixed with the other components of the ration. The stover, concentrate cake, maize grain and vitamin/mineral supplement would be weighed and fed into the mixing plant; molasses would be added to the mixture after these dry components have been mixed. The final mixture should be loaded into feed wagons for distribution to the pens.

The annual and daily feed requirements for the project during years 3 to 7 are shown in Table 6.4. It has been assumed that ration 10 would be used.

TABLE 6.4

Annual and Daily Feed Requirements

Year	Maize stover	Cake	Molasses	Maize grain	Total	Maize stover	Cake	Molasses	Maize grain	Total
	(tonnes/year)					(tonnes/day)				
3	316	113	243	162	834	0.87	0.31	0.67	0.44	2.29
4	316	113	243	162	834	0.87	0.31	0.67	0.44	2.29
5	948	339	483	412	2 182	2.60	0.93	1.32	1.13	5.98
6&7	2 625	942	999	1 039	5 605	7.19	2.58	2.74	2.85	15.36
8	3 350	1 200	2 580	1 710	8 840	9.18	3.28	7.07	4.68	24.21

It is proposed that the feedlot should use a series of mills and mixers with a capacity of 10 tonnes/day each. One such set would be required for years 3 to 5, two would be needed in year 6 and four needed in year 8. The advantage of using several small capacity units rather than one large capacity one is that it reduces the potential danger of breakdown. In fact, due to the problems that are encountered in getting spare parts it is recommended that a spare unit is always on hand in case of breakdown. The rate of purchase of the small capacity units will therefore be :

	Units purchased (Nr)	Units available (Nr)
Year 3	1	1
Year 4	0	1
Year 5	1	2
Year 6	1	3
Year 8	1	4

6.6.4 Water Requirements

Estimates of water requirements (Table 6.5) show that in year 8 250 000 litres would be required each day. Allowing for three days storage this would need a storage capacity of 750 000 litres.

TABLE 6.5

Estimated Water Requirements

Year	Cattle (Nr)	Daily (litres)(1)	Storage capacity (litres)(2)
3	300	15 000	45 000
4	300	15 000	45 000
5	900	45 000	135 000
6&7	2 500	125 000	375 000
8	5 000	250 000	750 000

Notes: (1) 50 litres/head/day.
(2) To hold 3 days' supply.

6.7 Animal Health and Husbandry

Ideally, only animals which have recently had the Government's vaccinations against CBPP, rinderpest, anthrax and haemorrhagic septicaemia should be allowed to enter the feedlot. In practice, however, it is unlikely that all the animals required at full commercial development would have been covered and unvaccinated stock should immediately be vaccinated at entry. On arrival all stock should be ear tagged, weighed and mouthed to estimate approximate age and to make sure that their teeth are in good condition. They should be given a basic veterinary inspection and dipped to kill any ticks. Cattle with excessively long sharp horns should have the points cut off to reduce the possibility of damage to other animals in the pens. Animals, especially any young stock, which appear to be infested by worms should be dosed and a check should be kept on trypanosomiasis. Although foot and mouth disease does not usually kill adult cattle in Somalia, due to a level of natural immunity within the national herd, an outbreak within the feedlot would seriously reduce daily weight gains. It would therefore be necessary for a careful check to be kept on this disease. If suitable export markets are identified which have more stringent input regulations than those currently used it would be advisable for all cattle to be vaccinated against this disease on entry to the feedlot or, preferably, in the holding grounds before they enter the feedlot.

Quarantine facilities have not been provided because it is considered that it is better to take prophylactic measures for all animals as they arrive at the feedlot and to maintain the feedlot isolated from the local cattle population.

6.8 Marketing

The projected number of animals which will be bought and sold by the project (Table 6.6) show at full development a purchasing requirement of 14 500 animals/year. These figures are based on the assumption of half the ration going to animals being fattened for 90 days and half for 120 days (Table 5.8). The difference between the numbers bought and sold is due to mortality, which at year 7 is estimated to be 2%.

TABLE 6.6

Livestock Marketing Requirements

(Nr of cattle)

Year	Annual		Monthly	
	Bought	Sold	Bought	Sold
3	1 050	998	87	83
4	1 050	1 029	87	86
5	2 800	2 744	233	229
6&7	7 250	7 105	604	592
8	10 200	10 000	850	833

The general livestock marketing situation in the project area has already been discussed in Chapter 4. With the completion of the marketing component of the Trans-Juba project LDA estimate that their total purchasing capacity will be just under 100 000 cattle each year and it would be possible to put 36 000 of these through the three holding grounds in the area (Gelib, Afmadu and Kismayo). The largest number of cattle LDA has purchased in the area between 1975 and 1978 was 37 214 in 1977. This means that they will have to increase offtake by 250% to reach 100 000 per year. It remains to be seen whether the improved stock

route facilities that are planned will in fact cause such an increase in offtake. These facilities should certainly reduce mortality and weight losses while trekking animals from the north but they might not necessarily increase offtake itself. However, the LDA has indicated that it is confident that it would be able to supply the number of animals required for the Mogambo feedlot, and the development of the Trans-Juba project's feedlot will allow time to assess the actual potential of the LDA to procure suitable feedlot animals in sufficient numbers. The very high price (SoSh 5.30 per kg liveweight) currently required by LDA for sale stock is a potential problem, as this considerably reduces the margins on fattened cattle.

