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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT  
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LIVESTOCK DEVELOPMENT PROJECT  
ZAMBIA

May 27, 1969

Agriculture Projects Department

Public Disclosure Authorized

### CURRENCY EQUIVALENTS

US\$ 1	=	Zambia Kwacha 0.714
Zambia Kwacha 1	=	US\$ 1.40
Zambia Kwacha 1	=	Ngwee 100
Zambia Kwacha 1,000,000	=	US\$ 1,400,000

### WEIGHTS AND MEASURES - IMPERIAL SYSTEM

1 Acre	=	0.405 Hectares
1 Imperial Gallon	=	4.7 Liters
1 Square Mile	=	2.590 Square Kilometers
1 Mile	=	1.609 Kilometers
1 Pound	=	0.453 Kilograms
1 Long Ton	=	1.016 Metric Tons
1 Short Ton	=	0.907 Metric Tons

### ABBREVIATIONS

ADC	-	Agricultural Development Corporation
CSB	-	Cold Storage Board
DCO	-	Dominion Colonial and Overseas
DPB	-	Dairy Produce Board
ZCDL	-	Zambia Cattle Development Limited

ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

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## ZAMBIA

### LIVESTOCK DEVELOPMENT PROJECT

#### SUMMARY

i. The Government of Zambia has requested a loan to help finance production of beef and milk by the development of twelve beef ranches and five dairy farms. Nine of the beef ranches would concentrate upon maximizing numbers and quality of weaners for sale to Zambian farmers. Two ranches would only produce fat steers and the remaining one would specialize in bull-breeding. The dairy farms, besides their milk output, would feed out their steer calves for beef production.

ii. Finance would be provided for on-ranch roads, firebreaks, fencing, buildings, machinery and water supplies as well as for breeding stock in the early stages. Semen for both beef and dairy herds would be imported. Funds would be included for technical services.

iii. The Project is estimated to cost about US\$5.8 million of which US\$5.2 million would be for ranch and farm development, US\$0.2 million for technical services and US\$0.4 million for working capital, the latter financed entirely from local sources. The proposed IBRD loan of US\$2.5 million would provide about 43% of the total Project cost and would cover in full the foreign exchange component. The remaining 57% of the Project cost would be met by Government, the Zambia branch of Barclays DCO, and the Zambia Cattle Development Ltd. (ZCDL).

iv. The proceeds of the IBRD loan would be lent by Government to the ZCDL. This Company, wholly owned by Government, would operate the ranches and farms and would administer the Project.

v. The Project is sound and would yield satisfactory returns to ZCDL (12%) and the national economy (16%). Subject to obtaining certain assurances during negotiations, the Project is suitable for a loan of US\$2.5 million repayable over 15 years including five years of grace. The Borrower would be the Government of Zambia. The Project is intended to be the first major stage of Zambia's national program of livestock development.



## ZAMBIA

### LIVESTOCK DEVELOPMENT PROJECT

#### I. INTRODUCTION

1.01 The Government of Zambia has requested a loan to help finance the development and expansion of beef and milk production. In 1964 the Ministry of Rural Development and the Cold Storage Board (CSB) began the development of a number of ranches and dairy farms, and in 1966 approached the Industrial Development Corporation to acquire and run them. Government then decided to create the Agricultural Development Corporation (ADC), owned entirely by Government, to exploit new projects in agriculture. ADC in turn formed a wholly owned subsidiary company, Zambia Cattle Development Limited (ZCDL) to take over and develop a number of beef and dairy operations previously run by Government. These included the Ministry and CSB ranches offered earlier to the Industrial Development Corporation. During this period, the Agricultural Development Service (ADS), an affiliate of the IBRD's Permanent Mission in Eastern Africa (PMEA), was requested to study the feasibility of operating these ranches and farms as commercial operations. Its report was presented early in 1968. PMEA organized a follow-up preparation mission in June 1968. The Project was appraised in October/November 1968 by a mission consisting of Messrs. J. Edwards and A. Schumacher (IBRD) and Messrs. C. Chisholm and G. Kahl (Consultants). As explained in paras. 3.07 and 3.08 of the report, the Project as submitted was reformulated and somewhat expanded in the course of appraisal with the agreement of the Zambian authorities. This reformulation and expansion of ZCDL's development program will enable the company's operations to be closely integrated into the national program of livestock development (Annex 4).

#### II. BACKGROUND

##### A. General

2.01 Only about 4 million Zambians inhabit a country which is almost the combined size of France and Germany. Although consumption levels of beef and milk are low, there is a shortage of both. Imports of one-third of present needs of these products are required at an annual cost of US\$8 million equivalent. The population grows at 3% per annum - it has doubled since 1940 - and the demand for beef and milk is increasing in the industrial and urban centers of the country, especially in the "copper-belt" where wages are high.

