ARAB AUTHORITY FOR AGRICULTURAL
INVESTMENT and DEVELOPMENT

FEASIBILITY STUDY FOR A FEEDLOT COMPLEX PROJECT IN WESTERN OMDURMAN - SUDAN

Volume 1

EXECUTIVE SUMMARY

ARAB ORGANIZATION FOR
AGRICULTURAL DEVELOPMENT

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LEAGUE OF ARAB STATES
ARAB ORGANIZATION FOR AGRICULTURAL DEVELOPMENT
KHARTOUM.

President,
AAAID,
P. O. BOX 2102,
Khartoum
Democratic Republic of Sudan

Dear Colleague,

Reference to the agreement made between AAID and AOAD so that AOAD carries out a feasibility study for you, and in accordance with the specified terms of reference, I am pleased to submit to you 50 copies of the final report of the feasibility study for a Feedlet Complex Project In Western Omdurman - SUDAN.

In this connection I should like to draw your kind attention to the fact that the project will have several locations in Darfur, Kordofan, White Nile and Khartoum Provinces. In Year Four the project will reach maturity and the number of cattle to be fattened and slaughtered will be 160,000/ year in addition to 32,000/ year live animal to be finished and sold in Omdurman livestock market for local consumption. The project capital cost is LS. 86.8 millions and the project operating costs will be LS. 55.2 millions, while the FRR and the ERR are expected to be 19% , 21.3% respectively at 1982 prices.

In submitting this final report of the project, I wish

to acknowledge the assistance of your two staff members who participated in the study. I also assure you that AOAD will always be ready for future cooperation between us in all fields of agriculture.

Best personal regards.

Yours sincerely,

H. Fahmi Jumah

Dr. Hassan Fahmi Jumah
DIRECTOR GENERAL

VOLUME I

EXECUTIVE SUMMARY

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PROJECT SUMMARY SHEET

The project will have several locations in Darfur, Kordofan, White Nile and Khartoum Provinces. The total area of the Provincial Holding grounds in Darfur, Kordofan and White Nile Provinces is 127,757 feddans (199,62 square miles) while the area of the Animal Production Complex in Western Omdurman, Khartoum Province, is estimated to be about 2,000 feddans.

PROJECT SIZE AND COMPONENTS :

1. From PY4 when the project will reach maturity the number of cattle to be fattened and slaughtered will be 160,000/year.

2. The five Provincial Holding Grounds will be located at Nyala, El Dea'n, El Merum, El Tibune and Kosti.

3. Animal Production Complex in Western Omdurman will comprise :

   - A Central Assembly Area : 15,000 - 20 cycles / year.
   - The Feedlot : 40,000 - 4 cycles /year
   - The Feed Mill : capacity by PY4 will be 30 tons/hour working two shifts/day. Total annual production will be 144,000 tons.
   - The Abattoir : capacity 75 head of cattle/hour or 500 head per working day.
   - Refrigerated capacity : 100 tons chilling and freezing, and 150 tons frost and cold storage.

Deboning facilities : 80 tons of meat/day.

Dry rendering plant capacity : 13 tons/day.

PROJECT OUTPUTS :

Live Animals sold at Omdurman Livestock Market	-	32,000 head
Bone- in meat	-	3274 tons
Prime cuts	-	9998 "
Minced Meat	-	3892 "
Valuable edible by-products	-	900 "
Other by-products (meat, bone and blood meal)	-	1000 "
Fat	-	1750 "
Hides	-	3640 "
Manure	-	240,000 M^3

PROJECT COSTS (£S)	FC		DC	
Projected Capital	53,990 M +		32.825 M	= £ 36.8
Projected Operating Cost	2,104 M +		53.122 M	= 55.2

PROJECT EVALUATION

FRR - 19%

ERR - 21.3%

ABBREVIATIONS USED IN THE REPORT

Project Year Zero	PY 0
Project Year 1	PY 1
Project Year 2	PY 2
Project Year 3	PY 3
Project Year 4	PY 4
Project Year 10	PY 10
Project Year 20	PY 20
Animal Production Complex	APC
Central Assembly Area	CAA
Diseases :	
Blackquarter	BQ
Contagious Bovine Pleuro-Pneumonia	CBPP
Foot and Mouth Disease	FMD
Hamorrhagic Septicaemia	HS
Rinderpest	RP
Feedlot	FL
Feed Mill	FM
Livestock and Meat Marketing Corporation	LMMC
Provincial Holding Ground	PHG
Railway Terminal Yards	RTY
Soba Railway Terminal Yard	SRTY
Sudan Railways	SR

been extensively studied in several previous reports.