There is uncertainty about the potential markets for finished animals. Again, the experience of the Trans-Juba project will be a helpful indication of what can be done. A lot will depend on whether KMF can exploit a profitable market for the export of chilled carcasses. It has been shown in Chapter 4 if the project were to buy animals from LDA and sell to KMF at the present prices, margins would be very small. Unless, therefore the Govenment was willing to step in and subsidise prices it would be necessary for the project to consider using private traders to supply animals and to sell their animals on the live export market. There is a long term need for Somalia to develop the export of chilled carcass meat as an alternative to live export to the Arabian peninsula. At the moment, however, it does not look as though this is an attractive economic proposition. This problem relates not only to the Mogambo project but to the future development of the livestock industry throughout the country.

6.9 Manangement and Staffing

A high standard of management would be essential if the feedlot is to operate successfully. Although the number of personnel with post-graduate training in animal production is gradually increasing, these staff are not enough to go around all the government posts and projects. The situation will further be improved when the new graduates in animal husbandry from the university have had an opportunity to acquire some practical experience. It is therefore proposed that the Mogambo feedlot is initially run by a suitably qualified and experienced expatriate specialist. This specialist would be required for the whole duration of the pilot feedlot and would hand over the management of the commercial feedlot to his counterpart during the first year of full commercial production.

The Phase II pilot feedlot would be important not only for establishing suitable systems of feedlot management but also for providing training for all levels of staff. This would mean that by the time the project enters full commercial production there would already be a nucleus of trained and experienced staff who are well acquainted with the techniques of feedlot production. This would mean that the pilot phase would carry more staff than are actually required for production alone. This is felt justified in view of the need to provide thorough training for Phase III. Details of staff requirements are shown in Table 6.7. At full development the commercial feedlot would require over 100 staff, two of which (the feedlot manager and assistant manager) should be graduates and four of which should have diplomas.

TABLE 6.7

Staff Requirements for Phases I, II and III

Designation	Man years year 1	2	3	4	5	6&7	8
	Phase I		Phase II			Phase III	
Expatriate Staff							
Animal nutrition specialist	0.7		0.3	0.3			
Feedlot manager(1)		1	1	1	1	1	
Local staff							
Assistant feedlot manager(1)	1	1	1	1	1	1	1
Animal production assistant		1	1	1	1	1	1
Animal health assistant				1	1	1	1
Livestock marketing assistant				1	1	1	1
Animal feed assistant				1	1	1	1
Feedlot manager(1)							1
General foreman			1	1	1	1	1
Stock foreman				1	1	1	1
Feed foreman				1	1	1	1
Storeman					1	1	1
Drivers	1	1	3	3	6	10	10
Secretaries	1		1	1	2	4	4
Clerks			1	1	2	4	4
Mechanic				1	1	1	1
Assistant mechanic					1	1	1
Watermen			2	2	4	6	6
Labourers:							
Stock	4		4	4	8	15	20
Feed	2		4	4	8	15	20
Stores			2	2	4	7	10
General			4	4	8	15	15

Note : (1) In year 8 expatriate manager hands over to assistant manager who becomes new feedlot manager. A new assistant manager would have to be appointed.

6.10 Development Alternatives

It is important from all aspects of planning that the Mogambo irrigation project does not develop in isolation from the other agricultural activities in the Juba area. It has been shown in the earlier chapters of this annex that any feedlot established at Mogambo would be dependent on a number of external factors, the most important of which are the routes, supply and sale of cattle, the construction of an oil mill in the Lower Juba area and the availability of relatively large amounts of molasses from the Juba Sugar project. It is clear, therefore, that the project must be looked at as one part of the overall agricultural and livestock production development of the area. It is to be hoped that the proposed Juba Valley Development Authority can soon be created and will be able to plan and supervise integration of all future activities in the area.

Looking at the production of crop residues and by-products at Mogambo on a regional basis there is a strong argument for incorporating the proposed Mogambo feedlot into the existing Trans-Juba feedlot, which lies on the northern boundary of the Mogambo project. This would take the form of an expansion of the present facilities and a change in emphasis from a ration based mainly on irrigated fodder to the greater use of residues and by-products. Integration of fodder and by-products might form a more nutritious and productive ration than by-products alone. By the time the Mogambo project starts to produce significant quantities of residues, the Trans-Juba feedlot would have been running for several years, and would have gained experience in the important fields of management and marketing. There would seem little sense in establishing a totally new feedlot, with its own infrastructure and management if there was an alternative project, only a few kilometres away, which could expanded to make efficient use of the available residues and by-products. This alternative would require a high level of inter-project co-operation and liaison, with residues coming from both the Juba Sugar project, an oil mill, and the Mogambo irrigation project. The animals would be purchased and managed by the Trans-Juba livestock project. The consultants are aware that such a suggestion raises a number of organisational, institutional and financial problems relating to funding and the responsibility for implementation but these should not be insuperable. Despite this it is felt that the suggestion should be given careful consideration as it should lead to reduced costs and improved efficiency.

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CHAPTER 7

COSTS

TABLE 7.1

Estimated Cost of Phase I: Initial Feeding Trials (SoSh)

Item	Unit	Unit cost	Nr of units	Total cost
Purchase and preparation of rations[1]				
Maize stover	tonne	160	78 3	12 527
Concentrate cake	tonne	800	37 5	30 000
Molasses	tonne	310	65 3	20 243
Maize grain	tonne	1 300	14 1	18 330
Vita minerals	tonne	55 000	0 2	11 000
Mixing costs	tonne	200	195	39 000
Sub-total				131 100
Veterinary Costs [2]	animal	20	240	4 800
Staff				
Animal production specialist (expatriate)	man-month	31 700	8	253 600
Trainee assistant feedlot manager	man-month	1 800	12	21 600
Driver	man-month	500	8	4 000
Labourers	man-month	312	48	15 000
Sub-total				294 200
Transport				
Hire and running of car	month	250	8	2 000
Air fare for AP specialist	ticket etc.	8 000	1	8 000
Sub-total				10 000
Housing[3]				
Accommodation for AP specialist	day	220	240	52 800
Allowance for other staff	month	1 200	20	24 000
Sub-total				76 800
Sundry equipment	set	5 000	1	5 000
Preparation of report	copy	300	50	15 000
Total				536 900

TABLE 7.1 (cont.)