2.02 Zambia is a landlocked country. It is 600 miles from the sea at Beira, Mozambique and 1,000 from Dar es Salaam, Tanzania. Altitude ranges from 3,000 to 4,000 feet. The topography over large areas is slightly undulating. There are three distinct seasons: a dry cool period begins in April and is followed by a dry hot spell from July until early November with a wet season up to March.

2.03 There are wide differences between the productivity and income of farmers. These are low among the Zambian farmers living in widely scattered tribal areas of the country, and higher - close to western levels - for the much smaller numbers of non-Africans farming along the 'line of rail' <sup>1/</sup>. Although agriculture contributes less than 10% of GDP, 80% of the population derives its livelihood from the land. By contrast, almost 50% of GDP is derived from mining, mainly copper. As a result of the dominance of the copper industry, an extended decline in the copper price would have serious consequences for the economy and affect its ability to pay for imports. Agricultural exports in 1967 accounted for about 3% of all exports whereas agricultural imports were about 4% of all imports. Annual earned income varies greatly according to occupation, being highest for mining (US\$1,240 equivalent) and lowest for agriculture (US\$246 equivalent). The latter, although it compares favorably with other East African countries, could be brought closer to non-farm earnings within Zambia with the increasing development of the agricultural sector.

B. The Beef and Dairy Cattle Industry <sup>2/</sup>

The Beef Sub-Sector

2.04 There are approximately 1.2 million cattle in Zambia beef-producing herds. The great majority - 1.1 million - are owned by traditional African farmers and their productivity is low. Slaughter cattle offtake from this sector is about 3-4% annually compared with 17-18% from the commercial herds of European farmers in which the balance of the country's beef cattle are found. The contribution from each source is therefore:

<u>Source</u>	<u>Cattle Numbers</u>	<u>Number Commercially Slaughtered</u>
Traditional	1,085,000	43,400
Commercial	130,000	22,750

The indigenous breeds - Tonga, Barotse and Angoni - are well adapted to their environment and cross productively with exotic breeds. Of the latter, the Africander, pure and crossed, accounts for 90% of the "blood" of beef herds in the commercial sector. In the last 10 years, this sector has used increasingly bulls and semen of the Hereford, Boran, Brahman, South Devon and Charolais breeds.

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<sup>1/</sup> The 'line of rail' describes the land running along both sides of the railway from the 'copper-belt' in the North to Livingstone in the South.

<sup>2/</sup> Annex 1, The Cattle Industry, gives further detail.

2.05 Communal grazing is characteristic of the traditional sector of the industry. Steers reach slaughter age at 5 to 7 years. Fenced grazing is typical of the commercial sector and cattle are often fed on maize for up to 120 days to reach slaughter age at 2½ years. Exceptionally, on more intensive maize feeding, they may be killed at 15 months in sharp contrast to the extensive beef production system prevailing in Eastern Africa.

2.06 Beef is in short supply in Zambia even at the current low annual consumption level of 12 lb per person compared to 20 lb per person in East Africa. About two-thirds of total requirements of 100,000 carcasses annually have been met from Zambian sources and the remainder from imports 1/. The Government has estimated (taking into account increases in population and incomes) that internal consumption will rise about 8% per year and will call for a supply of 165,000 carcasses in 1975 and as many as 300,000 by 1985. Most of this increase will have to come from greater imports - perhaps 80,000 carcasses in 1975 and 160,000 by 1985. National production schemes, however strongly supported, cannot match such a steep rise in demand. The cost in foreign exchange at current prices of these imports of beef, now running at US\$6.0 million, may rise to US\$12.0 million by 1975 and US\$25.0 million by 1985.

2.07 The marketing of beef as well as feeder steers 2/ and breeding cattle have developed rapidly since 1964 and, with the firm market conditions now existing, is likely to gain further momentum. At the center is the CSB which has played a major role in the stabilization and development of the livestock industry. Besides being responsible for 60% of the slaughtering of home-produced beef, it has been importing increasing supplies (as live cattle and carcass beef) to meet rising demand. The CSB does not retail beef but it has managed well the distribution, through butchers, of supplies for national consumption. Butchers also buy cattle from ranchers privately for retail sales. Butcher purchases have amounted to 17,000 head annually (25% of cattle slaughtered) in recent years. Annex 2 gives further detail on beef marketing.