Decisions in respect of the different components and operations of the project have been made on the following :-

- size and number of the provincial holding grounds, their sites and carrying capacities ;
- methods and schedule of cattle purchasing according to availability of the supply of animals and the requirements of the feedlot ;
- system and rate of transporting livestock so as to guarantee both minimum costs and a continuous flow of cattle to the feedlot ;
- the possibility of depending on existing feed mills and abattoirs versus constructing new ones to be owned by the project itself and so directly securing the project's requirements ;
- the form of project outputs and the marketing channels for its products taking into consideration the foreign market situation and the local regulations governing the production and export of meat and livestock.

The site of the feedlot was predetermined in an area already belonging to the AAAID at West Omdurman ,

Currently, the finishing operations are carried out in adjacent areas in the vicinity of Khartoum which is the major meat market for both domestic and export sales.

2. PROJECT COMPONENTS AND OPERATIONS :

The project will include the following components and operations.

2.1. PROVINCIAL HOLDING GROUNDS (PHG) :

The capacity of the feedlot when the project reaches maturity in year 4 will be 160,000 head per annum. This figure does not exceed 20% of the number of cattle supplied from the main livestock markets in the Western Sudan and White Nile Provinces, therefore the project should not in any way affect cattle prices in general. With a fattening period of 75 days for each consignment plus their 15 days on a medium gain ration in the Central Assembly Area, the stock purchasing schedule and cattle movements are designed to permit an average supply of 40,000 head every three months from PY4 onwards. The project is phased to be completed in four years with rising capacities of 40,000, 80,000 and 120,000 head in PY1, PY2 and PY3 respectively.

Five Provincial Holding Grounds will be established between PY0 and PY3. The sites were selected according to the following criteria :

- they are in almost empty areas where the grazing potential is rich through not currently being used by either nomadic or sedentary population ;
- the sites neither compete with nor contravene the traditional nomadic route ;
- each site is located within a radius of 15 - 20 miles from

traditional cattle markets and its close to the commercial cattle route ;

- two of the sites (at El Merum and Kosti) lie close to the railway lines so that the stock can be transported by rail during the summer time to the CAA at Omdurman ; and

- agreement and acceptance of the local authorities for the establishment of a provincial holding ground in their area.

Field surveys were conducted during January 1982 by the Range Management Expert and the following sites were selected after determining their forage production which was assessed from the vegetation measurements carried out at the same time.

Sites :	Capacity :
Nyala, South Darfur	40,000 head
ElMerum, South Darfur	30,000 "
Dea'n, South Darfur	40,000 "
Tibune, South Kordofan	20,000 "
Kosti, White Nile	30,000 "

(a) Method and Schedule of Cattle Purchase :

It is recommended that a permanent purchasing officer be appointed for each PHG who will utilise one or both of the following methods to ensure a continuous supply of cattle to the feedlot. First, to employ seasonal temporary agents who have good contacts with all communities dealing in livestock, i.e. producers, brokers, traders, sub-agents, local merchants, exporters and wholesale butchers. Second, to make annual contracts with merchants or local traders.

According to the proposed purchasing schedule, Nyala, Dea'n and Tibune will be utilised for purchasing stock during the rainy season when most of the nomadic livestock will be concentrated in their areas. Toward the end of the rainy season and before the start of the nomadic southward movement additional stock will be purchased and stored in each of these holding grounds so that supplies to the feedlot can be maintained during the critical period of January - March. The southern holding grounds at ElMerum and Kosti will supply stock during the summer time.