Item	Unit	Unit cost	Nr of units	Total cost
Contingencies (at 10%)				53 700
Purchase of stock				
2 to 3 years old(4)	beast	810	80	64 800
3 to 5 years old(5)	beast	945	80	75 600
>5 years old(6)	beast	1 125	80	90 000
Purchasing expenses	beast	10	240	2 400
Sub-total				232 800
GRAND TOTAL				823 400

Notes: (1) Costs of maize stover and grain greater in Mogadishu than Mogambo, assumed trials to be done at Km 7.
(2) Ear tags, drugs etc.
(3) To cover costs of accommodation in Mogadishu during period of trials. Housing allowances given to trainee feedlot manager and driver.
(4) Assumed 180 kg liveweight at SoSh 4.50/kg = SoSh 810
(5) Assumed 210 kg liveweight at SoSh 4.50/kg = SoSh 945
(6) Assumed 250 kg liveweight at SoSh 4.50/kg = SoSh 1 125

TABLE 7.2

Estimated Returns from Phase I Feeding Trials

Sale of fattened stock	Final(1) average liveweight (kg)	SoSh(2) per kg liveweight	SoSh per animal	Nr(3) of animals	Total value
2 - 3 years old	254	6.25	1 587.5	78	123 800
3 - 5 years old	284	6.25	1 775.0	78	138 500
>5 years old	323	6.00	1 938.0	78	151 200
TOTAL					413 700

Notes: (1) Assuming 700 g per day for both 90 and 120 day periods.
(2) Assumed premium available for younger animals to supply quality butchers and hotels in Mogadishu. Prices valid for only a limited number of animals.
(3) Allowing for 2% mortality.

TABLE 7.3

Capital Costs of Pilot Feedlot (SoSh)

Item	Unit	Unit cost	Nr of units	Total cost	Year
Feedlot Construction					
1. Cattle pens					
Feed bunks	m	1 200	100	120 000	
Internal fencing(1)	m	100	284	28 400	
Gates	Nr	600	4	2 400	
Shade(2)	m^2	10	1 080	10 800	
Water trough	set	1 100	1	1 100	
Earthworks for raised area(3)	m^2	12	1 080	13 000	
Coral base	m^2	25	1 080	27 000	
Sand layer	m^2	25	4 256	106 400	
Sub-total				309 100	2
2. Dip and handling yards	sum	-	-	60 000	2
3. Office and general store	m^2	1 800	50	90 000	2
4. Silos	sum	-	-	9 200	
Auger and elevator system	sum		-	10 000	
Feed mixing shed	m^2	1 500	100	150 000	
Storm ramp and cover	sum	-	-	11 600	
Sub-total				180 800	2
5. Perimeter fence	m	55	600	33 000	2
6. Water tank (50 000 litres + foundations)	tank	80 500	1	80 500	2
7. Molasses tank	tank	30 000	1	30 000	2
8. Roads	km	275 000	0.5	137 500	2
Construction sub-total				920 900	
Feed mixing equipment (2.3 hours/day)					
Chopper	sum	-	-	7 000	
Milling and mixing unit	sum	-	-	70 000	
Sub-total				77 000	3

TABLE 7.3 (cont)

Capital Costs of Pilot Feedlot (SoSh)
(Continued)

Item	Unit	Unit cost	Nr of units	Total cost	Year
Cattle weighbridge	set	3 500	1	35 000	3
Miscellaneous livestock equipment (ear tags, vet. equipment etc.)	sum	10 000	1	10 000	3
Vehicles and machinery					
4 wheel drive pick up	unit	100 000	1		3 and
65 hp tractor	unit	110 000	2		every 7
3 tonne trailer	unit	20 000	2		3 and
Feed wagon (3 tonnes)	unit	45 000	1		every 10
Scraper blade	unit	9 000	1		"
Sub-total					
Housing					
Feedlot manager (200 m^2)	house	550 000	1	550 000	
Assistant manager (100 m^2)	house	255 000	1	255 000	
Technical assistants (75 m^2)		1 000	4	4 000	
Foreman (75 m^2)	Materials	1 000	3	3 000	
Clerks & secretaries (75 m^2)	in	1 000	2	2 000	
Drivers	lieu	500	(3)	1 500	
Mechanic		500	(1)	500	
Labourers	"	500	(14)	7 000	
Sub-total				823 000	3
Equipment and Services					
Office equipment	sum	-	-	5 000	
Office furniture	sum	-	-	10 000	
Water reticulation	sum	-	-	60 000	
Electricity supply	sum	-	-	50 000	
Workshop tools and equipment	sum	-	-	10 000	
Sub-total				135 000	3

Notes: (1) Internal fencing for feedlot to be wooden poles as described in Chapter 6.5.
(2) Shade to be either locally made coconut thatch or maize stover threaded onto wire.
(3) Earthworks, coral base and sand to improve drainage of pens.