#### The Dairy Sub-Sector

2.08 Compared with the national beef herd, the national dairy herd is small, comprising about 10,000 cows of milking age. All are owned by European farmers on land along the 'line of rail'. Apart from eight herds in the Southern Zambia area, commercial milk production does not exist except in this area. Numbers of producers supplying milk to the Dairy Produce Board (DPB) declined from 140 in 1962 to 89 in 1968. However, over this period the size of herds increased (from 70 to 100 milking cows on average) so that numbers of cows in milk were not greatly affected and annual sales per herd increased from 20,700 gallons to 42,700 gallons. Productivity is

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1/ Zambia carcasses average about 400 lbs cold dressed weight. Imported carcasses are somewhat heavier, averaging 450 lbs cold dressed weight.

2/ Castrated males varying in age from 8 months to 2½ years.

best in Zambia's 'maize belt' running from Kabwe in the North to Mazabuku in the South. In the copper-belt area it is less profitable because of poorer soil and higher labor and feed costs. Milk production is based on the feeding of home-grown maize and maize silage plus pasture in season supplemented by purchased cotton seed cake, groundnut cake and mineral supplements. Average annual milk yields are about 600 gallons/cow in most Friesian herds which is somewhat higher than average yields from similar grades of cows in Kenya and Uganda, but lower than average yields of nearly 1,000 gallons from Friesian in the U.K. However, some better managed herds attain up to 1,000 gallons/per cow per year. A small number of commercial dairy farmers have started dairy steer fattening programs - a profitable operation with the higher beef price levels prevailing in Zambia since early in 1968.

2.09 Until 1965, supplies of fresh milk were in surplus at certain times of the year and were used by the DPB to make butter and cheese. The Cheap Milk Scheme, by which milk is subsidized 25% to low-income consumers in urban areas, altered this radically after its introduction in 1965. From a virtually non-existent demand from these consumers (800 gallons/day) sales grew to 8,500 gallons/day, whereas the higher income consumers maintained their demand at 6,000 gallons/day. As a result, milk has had to be reconstituted from imported ingredients. In this form it accounts, at present, for 32% of total annual consumption. The demand for milk, like the demand for beef, will probably continue to grow as the population increases and purchasing power improves.

2.10 The DPB is supposed to have sales coverage over all Zambia, but in practice, its marketing activities, both at factory and retail level, are confined to the 'line of rail' area and its 800,000 inhabitants. A new milk processing factory is being constructed in Lusaka with a starting (one shift) capacity of 16,000 gallons/day. An ultra high temperature pasteurizing process will be used to achieve longer milk life. The three million inhabitants living in the rural areas, who receive little milk at the present time, will benefit from this type of milk.

### C. Animal Health

2.11 Zambia has been free for many years from the major diseases of Foot-and-Mouth, Contagious Bovine Pleuropneumonia and Rinderpest. It is almost completely free from East Coast Fever. The risk of introduction of East Coast Fever is controlled by means of a ban imposed by Government on the internal movement of live cattle. This ban prohibits the movement of cattle into the South from areas North of the 12° line of latitude and into the West from the area east of the Luangwa River (see Map 1). Other diseases (tick borne and otherwise) which exist in the country may be controlled by good ranch management and hygiene. Cattle are not kept in Zambia's diminishing tsetse fly areas and losses from trypanosomiasis in contiguous zones may be reduced by prophylactic treatment.

2.12 The main cause of low productivity in the traditional sector is poor nutrition which results in a low calving rate and a high death rate

among calves, before they reach one year of age. Maintaining herd numbers is difficult under such conditions. Adult mortality is 2% to 3%. Deficiencies of minerals such as cobalt, iron and phosphorus exist in several parts of the country. Cattle, grazing depleted pastures in the long dry season, also suffer a severe deficiency of protein. Both conditions may be lessened by improved management consisting in the feeding of a compound of urea and minerals for about 210 days.

#### D. Agricultural Services

2.13 The Ministry of Rural Development has four departments relevant to the Project: Agriculture, Marketing, Veterinary Services and Lands. The Department of Lands issues leases on state land and is responsible for alienating trust and reserve lands. The Ministry also has responsibility for a number of important Boards dealing with marketing of grain, tobacco, beef and milk <sup>1/</sup>. The Ministry's Agricultural Department runs the extension staff including the animal husbandry personnel.