(b) Transportation of Cattle from PHG to the CAA at Omdurman :

Extraction of stock from the PHGs at Nyala Dea'n and El Tibune will take place according to the purchasing schedule during the rainy season (July - December) when grazing and drinking water will be available along the route. Trekking usually takes between 40 to 70 days.

During the summer time (April - June) grazing and drinking water are scarce and trekking through the traditional route may be hazardous for the livestock. Thus at this time stock will only be purchased and extracted from El Merum and Kosti.

Since the transport of livestock by rail is much more expensive than trekking, utilisation of the railway services should be kept to a minimum. Only the stock extracted from El Merum (30,000 head in PY4) will use the block trains to Soba railway terminal from where they will be transferred to the CAA at Omdurman by truck-trailer transporters. Cattle purchased at Kosti will be trekked to Omdurman through a reasonably adequate route.

In the first year of operation (PY1) the project abattoir will be still under construction and it is planned for the finished animals to be slaughtered at the Kadero abattoir. The projected number of finished cattle in PY1 - 40,000 head - will be transferred from the feedlot to Kadero at a maximum rate of 250 head/day which is the present capacity of that abattoir. The same fleet of a transporters used in transferring the cattle from Soba to Omdurman will be utilised in moving the cattle to the slaughterhouse.

When the project's own abattoir is completed, the same prime transporters can be used for towing refrigerated containers or animal feed trailers as required.

2.2. FEEDLOT OPERATIONS :

The operation is based on holding stock assembled from the PHGs in the CAA for 15 days during which time intensive veterinary measures will be taken and the animals put under medium gain ration. On entering the CAA animals are expected to average approximately 275 kg liveweight, and a daily gain of .5 to .7 kg/day is anticipated during the 15-day period.

Animals will then be moved to the feedlot (FL) where a high phase of nutrition will be applied. An average liveweight gain of 75 kg per animal in 75 days is expected to be achieved in finishing the animals for slaughter. Four finishing cycles per year are intended to produce 160,000 head annually. An average of 500 head will enter the feedlot per day for 300 days. About 32,000 animals will be sold live after an average fattening period of 45 days ; the rest will complete the 75 days and then be moved to the slaughterhouse.

Both the CAA and the FL will consist of 55 yards in a corral-design which will facilitate replication and minimise costs. Each yard will have a capacity for 1000 animals. The flow of stock from the PHGs is expected to exceed the capacity of both the CAA and the FL during the period mid-July to mid-November, so the extra animals will be sold live after being fattened for 45 days.

2.3. FEED MILL :

This is designed to produce a complete pelleted ration for feeding the animals in the CAA and FL. At PY4 when the project will be in full swing, the total amount of feed required for 160,000 head of animals for 90 days per annum will be about 125,000 tons. Therefore the establishment of a 30 ton/hour feed mill working two shifts (16 hours/day) to produce about 144,000 tons/annum is recommended. It is proposed that it should be sited within the Animal Production Complex in an area of approximately 15 feedlot about 300 metres from the feedlot.

About 47,000 tons of sugar cane by-products (bagasse and molasses), 24,000 tons groundnut cake, 31,000 tons of sorghum and 19,000 tons of wheat bran will be used for processing the animal feeds.

2.4. CENTRAL ASSEMBLY AREA :

The animals will be held in the CAA for 15 days during which time they will be on medium plan nutrition feed and undergo intensive veterinary treatment.

The CAA has a capacity for 15,000 animals at a time and it is expected that about 8,000 head of cattle will enter the area every 15 days with an equal number being moved out to the FL.

As stated above, the CAA will also be within the Animal Production Complex lying about 300 metres from the Feed Mill.

Animals will consume about 8 kg of pelleted feed (ration A)/ head/day and their daily gain is expected to range from 0.5 to 0.7 kg/head . About 19,000 tons of this pelleted ration (A) will be consumed by 160,000 head of cattle during the 15 days period.

2.5. FEEDLOT :

Fattening of animals in the feedlot aims at improving quantity and quality of meat production in Sudan. The fattening system is intended to hold 40,000 head for 75 days and to produce 160,000 head per year in 4 cycles.