TABLE 7.4

Recurrent Costs of Pilot Feedlot (SoSh)

Item	Unit	Unit cost	Nr of units	Total cost
Feed costs				
Maize stover	tonne	50	316	15 800
Concentrate cake	tonne	800	113	90 400
Molasses	tonne	310	243	75 330
Maize grain	tonne	750	162	121 500
Vitamins and minerals	tonne	55 000	1	55 000
Sub-total				358 030

			Year 3		Years 4-5	
			Nr	Cost	Nr	Cost
Staff salaries						
Animal nutrition consultants	man year	380 000	0.3	114 000	0.3	114 000
Feedlot manager	man year	30 000	1	30 000	1	30 000
Assistant manager	man year	21 600	1	21 600	1	21 600
Technical assistants	man year	10 800	-	-	3	32 400
Foreman	man year	9 600	1	9 600	3	28 800
Clerks and secretaries	man year	8 400	2	16 800	2	16 800
Drivers	man year	6 000	3	18 000	3	18 000
Mechanics	man year	10 800	-	-	1	10 800
Labourers	man year	3 750	14	52 500	14	52 500
Watchman	man year	3 750	2	7 500	2	7 500
				270 000		332 400

TABLE 7.4 (cont.)

Recurrent Costs of Pilot Feedlot (SoSh)

Item	Unit	Unit cost	Nr of units	Total cost
Operation and maintenance of vehicles				
4 wheel drive pick up	sum	18 320	1	18 320
65 hp tractor	sum	36 500	2	73 000
Trailer	sum	2 000	2	4 000
Feed wagon		6 750	1	6 750
Scraper blade		900	1	900
				102 970
Veterinary costs	beast	30	1 050	31 500
Office costs	sum	10 000	1	10 000
Purchase of stock	beast	1 226	1 050	1 287 300

TABLE 7.5

Capital Costs, Commercial Feedlot (SoSh)

Item	Unit	Unit cost	Year 5 Nr units	Year 5 Cost	Year 6 Nr units	Year 6 Cost	Year 7 Nr units	Year 7 Cost	Total cost
Feedlot construction									
1. Cattle pens									
Feed bunks	m	1 200	250	300 000	350	420 000	700	840 000	
Internal fencing	m	100	520	52 000	804	80 400	1 608	160 800	
Gates	Nr	600	10	6 000	14	8 400	28	16 800	
Shade	m^2	10	2 700	27 000	37 800	37 800	7 560	75 600	
Water trough	set	1 100	3	3 300	4	4 400	8	8 800	
Earthworks	m^2	12	2 700	32 400	3 780	45 360	7 560	90 720	
Coral base	m^2	25	2 700	67 500	3 780	94 500	7 560	189 000	
Sand layer	m^2	25	10 640	266 000	14 896	372 400	29 792	744 800	
Sub-total				754 200		1 063 260		2 126 520	
2. Dip and yards	sum	-	-	150 000	-	-	-	-	150 000
3. Office and store	m^2	1 800	100	180 000	-	-	-	-	180 000
4. Silos	sum	-	-	22 800	-	32 000	-	64 000	
Auger and elevators	sum	-	-	30 000	-	30 000	-	30 000	90 000
Feed mix shed	m^2	1 500	100	150 000	50	75 000	-	-	225 000
Sub-total				1 080 000		3 105 000		4 050 000	
5. Perimeter fence	km	55 000	2	110 000	-	-	-	-	110 000
6. Water tank (200 000 litres)	tank	200 000	2	400 000	2	400 000			800 000
7. Molasses tanks (1 000 litres)	tank	30 000	1	30 000	2	30 000			
8. Roads 5 m width	km	27 000	1	27 000	1	27 000	0.5	137 500	
Construction Sub-total				2 082 000		1 876 260		2 328 020	
9. Feeding equipment chopping milling and mixing unit (20 tonne/day)	unit	400 000	1	400 000	1	400 000	1	400 000	1 200 000

TABLE 7.5 (cont)

Capital Costs, Commercial Feedlot (SoSh) (Continued)

Item	Unit	Unit cost	Year 5 Nr units	Year 5 Cost	Year 6 Nr units	Year 6 Cost	Year 7 Nr units	Year 7 Cost	Total cost
10. Cattle weighbridge	set	35 000	1	35 000	-	-	-	-	35 000
11. Miscellaneous livestock equipment	sum	-	-	10 000	-	20 000	-	20 000	50 000
12. Vehicles and machinery									
4 wheel driver pick up	unit	100 000	2	200 000	-	-	-	-	
65 hp tractor	unit	110 000	2	220 000	4	440 000	2	220 000	
3 tonne trailer	unit	20 000	2	40 000	2	40 000	-	-	
Feed wagon (3 tonne)	unit	45 000	1	45 000	2	90 000	2	90 000	
Scraper blade	unit	9 000	2	18 000	-	-	-	-	
Fore end loader	unit	20 000	1	20 000	2	40 000	-	-	
Sub-total				543 000		610 000		310 000	
13. Housing									
Storeman (75 m^2)		10 000	1	1 000	-	-	-	-	3 500
Drivers) Materials		500	3	1 500	4	2 000	-	-	1 000
Mechanics) in lieu	man	500	1	500	1	500	-	-	25 500
Labourers)		500	14	7 000	24	12 000	13	6 500	
Sub-total				10 000		14 500		6 500	
14. Equipment and services									
Office equipment	sum	-	-	20 000	-	-	-	-	20 000
Office furniture	sum	-	-	30 000	-	-	-	-	30 000
Water reticulation	sum	-	-	10 000	-	10 000	-	10 000	30 000
Electricity supply	sum	-	-	35 000	-	15 000	-	-	50 000
Workshop tools and equipment	sum	-	-	20 000	-	-	-	-	20 000
Sub-total				115 000		25 000		10 000	150 000