2.14 The research program for livestock and pasture development which, until Independence, was centered in Salisbury, Southern Rhodesia, is now a responsibility of the Ministry of Rural Development and its Agriculture Research Council. The Animal Husbandry Central Research Station at Mazabuku contains experimental herds of all indigenous and exotic breeds kept in the country. Experiments with these are in progress and should yield information of value to Zambia's developing cattle industry. The center is also used to performance test young bulls (140 a year) for their growth rates under Zambian conditions and provides facilities for producers who use artificial insemination - mainly commercial farmers - for beef and dairy cattle breeding. The Center imports and distributes to producers frozen semen from the U.K., Kenya and the U.S.A.

2.15 Education and training facilities for the livestock industry are still limited. As there is no degree course in Veterinary Science or Agriculture at the University, all professional staff must be trained abroad. However, diploma and certificate level courses are provided for by the Natural Resources Development College and the Masabuka Veterinary Training School. From the annual output of 15 graduates in Animal Management from the Development College, it will be possible to select qualified assistant ranch managers for Project ranches who can eventually be promoted to full-time management responsibilities. The College of Agriculture (Monze) provides courses for extension workers in Animal Husbandry at the certificate level.

2.16 The agricultural sector will require the services of non-Zambian professional and technical staff for some years to come. The professional

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<sup>1/</sup> For a description of the operations of the Cold Storage Board (beef) and the Dairy Produce Board (milk) see Annex 2.

staff of the Animal Husbandry and Veterinary Services comprises 24 non-Zambians and 2 Zambians despite efforts to increase numbers in the latter category 1/. The limited availability of qualified Zambians is most acute in the fields of education, planning and research. The necessary combination of commercial experience and professional skills required by those running large development projects and commodity boards is at a premium.

2.17 Credit for the agricultural sector and livestock industry is provided by the Credit Organization of Zambia (Government owned) and by the commercial banks operating in Zambia. The Credit Organization of Zambia recently absorbed the Land Bank, thereby giving it facilities to lend medium- and long-term as well as seasonally to sub-borrowers. However, this Organization has some staffing and organizational problems and has recently experienced problems in collecting its seasonal loans in rural areas. It is likely to be some years before it can become an effective agricultural credit institution. The commercial banks have supplied the bulk of the short-term credit to agriculture. Most have been reluctant to extend medium-term development credit. Recently, though, Barclays Bank DCO appointed an agricultural development adviser and is now preparing to provide medium-term credit for the livestock industry, to qualified Zambian farmers and viable grazing associations. The principal source of livestock credit is provided through the Grazier Scheme currently run by the CSB. Some 52,000 breeding cows and store cattle worth US\$3 million equivalent are now fattened and bred by the local ranching sector under this Scheme (Annex 3).

#### E. Government Policies for Livestock Development

2.18 Government investment in livestock development has been on a small scale, being only one-half of 1% of total development expenditure of US\$458 million equivalent (1966-1968). It is now realized that this is inadequate and an expanded program is being embarked upon by the Ministry of Rural Development (Annex 4). Perhaps the most important step taken in 1968 was the increase of 38% in the minimum price for beef to the Zambian producer to bring this closer to the price of imported beef. Government guarantees minimum prices, in three quality grades, to the producer and these are the prices paid by the CSB. Butchers buying privately offer as much as 10-20% above this and provide very effective competition for the

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1/ The Department of Veterinary Services has an establishment of 16 professional veterinarians (including 2 Zambians) and numbers of Zambian field staff in support totalling about 240 in grades ranging from senior veterinary assistants to tsetse control orderlies. The field staff of the Animal Husbandry extension service consists of 10 provincial officers and senior technical officers, all non-Zambians, as well as 50-60 Zambians as technical and agricultural assistants.

CSB as well as being able to be very selective in the cattle they purchase. Although Government also attempts to fix a maximum retail price in urban areas, this is difficult to control because of the many different values of the variety of cuts and joints in a carcass.

2.19 In late 1968, a National Livestock Development Group was created by the Ministry of Rural Development to bring together the many organizations in Government, business and research concerned with developing the cattle industry. The Assistant Secretary, Ministry of Rural Development, is Chairman and he reports directly to his Permanent Secretary 1/. The National Livestock Development Group has no independent financial or policy authority. It is comprised mainly of civil servants of the Ministry of Rural Development meeting regularly in Ministry offices. Its current functions are to coordinate existing programs for livestock production, marketing, research, extension and education, to prepare a medium-term livestock development program for the beef and dairy industries and to consider if parts of this program may be eligible for local and/or international funding. Plans being considered by this Group include technical and financial encouragement to emergent Zambian ranchers, grazier associations and cattle cooperatives with the objective of placing 5% (60,000 cattle) of the traditional herd under commercial management within 10-15 years. Government also intends to extend dairy production in remote rural areas by creating 40-cow herds. Current thinking by ADC is that these dairy herds would be owned and managed by a separate subsidiary of ADC. The market would comprise mainly schools, hospitals and the staff and families of local and regional provincial administrative officers.