Animal feeds will be introduced in pelleted form twice daily, with each animal consuming about 9.0 kg feed (ration B) per day. The expected increase in average body weight is about 1 kg/ day. When the project will be at full production level in PY4 about 105,000 tons of pelleted ration will be consumed and about 12,000 tons increase in daily gains of the animals can be expected.

2.6. FEED RESOURCES :

Feeds are generally classified into two broad categories, namely concentrates and forages. Sudan's natural grazing resources comprise approximately 60% of its total area (about one million square miles). The utilization of the feed resources from cultivated areas can be regarded, therefore, as complementary to the range grazing. Feed resources in Sudan have three main categories : Range, Concentrates, and Forages.

(a) Range Resources, Current Production and Utilization :

Apart from the existing cultivated areas which amount to 15.2 million feddans (1.3% of total area), and areas which are currently not available for agriculture or grazing (48.5%), range resources and forest comprise almost 279.4 million feddans (50.2%). Within this vast range of grazing resources there are many divergent environments resulting from action and interaction of soils, climate, topography, and predominant human activities. These environmental interactions, particularly the wide range of the rainfall (75 mm in the North to 1500 mm in the South) have resulted in the creation of major ecological zones : Desert, Semi-Desert, Low Rainfall Savannah, High rainfall Savannah, Flood Region and the Montaine Vegetation.

The best immediate measure of range productivity is the livestock population which it supports, and according to the 1978/79 census this amounted to about 27 million animal units. The Range and Pasture Administration have assessed that the total forage production within the available grazing areas all over the country amounts to approximately 77.7 million tons (DM). This estimate does not include areas which are not currently available for grazing utilization, and which represent almost 48.5% of the country's total area.

At the present time, up to 90% of Sudan's livestock population is owned by the nomadic tribes, and the dominant livestock production system is by seasonal movements of stock to areas where drinking water and grazing is available. Within the actual proposed project area (Western and White Nile Provinces) as much as 92% of the livestock population is still owned by the nomadic and transhuman population, thus nomadism can be considered the major form of the grazing management and utilization.

(b) Concentrates :

Sudan is a big producer of agricultural crops and its agro-industrial by-products are of prime importance to the feed industry. Some of its production from cereal grains and cakes (cottonseed, sesame, groundnuts) are exported also.

Concentrates are feeds that are high in energy content and low in crude fibre content. They are classified according to the protein content as follows :

(1) Low Protein Concentrates (less than 15%)

Cereal Grains

Sorghum is the main food crop in Sudan occupying 68.5% of the total area cultivated with cereal crops, and it is also the most stable food grain. It consists of a high ratio of soluble carbohydrates (rich in starch), moderate protein and low fibre content, therefore it is a most suitable grain for concentrate mixtures for fattening cattle.

Molasses : At the present time Sudan has an annual surplus of some 160,000 tons of molasses . It is used to a large extent in formula feeds because it improves the palatability and acts as a binder as well as being a replacement for other more expensive carbohydrates in the feed.

(2) Medium Protein Concentrates (15% - 25%)

Wheat Bran : During recent years there has been a great shortage of wheat bran in the local market due both to its cheapness and a decrease in wheat crop production. It is a very popular feed for beef cattle. As it has a slightly laxative effect it should not exceed 20% of the total ration.

(3) High Protein Concentrates (More than 25% Protein)

Oil Mill By-Products. Cottonseed, groundnuts and sesame seed constitute the main sources of oil production in the Sudan.

The residue remaining after the removal of the oil is used for animal feeds (cakes). Usually, it is rich in crude protein, low in carbohydrates and the fat content will depend on the method used in extracting the oil. Normally, the pressed cake contains more fat (5 - 10%) oil and is of higher nutritive value than cake produced by solvent extraction (2% oil). It is a very palatable protein supplement though it can have a constipating effect on cattle which makes it beneficial in feeds with high molasses or wheat bran content.

Slaughterhouse By-Products. These are raw materials from the slaughterhouse constituting by-products from animals that have died from disease, carcasses or parts of carcasses that have not passed meat inspection, technical blood, inedible parts of the digestive tract, reproductive organs, bones and other trimmings that are not acceptable as food for aesthetic reasons.