TABLE 7.6

Recurrent Cost - Commercial Feedlot (SoSh)

Item	Unit	Unit cost	Year 5 Nr units	Year 5 Cost	Year 6&7 Nr units	Year 6&7 Cost	Year 8 Nr units	Year 8 Cost	Total cost
1. Feed costs									
Maize stover	tonne	50	632	31 600	2 625	131 250	3 350	167 500	
Concentrate cake	tonne	800	226	180 800	942	753 600	1 200	960 000	
Molasses	tonne	310	240	74 400	999	309 690	2 580	799 800	
Maize grain	tonne	750	250	187 500	1 039	779 250	1 710	1 282 500	
Vitamins and minerals	tonne	55 000	1.6	88 000	6.7	368 500			
Sub-total				474 300		1 973 790		3 209 800	5 657 890
2. Staff salaries[1]									
Expat. feedlot manager	man year	380 000	-	-	1	380 000	-	-	
Feedlot manager	man year	30 000	-	-	-	-	1	30 000	
Assistant feedlot manager	man year	21 600	-	-	1	21 600	1	21 600	
Technical assistants	man year	10 800	1	10 800	4	43 200	4	43 200	
Foremen and storemen	man year	9 600	1	9 600	4	38 400	4	38 400	
Drivers	man year	6 000	3	18 000	10	60 000	10	60 000	
Mechanic	man year	10 800	-	-	1	10 800	1	10 800	
Clerks and secretaries	man year	8 400	2	16 800	8	67 200	8	67 200	
Assistant mechanic	man year	10 800	1	10 800	1	10 800	1	10 800	
Labourers	man year	3 750	14	52 500	52	195 000	65	243 800	
Watchmen		3 750	2	7 500	4	15 000	4	15 000	
Sub-total				126 000		842 000		540 800	

TABLE 7.6 (cont.)

Recurrent Cost - Commercial Feedlot (SoSh)

Item	Unit	Unit cost	Year 5 Nr units	Year 5 Cost	Year 6&7 Nr units	Year 6&7 Cost	Year 8 onwards Nr units	Year 8 onwards Cost
3. Operation and maintenance of vehicles								
4 wheel drive pick up		18 320	3	55 000	3	55 000	3	55 000
65 hp tractor		36 500	4	146 000	8	292 000	10	365 000
Feed wagons		6 750	2	13 500	4	27 000	6	40 500
Trailer		2 000	4	8 000	6	12 000	6	12 000
Scraper blade		900	3	2 700	3	2 700	3	2 700
For end loader		2 000	1	2 000	3	2 000	3	2 000
Sub-total				227 200		390 700		477 200
4. Veterinary costs								
Cattle	beast	30	1 750	52 500	7 250	217 500	10 200	306 000
5. Maintenance of buildings and facilities	sum							
6. Office costs	sum	-	-	5 000	-	10 000	-	15 000
7. Purcase of stock	beast	1 226	1 750	2 145 500	7 250	8 888 500	10 200	12 505 200

Note: (1) During year 5 the expatriate manager, assistant manager, 3 technical assistants and a number of subordinate staff are already available for the pilot feedlot.

TABLE 7.7

Estimated Returns from Sale of Finished Stock

Year	Total cattle sold[1] (Nr)	From 90 day feeding at 293 kg (Nr)	Total liveweight from 90 day feeding per year (kg)	From 120 day feeding at 314 kg (Nr)	Total liveweight from 120 day feeding per year (kg)	Total annual finished liveweight (kg)	Total annual income (SoSh '000) at different liveweight values (SoSh/kg)[3]		
							5.40	5.90	6.25
3	998	570	167 010	428	134 392	301 402	1 627.57	1778.27	1 883.76
4	1 029	588	172 284	441	138 474	310 758	1 678.09	1 833.47	1 942.24
5	2 744	1 568	459 424	1 176	369 264	828 688	4 474.92	4 889.26	5 179.30
6 & 7	7 105	4 060	1 189 580	3 045	956 130	2 145 710	11 586.83	12 659.69	12 410.69
8 onwards	10 000	5 700	1 670 100	4 300	1 350 200	3 020 300	16 309.62	17 819.77	18 876.88

Notes: (1) See Table 6.6

(2) Feed divided equally between 90 day and 120 day rations

(3) See Table 4.7

CHAPTER 8

FINANCIAL AND ECONOMIC ANALYSIS

8.1 Introduction

The original TAMS/FINTECS report included a feedlot component in the overall project design, and a substantial part of the project area was planted to fodder crops or crops with by-products usable by livestock.

With the new cropping patterns presented in this report, any livestock component becomes virtually independent of the main project, since the only usable direct by-product from the project is maize stover. For this reason, this analysis considers a potential feedlot as an independent entity.

Costs and returns presented in Chapter 7 are all calculated on a financial basis. This chapter presents a financial analysis based on these data, and then reconsiders the feedlot on the basis of economic data.

The analysis only includes the pilot feedlot and commercial feedlot since it is assumed that the initial feeding trials described as Phase I will be supported by MLFR at Kilometre 7 in Mogadishu.

8.2 Results of Financial Analysis

Table 8.1 presents a 20 year cash flow for the feedlot as specified, using 1979 financial prices. Machinery operating and maintenance costs are shown in Table 8.2. The sale price identified by the 1979 IBRD/FAO Livestock Marketing Study is shown in Table 4.6 as SoSh 5.90 per kg. At this price the internal rate of return is 1.98%. At SoSh 5.40 per kg, the feedlot project makes a net loss over the 20 year period, assuming SoSh 6.25 per kg gives an internal rate of return of 12.86% but it must be noted that this price is obtainable only for a specialised limited market in Mogadishu (see Table 4.6).