2.20 However, any long term plan to tap the considerable cattle reserves of the traditional areas depends for its success on changes, currently being considered, in prevailing land tenure systems. Only 6% of the land area of Zambia can be legally alienated with freehold or leasehold title. This category of land is referred to as state land, which is either in the hands of Government or allocated by Government to individuals on long-term leases or sold straight freehold. The remainder (94%) is still operated under reserve and trust land legislation. These latter categories are administered under traditional and tribal land-use rules in which grazing rights are normally communal. Government recognized this problem soon after Independence in 1964 and appointed a Commission to report to the Cabinet with recommendations. The Report, issued in August 1967, concluded that freehold or leasehold titles should be granted for agricultural land in the reserve and trust areas to those now occupying their lands under customary tribal rules.

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1/ Principal members of the Group include the Chairman of the Commercial Farmers Bureau (a rancher), the directors of the Ministry's Veterinary, Animal Husbandry and Agricultural Projects Services, the General Manager, ZCDL, and the head of the Cattle Department of the Cold Storage Board. There are representatives also of the Government Departments of Planning and Cooperatives and of the Agricultural Research Council and its Research stations at Mt. Mkulu and Mazabuku.

### III. THE PROJECT

#### A. Project Description

3.01 The Project includes the development of 12 beef cattle ranches and 5 dairy farms under the management of Zambia Cattle Development Ltd. (ZCDL). It would support ZCDL's livestock development program and would comprise the first major stage of Zambia's national program of livestock development. Because of the need for feeder stock by existing producers, both in the commercial and traditional sectors, emphasis would be on producing weaner steers for sale from 12 to 24 months of age on the company's beef ranches. The dairy farms would produce milk as well as beef from intensively fattened dairy steer calves.

3.02 In addition, the Project would include limited pilot pasture proving trials (100 acres on each of the ranches) and a 50-acre selected legume seed multiplication plot to be located on one of the beef ranches. To supplement the numbers of quality bull stock in Zambia which are in short supply, frozen semen of suitable breeds would be imported for use in the company beef and dairy herds. The purchase of breeding cows and heifers during the development years of the Project as well as initial working capital would be included under the Project. The Project would also provide for technical services. On-ranch investments would be spread over 5 years, phased with the annual availability of breeding stock for purchase.

3.03 As a complement to the Project, the National Livestock Development Group would prepare plans for the technical and financial encouragement of emergent Zambian farmers, grazer associations and cattle cooperatives (para. 2.19). These activities would be undertaken with technical assistance funded from proceeds of the proposed loan. The work of this Group should provide the basis for a broader scope second stage of Zambian livestock development.

#### B. Project Areas and Land Tenure

##### The Project Areas

3.04 The beef ranches and dairy farms comprising the Project are spread throughout Zambia (see Map I). The climate in the ranching areas is sub-tropical with annual average rainfalls varying from 30" in Southern Province to 53" in Northern Province. Most of these rains fall between November and April. Temperatures range from about 64° F in the cool season to 95° F in summer. Most of the ranches and dairy farms are in gently undulating country. About 80% of the soil is light granite sand (sand veldt) and 20% is broad shallow river flood plains referred to locally as "dambos", containing impeded drainage of gray clay loams and peat. The sand veldt areas carry about a 60% high and low tree cover. The predominant grass in the sand veldt area is a thin cover of Hyparrhenia, an indigenous grass of

moderate nutritional value. Most of the Project ranches are subject to annual bushfires, which can reduce ranch carrying capacity up to 30%. This hazard has been allowed for in estimating ranch stocking rates.

#### Land Tenure

3.05 Seven of the existing nine beef cattle ranches and Gravetts dairy farm are located on state land. Government is in the process of granting leasehold titles to the ZCDL for these properties. ZCDL has now surveyed a number of suitable areas on state land for the location of the four other dairy farms and the two additional 55,000 acre breeding/weaning ranches allowed for in the Project (paras. 3.07 and 3.08). Assurances were obtained during negotiations that Government would submit certified documentation that each of the Project ranches and dairy farms on state land included in the Project is covered by a 99 year leasehold title prior to requesting disbursement of loan funds for that particular ranch or dairy farm.