Meat Meal : this is unpalatable and very expensive for ruminant feeds and is used mainly to balance the amino acids compositions of poultry diets.

Blood Meal : this is very rich in protein but is not palatable and is used mainly in feeding poultry and with milk substitutes for calves.

Bone Meal : it is used as a source of phosphorous, calcium, trace elements and as a source of protein (raw bone meal). If the bone is burnt it can be used as a mineral source.

in the Sudan come mainly from the Range (0.2%), the poor quality roughages (32.8%), concentrates (3%) and green forages (2%).

2.7 THE ABATTOIR :

It is considered essential that the project should build its own abattoir since the Kadero abattoir could not cope with the project's planned output without jeopardising the interests of its traditional customers.

The proposed abattoir is of the factory type, designed according to EEC and USDA standards. Its planned capacity will be 75 head of cattle per hour or 500 head per working day. It will have a refrigerated capacity for 100 tons chilled and frozen meat and 150 tons for frost and cold storage. Facilities for deboning will be 80 tons of meat per day, and a dry-rendering plant with a capacity of 13 tons will also be provided.

Total number of personnel required to run this plant has been estimated at about 185 most of them will receive adequate training both inside and outside the country. The management staff required for the plant is also proposed in this study.

The total cost of the abattoir is expected to amount to £ S.16 million. Annual operating costs are detailed in the appropriate section.

Annual outputs from the Abattoir are :-

Bone in meat	=	3,274	tons
Primal cuts	=	9,998	"
Minced meat	=	3,892	"
Valuable edible by-products	=	900	"

Other by-products	=	120,000 units
Non-edible by-products :		
Meat, Bone and Blood Meal	=	1,000 tons
Fat	=	1,750 "
Hides	=	3,640 "

3. ANIMAL DISEASES AND HEALTH MEASURES :

For several years now the Animal Resources Directorate General has organised annual vaccination campaigns against contagious and infectious diseases which has resulted in a considerable reduction in the number of cases and incidences of disease. The most important diseases encountered in Sudan are C. B. P. P., RP, FMD, Anthrax, H. S., BQ, Trypanasomiesis babesiosis, ecto- and endo- parasites.

The provinces where the components of the project will be located (Western Sudan, White Nile and Khartoum) are all under strict veterinary control, especially Khartoum Province which is considered to be mainly a disease free area.

Veterinary measures to be applied for the cattle, intended for a fattening at Omdurman animal production complex and then slaughtering for export, will start from the time of purchasing in the livestock markets and will continue right through the storage time at the provincial holding grounds, trekking and rail transport until they arrive in Omdurman where they will be admitted and rested for 1/2 days. The animals will then be inspected and those found fit and in good bodily condition will be admitted to the CAA which is adjacent, and the rest will be moved to the detention area.

offices and domestic use.

5.2. ANIMAL PRODUCTION COMPLEX :

Here the buildings will consist of the corrals (reception area, assembly area and feedlot), the central service area (administration offices, central workshop and stores) and the staff village. On the industrial side, there will be the slaughter-house and the feed mill, and on the services side there will be the power plant water supply.

Again, ground water will be utilised to meet the daily consumption requirements of the whole complex which is estimated to be about 9000 m^3. Electrically driven submersible pumps giving an hourly discharge of 100 m^3 will be used.

A complete electric power facility will be provided for the complex including transmission lines, transformer and switchgear.

Gravel roads will be laid within the complex to link the various functional areas.

A transport fleet of truck/trailer combination will be provided for transporting cattle from Soba railway terminal to the complex ; and also to Kadero slaughterhouse during the first year of operation.

To facilitate communications between the five provincial holding grounds and the administration at the West Omdurman complex, a radio/telephone system will be installed with the base station at the complex.

6. PROJECTED COSTS AND REVENUES

Table (10.1) gives a summary of the project capital costs which equals £S.86.8 million divided according to the various components of the project. Foreign currency comprises 62.2% of the capital costs with the balance of 37.8% being in local currency. While capital costs are expressed in terms of 1982 prices, they do include an additional 12% per annum for price contingencies during the project development period (PY0-PY4), in addition to 10% of capital costs to allow for physical contingencies.