8.3 Economic Analysis

An economic analysis also at 1979 values, has been prepared based on Table 8.1, but removing the effects of taxes and duties, shadow pricing unskilled labour and using import - parity prices where appropriate for taxes and duties.

The adjustments for taxes and duties are:

Item	Economic value
Construction costs	Financial value less 10%
Feed mixing equipment	Financial value less 10%
Cattle weighing and mix equipment	Unchanged
Agricultural machinery	Unchanged
Housing	Financial value less 30%
Equipment & services & office costs	Financial value less 10%
Veterinary costs	Financial value less 10%
Maintenance of buidings	Unchanged

TABLE 8.1 Mogambo Feedlot - 20 Year Cash Flow Annual Cost (Financial) (SoSh '000)

Year	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Capital Costs																				
Pilot feedlot construction	921	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feed mixing equipment	-	77	-	-	-	-	-	-	-	-	-	77	-	-	-	-	-	-	-	-
Cattle weighbridge and mixing equipment	-	45	-	-	-	-	10	-	-	-	-	10	-	-	-	-	10	-	-	-
Land Rovers and tractors	-	320	-	-	-	-	-	-	320	-	-	-	-	-	-	320	-	-	-	-
Trailers and scrapers	-	94	-	-	-	-	-	-	-	-	-	94	-	-	-	-	-	-	-	-
Housing	-	823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment and services	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	921	1 494	-	-	-	-	10	-	320	-	-	181	-	-	-	320	10	-	-	-
Commercial feedlot construction (1 - 8)	-	-	-	2 082	1 876	2 328	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feed mixing equipment	-	-	-	400	400	400	-	-	-	-	-	-	-	400	400	400	-	-	-	-
Cattle weighbridge and mixing equipment	-	-	-	45	20	20	-	-	-	-	-	30	-	-	-	-	30	-	-	-
Land Rovers and tractors	-	-	-	420	440	220	-	-	-	-	420	440	220	-	-	-	-	420	440	220
Trailers, scrapers and fore-end loader	-	-	-	123	170	90	-	-	-	-	-	-	-	123	170	90	-	-	-	-
Housing	-	-	-	10	15	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment and services	-	-	-	115	25	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	3 195	2 946	3 075	-	-	-	-	420	470	220	523	570	490	30	420	440	220
Operational Costs																				
Feed costs	-	358	358	832	1 974	1 974	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210	3 210
Salaries and wages	-	270	332	458	842	842	541	541	541	541	541	541	541	541	541	541	541	541	541	541
Operation and maintenance of vehicles(2)	-	103	103	432	390	390	477	477	477	477	477	477	477	477	477	477	477	477	477	477
Veterinary costs	-	32	32	84	218	218	306	306	306	306	306	306	306	306	306	306	306	306	306	306
Maintenance of buildings and facilities	-	-	14	14	16	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Office costs	-	10	10	15	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Stock purchases	-	1 287	1 287	2 146	8 889	8 889	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505
Sub-total	-	2 060	2 136	3 881	12 339	12 340	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071	17 071
TOTAL Costs	921	3 554	2 136	7 076	15 283	15 415	17 081	17 071	17 391	17 071	17 491	17 722	17 291	17 594	17 641	17 881	17 111	17 491	17 511	17 291
Total returns @ SoSh 6.25/kg	-	1 884	1 942	5 179	13 411	13 411	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	27 002(1)
Total returns @ SoSh 5.90/kg	-	1 778	1 833	4 889	12 660	12 660	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 810	17 820	17 820	17 820	25 490(1)
Total returns @ SoSh 5.40/kg	-	1 628	1 678	4 475	11 587	11 587	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	23 330(1)

Notes: (1) Includes herd salvage value of 5 000 animals @ 260 kg each.
(2) See Table 8.2.

As discussed in Annex 7, unskilled labour is shadow priced at the opportunity cost of SoSh 8 per day, or SoSh 2 500 per year.

Machinery economic operation and maintenance costs are detailed in Table 8.2.

There is no export parity price for maize stover; and molasses, vitamin and mineral costs are based on world prices. A large proportion of the concentrate cake available from the Mogadishu oil mill is based on imported feeds bought on the world market, so the only economic adjustment to feed costs is the substitution of the economic price (Annex 7) for maize grain of SoSh 120 per tonne.

Cattle purchase and sale prices are effectively based on competition with world producers in Arabian markets, so these prices will remain unchanged for the economic analysis.

Table 8.3 shows the result of economic analysis. The IRR's at various price levels are:

Sale price SoSh/kg	IRR
6.25	7.98
5.90	0
5.40	0

Again the project is only liable under an exceptionally high price assumption. In practice, SoSh 5.90 is the highest price to be expected, and at this price the project makes a loss over 20 years.

8.4 Conclusion

The proposed feedlot cannot be considered economically or financially viable under the assumptions developed in this annex. The underlying reason is that there is very little difference between the liveweight buying and selling prices per kilogramme and no price premium is paid for quality carcasses in the markets available to the feedlot. In addition to the price differentials, the absolute level of prices is low, reflecting the margins required for the low cost efficient traditional producers in Somalia. no bonus prices are available to the feedlot to offset the costs which are greater than for traditional producers.