3.06 Two existing Project beef ranches, Solwezi and Chishinga, are on trust land. Under the Trust Land Ordinance of 1961, authority over the rights of occupancy on trust land is vested in the President who has authorized the Commissioner of Lands to make and execute disposition of trust land. All the land comprising Chishinga and Solwezi ranches is empty and the Attorney General saw no problem in granting ZCDL 99 year rights of occupancy for these ranches. Nevertheless, assurances were obtained from Government that such rights of occupancy would be issued to ZCDL and that certified documentation would be received in the IBRD attesting to these rights prior to ZCDL requesting disbursement of loan funds for these two ranches.

#### C. Detailed Features of Beef Ranch and Dairy Farm Developments 1/

##### Selection of Ranches and Dairy Farms

3.07 The loan request originally submitted by Government proposed a financial program for the further development of nine beef ranches and two dairy farms. Development work on these ranches and farms has been started by Government. Government selected the sites for these ranches and dairies with a view to providing milk to urban areas, beef to deficit meat areas and breeding stock and feeder steers for fattening to existing and future beef ranchers. In view of the availability of breeding stock and in light of the strong demand for weaner stock, the Project was expanded to include two additional breeding/weaning beef ranches 2/. Due to the shortage of improved

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1/ Annex 5 gives further details on technical aspects of the Project.

2/ If demand for weaner steers and heifers slackened for any reason in the foreseeable future, ZCDL would have no difficulty, in light of suitable empty veldt available near its ranches, in grass fattening these weaners to slaughter age.

breeding bulls in Zambia, Government requested the inclusion of a bull stud ranch located at Monze in the Project during the visit of the appraisal mission. Seven breeding/weaning ranches and two breeding/fattening ranches already exist and are operated by ZCDL (Annex 6 Tables 1-3). Sites for two additional breeding/weaning ranches of approximately 55,000 acres are currently being selected from a number of sites tentatively identified (Annex 6 Table 4).

3.08 Two dairy farms, Kafubu and Gravetts, were originally proposed for inclusion in the Project. Kafubu is located 32 miles south of Kitwe in Northern Zambia. Gravetts is close to Lusaka. Because of the high costs of development and production on the Kafubu (8,800 acres) dairy farm proposed by Government, it was dropped from the proposal in agreement with Government. It would be replaced with four economic sized units of 2,500 acres each (Annex 6 Table 5). Thus, five dairy farms, including Gravetts, which remains in the Project, would be developed under the Project. Sites for the four other dairy farms mentioned above are being selected from a list of eight "line of rail" locations in Central and Southern provinces submitted to ZCDL by the Ministry of Rural Development. During negotiations, assurances were obtained that ZCDL would submit to the IBRD for final review and approval its plans for the development of four dairy farms and two beef breeding/weaning ranches no later than 6 months from date of signing.

#### Detailed Features (Annex 7)

3.09 The typical Project breeding/weaning ranch would be about 50,000 acres, carrying an adult herd before development of about 1,400 head, building up to about 5,000 head after 8 years at a stocking rate of 1 animal unit to 10 acres. This typical ranch (of which there would be 9) would produce about 1,000 weaner steers for fattening and 500 surplus heifers for sale annually to the national livestock sector.

3.10 The two Project breeding/fattening ranches are located in areas where movement of cattle to other regions is restricted by veterinary authorities. Each is about 110,000 acres, carrying an adult herd before development of 1,500 head, building up to a 6,000 head when totally stocked at about the seventh year. These ranches would each market annually about 800 head of grass-fattened 3 to 4 year old slaughter steers, as well as 300 surplus weaner heifers for breeding. At full production these ranches would carry one animal unit on fifteen acres. See Annex 8 Table 1 for annual operating costs.

3.11 Specialized bull breeding would be organized as a service to Project beef ranches and would later also be available to interested beef ranchers. A suitable bull breeding ranch of some 20,000 acres carrying one animal unit on seven acres has been selected near Monze in the Southern Province (see Map) for this purpose. Fully developed, this ranch will have about 500 improved bulls available for use on Project ranches and for sale to local ranchers to upgrade their herds. A herd of 1,300 stud breeding cows will be maintained on this ranch.

3.12 The existing Project dairy farm, Gravetts (mentioned in para. 3.08), is located some 8 miles south of Lusaka. The farm comprises about 1,500 acres. Maximum use is to be made of farm grown fodder crops, temporary leys and the natural veldt. About 200 acres is planted in maize each year. A herd of about 400 cows would be kept. At full development, this farm should provide some 196,000 gallons of milk annually, plus 155 fat yearling steers for slaughter.