Table (10.2) shows the phasing of the capital costs during the project development period (PY0-PY3). The major part of capital cost (59%) occurs in PY0 with remainder divided out at 21.1%, 0.3% and 10.6% at PY1, PY2 and PY3 respectively.

The operating costs of the project are shown in Table (10.4) and are divided into foreign and domestic currencies. They will increase gradually from £S. 15.4 million in PY1 to £S. 55.2 million in PY4; it will remain stabilised at this level through to PY20. These operating costs are also expressed in terms of 1982 prices.

Estimated prices for the various products of the project are shown in Table (10.19). These prices are the same as those prevailing in 1982 and they are expected to remain constant during the assumed life of the project. Table (10.21) shows the development of total revenue (in constant 1982 prices) from the project where it reaches £S. 18.2 million in PY1, then increasing gradually until it reaches FS. 75.9 million in PY4 and continuing at that level up to PY2.

7. FINANCIAL AND ECONOMIC ANALYSES :

The financial rate of return (FRR) for the project is estimated at 19% and its calculation is based on the following assumptions.

- Revenues in foreign currency are calculated at the present exchange rate for the £S where US$ 1 = £S. 0.9.

- The project will be exempted from the business profits tax up to PY10 in accordance with the Encouragement of Investment Act, 1980.

- The cash flow is expressed in constant 1982 prices. It includes physical contingencies but excludes price contingencies.

- No residual value for the project has been considered for PY20.

The sensitivity of the FRR has been considered for an increase in total costs by 10% where it was found that the FRR will decrease to 11%. On the other hand, a decrease in total revenue by 10% will lead to a reduction in the FRR to 10%.

The economic rate of return (ERR) for the project is estimated at 21%, and its calculation is based on the following assumptions and parameters.

- The foreign exchange coefficient is assumed to be 1.25. Thus the foreign currency components of total costs and total revenues are multiplied by this coefficient to

reach their economic value for the country.

- Business profit taxes have not been excluded from net revenues.

- Net revenues to the country's economy without the project have been excluded from net revenues to reach net economic revenues.

The sensitivity of the ERR has been considered for an increase in total economic costs by 10%, where it was found that the ERR will fall to 14%. A decrease in total economic revenues by 10% will also reduce the ERR to 14%.

8. MANAGEMENT ORGANISATION :

It is proposed that an independent company should be formed for the purpose of executing this project. In line with its usual policy, such as a company would come under the aegis of AAAID with other countries being invited to become shareholders. The Board of Directors should be drawn from representatives of AAAID and the shareholding Arab Countries.

The Managing Director comes at the appex of the pyramid and immediately under him come the three departmental directors : Director, Administration and Finance ; Director, Marketing ; and Director, Feedlot Complex. Each Directorate will have its own specialised sub-sections.

The Provincial Holding Grounds in the production areas will be staffed with specialists in the fields of veterinary services, range management, accounts, marketing etc. These will work directly with the Managing Director and the other Directors as well as with the Heads of the specialised sections, according to the needs of the situation or as the occasion demands.

EXPERTS WHO PARTICIPATED IN THE STUDY

1.	Dr. Abdel Kader Abou Akkada Director, Animal Production Division A. O. A. D.	Head of Team
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37. Sir McDonald & Partner, (1981.) Wateryard Rehabilitation Plan for NWA. Western Savannah Development Corporation, Khartoum pp. 2-8, Wateryard Location Map.

38. Public Electricity and Water Corporation, 1982. Power III Project Quarterly Report IV-81, Oct-Dec(1981,)PEWC, Khartoum pp - 1-6.

39. Walton, W.C., (1970.) Ground Water Resources Evaluation. McGraw Hill, New York, pp 315 - 454.

40. Swedish Consulting Group (Sept , (1980)and amended Nov. 1980) Sudan Feed Plant APPC, Sudan - Feasibility Study, Final Report.

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