The result is not surprising since at the time of writing very few feedlots anywhere in the world were still operating profitably, even in areas where production efficiency is better than might be expected to be achieved in Somalia.

The economic success of feedlot operation depends on the margin between buying and selling prices, on the availability of low cost feeds, on the achievement of high growth rates, and on the minimisation of overhead costs. If the first two factors change during the life of the Mogambo project, a feedlot component can be re-examined for inclusion. Meanwhile, the Mogambo project should be able to assist the Trans-Juba Feedlot by supplying maize stover, and its presence may encourage the establishment of a local oil mill producing concentrate cake.

TABLE 8.2

Annual Operating and Maintenance Costs for Feedlot Machinery (SoSh)

Item	Base price	Life (years)	Repairs annual % of base price	Annual repairs costs	Allowances (1)	Annual fuel costs Economic	Annual fuel costs Financial	Total annual costs Economic	Total annual costs Financial
Land Rover	100 000	7	10	10 000	1 000	4 260	7 320	15 260	18 320
65 hp Tractor	110 000	7	15	16 500	2 000	12 500	18 000	31 000	36 500
3 Tonne Trailer	20 000	10	10	2 000	-		-		2 000
3 Tonne Feed Wagon	45 000	10	15	6 750	-		-		6 750
Scraper blade	9 000	10	10	900	-		-		900
Fore-end loader	20 000	10	10	2 000	-		-		2 000

Note : (1) See Annex 7, Appendix II.

TABLE 8.3 Mogambo Feedlot - 20 Year Cash Flow

Annual Costs (Economic) (SoSh '000)

Year	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Capital Costs																				
Pilot feedlot construction	829	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feed mixing equipment	-	69	-	-	-	-	-	-	-	-	-	69	-	-	-	-	-	-	-	-
Cattle weighbridge and mixing equipment	-	45	-	-	-	-	10	-	-	-	-	10	-	-	-	10	-	-	-	-
Land Rovers and tractors	-	320	-	-	-	-	-	-	320	-	-	-	-	-	320	-	-	-	-	-
Trailers and scrapers	-	94	-	-	-	-	-	-	-	-	-	94	-	-	-	-	-	-	-	-
Housing	-	576	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment and services	-	122	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	829	1 226	-	-	-	-	10	-	320	-	-	173	-	-	320	10	-	-	-	-
Commercial feedlot construction	-	-	-	1 876	1 688	2 095	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feed mixing equipment	-	-	-	360	360	360	-	-	-	-	-	-	-	360	360	360	-	-	-	-
Cattle weighbridge and mixing equipment	-	-	-	45	20	20	-	-	-	-	-	30	-	-	-	-	30	-	-	-
Land Rovers and tractors	-	-	-	420	440	220	-	-	-	-	420	440	220	-	-	-	-	420	440	220
Trailers, scrapers and fore-end loader	-	-	-	123	170	90	-	-	-	-	-	-	-	123	170	90	-	-	-	-
Housing	-	-	-	10	15	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment and services	-	-	-	104	23	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	2 936	2 716	2 801	-	-	-	-	420	470	220	483	530	450	30	420	440	220
Operational Costs																				
Feed costs	-	439	439	1 038	2 493	2 493	4 065	4 065	4 065	4 605	4 085	4 065	4 065	4 065	4 065	4 065	4 065	4 065	4 065	4 065
Salaries and wages	-	250	280	386	772	772	455	455	455	545	455	455	455	455	455	455	455	455	455	455
Operation and maintenance of vehicles[2]	-	89	89	287	339	339	415	415	415	415	415	415	415	415	415	415	415	415	415	415
Veterinary costs	-	29	29	76	196	196	275	275	275	275	275	275	275	275	275	275	275	275	275	275
Building maintenance	-	-	12	12	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Office costs	-	9	9	14	9	9	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Stock purchases	-	1 287	1 287	2 146	8 889	8 889	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505	12 505
Sub-total	-	2 103	2 145	3 959	12 712	12 713	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744	17 744
TOTAL Costs	829	3 329	2 145	6 875	15 428	15 514	17 754	17 744	18 864	17 744	18 164	18 387	17 964	18 227	18 594	18 204	17 774	18 164	18 184	17 964
Total returns @ SoSh 6.25/kg	-	1 884	1 942	5 179	13 411	13 411	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	18 877	27 002[1]
Total returns @ SoSh 5.90/kg	-	1 778	1 833	4 889	12 660	12 660	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 820	17 810	17 820	17 820	17 820	25 490[1]
Total returns @ SoSh 5.40/kg	-	1 628	1 678	4 475	11 587	11 587	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	16 310	23 330[1]

Notes: (1) Includes herd salvage value of 5 000 animals @ 260 kg each.
(2) See Table 8.2.

Source: Tables 7.3 to 7.7 and Section 8.3

APPENDIX I

COMMENTS ON THE TAMS/FINTECS FEASIBILITY STUDY PROPOSALS FOR A LIVESTOCK FEEDLOT

Comments on the TAMS/FINTECS Feasibility Study

LIVESTOCK

1. Introduction

The terms of reference for the consultants requires them to 'review critically the technical and economic aspects of the livestock component of the project and recommend whether it should be included in the project'.

Since the orignal feasibility study was written there has been a basic change in the proposed cropping pattern which has meant that irrigated fodder is not going to be grown. This change has also meant that different crop residues will now be available than were originally planned for. In view of these changes the consultants decided that it would be more useful to write a new proposal for a feedlot rather than to attempt modfications of the existing proposals. In some respects the new proposals do not differ a great deal from the original ones; in others, however, there are considerable differences. These differences are partly due to the changes in the cropping programme and partly due to changes in local conditions since the original proposals were written. The new proposals are presented in Annex 4 of this report.