3.13 There would be four other Project dairy farms with an average size of 3,500 acres which would be operated by experienced dairy managers under ZCDL direction. Much of the feed requirements (maize and maize silage) would be grown on the farm for milk production as well as for rearing and feeding young steer calves through to slaughter at an estimated 12 to 14 months of age. These Project dairy farms would be intensively developed and at full development, year 7, would produce 280,000 gallons per annum of milk and about 190 fat yearling steers for slaughter. This intensity of production would only be achieved if a high level of management is maintained. The scale of the Project dairy farm operations is suitable for company type management control only and would not be considered as a model for development of individual dairy farms suitable for Zambian producers. See Annex 8 Table 2 for annual operating costs.

#### On-Ranch Improvements

3.14 On-ranch improvements for the beef cattle operations would include roads, firebreaks, fencing, water facilities, stock handling and animal health control facilities, tractors, vehicles, ranch buildings and radio communications equipment. On the dairy farms, silage pits, milking equipment, land clearance, cooling facilities and grain storage bins would be included, in addition to the type of equipment and facilities provided above for the beef cattle operations. In addition, funds for an artificial insemination program and a pasture development program would be provided (see Annex 9 Tables 1, 2 and 3 for details of the on-ranch and farm investments, artificial insemination program and pasture development plan respectively).

#### D. Cost Estimates

3.15 The total investment proposed under the Project, equivalent to US\$5.8 million, is detailed in Annex 9 and briefly summarized below by major investment categories. Cost estimates are based on prices prevailing in Zambia. A contingency provision of about 10% is included to cover possible unforeseen costs. The foreign exchange component is about US\$2.5 million, roughly 43% of the estimated Project cost. About 70% of the proposed investments would be for development of beef cattle operations, the remaining 30% for the dairy farm component. The total Project cost estimates are as follows:

Total Project Cost 1/

<u>Category</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
	- - -	(K '000)	- - - - -	- (US\$ '000 Equivalent)	-	-
<u>Development Capital</u>						
Physical Inputs	423	1,115	1,538	592	1,561	2,153
Livestock Purchases	1,413	243	1,656	1,978	340	2,318
Pasture Improvement Program	38	50	88	53	70	123
Contingencies	<u>170</u>	<u>150</u>	<u>320</u>	<u>238</u>	<u>210</u>	<u>448</u>
Subtotal	2,044	1,558	3,602	2,861	2,181	5,042
<u>Technical Services</u>	-	147	147	-	206	206
<u>Artificial Insemination</u>	-	82	82	-	114	114
<u>Working Capital</u>	<u>300</u>	-	<u>300</u>	<u>420</u>	-	<u>420</u>
Subtotal	<u>300</u>	<u>229</u>	<u>529</u>	<u>420</u>	<u>320</u>	<u>740</u>
Grand Total	<u>2,344</u>	<u>1,787</u>	<u>4,131</u>	<u>3,281</u>	<u>2,501</u>	<u>5,782</u>

1/ See Annex 9 Table 1 for details.

E. Financing

3.16 The proposed IBRD loan of \$2.5 million would cover 43% of total estimated Project cost with Barclay's Bank, DCO lending 21% and ZCDL providing 10%. The Government would make available the remainder of the Project's financial requirements and would receive equity shares in return for funds it provides ZCDL under the Project. Work on beef ranch and dairy farm development and cattle purchases costing in all approximately \$300,000 have taken place since January 1, 1969 (when ZCDL took over from Government) and have been paid from Government sources. Of the total, 37% (approximately \$110,000) would be eligible for reimbursement under the proposed IBRD loan. The project cost of US\$ 5.8 million would be financed as follows:

Category	Government		ZCDL		Barclays DCO		IBRD		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
	----- (US\$ Million Equivalent) -----									
<u>Development</u>										
<u>Expenditure</u>										
I. Equipment including vehicles, water pipes, fencing wire <sup>1/</sup>	-	-	-	-	-	-	0.5	100	0.5	100
II. Technical Services	-	-	-	-	-	-	0.2	100	0.2	100
III. Artificial Insemination	-	-	-	-	-	-	0.1	100	0.1	100
IV. Other Development Expenditures	1.5	33	0.6	13	0.8	17	1.7	37	4.6	100
Working Capital	-	-	-	-	0.4	100	-	-	0.4	100
Total Project Costs <sup>2/</sup>	1.5	26	0.6	10	1.2	21	2.5	43	5.8	100

<sup>1/</sup> This category comprises all goods purchased for the Project on which expenditure is 100% foreign exchange.

<sup>2/</sup> See Annex 9 Table 4 for phasing of Project cost estimates.