In order to satisfy the terms of reference the consultants have reviewed the original feedlot proposals.

2. General Comments

Although in all planning exercises it is obviously necessary to offer positive and constructive suggestions it is felt that the proposals over simplify the complex livestock production and marketing systems in the area and do not stress sufficiently the uncertainties and possible constraints of feedlot development. There is very limited local experience in operations of this kind and a more cautious approach would have been justified. In general the estimate of yeilds and liveweight gains are over optimistic and the cost estimates are too low. It should, however, be added that since the report was written prices have risen steeply.

3. Specific Comments

The following comments refer to specific technical aspects of the original proposals in Part VI of Appendix 2.

Page	Paragraph	
VI - 3	2	Data from the Animal By-Product at Km 7 are not 'well documented' and little reliable information is available.
VI - 7	6,7	These weights are more likely to be normal maximum weights rather than average weights.

VI - 8	9	During the rains pastoralists are more likely to retain their animals than sell them. There is a marked increase in price at the start of the rains which is due to the lack of animals on the market and the need for an increased inducement to get the pastoralists to sell stock. Sales increase and prices drop during the dry season or a series of bad years due to the pastoralists' need to obtain cash to purchase grain food supplements to feed their family.
VI - 10	10	It is doubtful whether 'proper planning and development strategy could easily double the number of livestock in the country'. The rangelands of Somalia are in a state of delicate ecological balance between primary production (which depends on rainfall) and grazing pressure (which depends on the number of livestock). Proper range management planning has to take into account the constant and very real threat of drought and stocking rates should be adjusted accordingly. It certainly should be possible to increase carrying capacity and improve the weight and condition of animals, but this is very unlikely to result in a doubling of the livestock population, and it certainly will not be easy.
VI - 10	11	Although under good conditions the rangeland of Somalia can be very productive, low and erratic rainfall makes the classification of 55% of the land as 'prime' rangeland questionable.
VI - 14	15	There is no evidence that the cattle are resistant to foot and mouth disease, but they are certainly tolerant to it.
VI - 21	Table VI-7	The 10% assumed animal offtake is probably too high; between 5 and 7% would be a more realistic figure, reducing the number available to between 75 780 to 106 092. No account is taken of local home slaughter (estimated in the Livestock Sector Review to be 1.2% of the total herd) which would require 18 190 extra cattle, but the reduced new Trans-Juba needs would allow for that. Municipal slaughter needs appear to be low; 0.35% of total need. When compared with the 2.4% quoted in the Livestock Sector Review the higher figure would require an extra 31 000 cattle. All these calculations, however, depend on an accurate estimate of the total number of animals available and it is possible that the figure is 2 million as opposed to 1.5 million.
VI - 24	28	The need for co-operation between projects discussed in this paragraph is very important and has the full support of the present consultants.
VI - 25	31	There are no indications that Kismayo Meat Factory has progressed with its plans to install additional equipment to increase the capacity to 120 000 head per year.

VI - 27 34 The facilities for handling stock at Kismayo port are far from adequate.

VI - 29 Table VI-8 Sugar cane tops 13% TDN not 40%; sugar cane molasses 54% TDN not 30%. Although large quantities of bagasse are produced it is all to be used as fuel on the Juba Sugar project and would not therefore be available for animal production.

VI - 30 38 Prices have changed considerably since this was written, and the margins that can be expected are very much less.

VI - 31 40 Veterinary standards at Kismayo port are low.

VI - 34 44 It is unlikely that berseem (**Trifolium alexandrinum**) would grow well in the Juba area. It is possible that the author means **Medicago sativa** (lucerne or alfalfa) which, in some countries, is erroneously called berseem. In view of the earlier reference to alfalfa (page VI - 13, paragraph 13) though, it is unlikely that this mistake is being made.

VI - 37 47 56 to 66 cm/head feeding space is more than would be required; construction costs could be reduced if only 25 to 30 cm/head were used.

VI - 38 Table VI-9 Neither rice straw nor sesame stalks are particularly good components of a feedlot ration. Estimated yields of residues appear rather too high. More realistic yields would be:-

	Tonnes/ha	% Availability
Maize stover	4	60
Rice straw	2	60

VI - 42 Table VI-10 and VI - 11 If the actual dry matter intake levels given in Table VI - 10 are applied to the relative amounts of TDN and DP shown in Table VI - 11 the only nutritional requirement met is that of DP for 300 kg animals.

Weight (kg)	DM intake	DP needed	DP available	TDN needed	TDN available
200	5.3	0.60	0.47	4.3	3.9
300	7.4	0.66	0.66	5.7	5.44
350	8.0	0.73	0.71	6.4	5.88

This shortfall of nutrients is unlikely to have effects on the potential daily weight gains.

VI - 49 Table VI-5 It is unlikely that only 2 green crop loaders would be sufficient to handle the 240 tonnes of green forage that would be fed every day.

VI - 56	59b	It is not justifiable to use the prices obtained by the Km 7 feedlot as it was (and still is) supplying a limited, high quality market in the Mogadishu hotels.
VI - 57	61b	The bulk of the Km 7 ration was rice or wheat bran and very little roughage was fed. Although 1.04 kg/head/day had been recorded for certain animals this is certainly not the average gain. The proposed ration will be feeding 40% DM high fibre roughage and will provide less than the total required nutrients. The 1 kg/day weight gain is therefore considered to be too high and 700 g/day would be a more realistic figure.