3.17 The IBRD loan would be made to the Government for 15 years including a grace period of 5 years and, would be relent to ZCDL on the same terms and conditions. The loan term and grace period are based on the estimated financial ability of ZCDL to service the loan to the Government. Assurances were obtained that the Government would relend the proceeds of the IBRD loan to ZCDL on these terms and would contribute the residual of ZCDL's annual development expenditure costs under the Project to that company in return for further equity shares.

3.18 Barclays Bank, DCO would lend ZCDL development expenditures of US\$0.8 million equivalent from its local resources for a term of 15 years including a grace period of 5 years. An interest rate of 0.25% above prime (currently 7%) was tentatively agreed between Government, ZCDL and Barclays Bank, with a ceiling of 8.25% and a floor of 6.25%. The loan would be made direct to ZCDL with Barclays securing its note by a charge over ZCDL's fixed assets plus a chattel mortgage over the cattle. Barclays Bank, DCO has also undertaken to supply the working capital needs of ZCDL as required by that company up to US\$0.4 million with an interest rate of 0.5% below prime; this interest rate is the same as offered by commercial banks in Zambia to Government corporations. The terms and conditions of Barclays Bank's proposed loan

to ZCDL would be acceptable to the IBRD. The IBRD would have sole responsibility for supervision of the Project. The lending operations and disbursement procedures of each lender were agreed during negotiations. Assurances were obtained during negotiations that the effectiveness of the loan agreement between ZCDL and Barclays Bank DCO would be a condition of effectiveness of the loan agreement between the Government and the IBRD.

#### F. Procurement

3.19 International competitive bidding would be required for the purchase of all goods, except livestock, procured under any single contract of value in excess of US\$25,000 equivalent. To the extent feasible, ZCDL will bulk up its development input requirements for international bidding. Indications are that fencing wire, water piping, radio equipment, ranch vehicles and tractors for Project ranches and dairy farms will be purchased by international competitive bidding. Any physical inputs required, not purchased under international competitive bidding, would be subject to local competitive bidding. In the latter case bidding notices would be published in local newspapers and circulated to representatives of foreign governments in Zambia. Adequate local representation of international agricultural equipment firms exists in Zambia to ensure effective competition. Private contractors are available for construction of ranch roads and for the installation of boreholes.

3.20 For the beef ranches, purchases of about 10,000 breeding heifers and cows and 1,300 bulls are contemplated. Development of the Project dairy farms would require purchase of 2,200 dairy heifers and cows. Dairy bull requirements can be met from local sources, from imports and by use of artificial insemination. As the type and quality of beef and dairy stock suitable for Zambian conditions can only be obtained from local areas, international tendering would not be appropriate for livestock procurement. An assessment of the availability of beef and dairy stock for Project ranches was made and the development phasing of Project ranches was adjusted to ensure that it would be in line with the conservative estimates made of annual livestock availability. An assurance was obtained during negotiations that any livestock imported to the Project would be subjected to quarantine and other veterinary regulations in force at the time and acceptable to the Bank; that purchases of beef cattle within Zambia would be made after veterinary consultation; and that of dairy cattle to be purchased would be subjected to veterinary inspection and health tests.

#### G. Disbursements and Auditing

3.21 Disbursements would be spread over five years. The proposed IBRD loan of US\$ 2.5 million would finance (a) 100% of the direct foreign exchange costs of the project estimated at US\$ 800,000 and (b) 37% of the remaining development expenditure. This latter percentage represents the estimated foreign exchange component of the expenditure in this category. Thus, the

IBRD loan would amount to 43% of the total cost of the Project. All documentation would be certified by the General Manager or the Senior Beef and Dairy Managers of ZCDL and by the appropriate official in the Ministry of Finance.

3.22 Independent commercial auditing services are available in Zambia. However, there is a shortage of qualified accountants which is giving rise to delays of up to four months in the audit of accounts of Government and commercial firms. Currently, the local branch of Cooper Brothers has been retained by ZCDL to audit its accounts and to advise the company on financial and accounting procedures. Assurances were obtained during negotiations that ZCDL would maintain separate accounts for each Project beef ranch and dairy farm, arrange for the auditing of these accounts and the accounts of ZCDL by an accounting firm acceptable to IBRD and would forward the audited accounts no later than six months after the close of ZCDL's fiscal year.

#### H. Corporate Structure and Management

3.23 In July 1968, ADC established its first subsidiary ZCDL, as a company limited by shares under the Companies Ordinance of Zambia (Para. 1.01). See Chart I for details of ZCDL's organizational aspects. Currently all its shares are owned by ADC. ADC, in turn, is wholly owned by Government. ZCDL by ordinary resolution can issue regular shares and shares with special rights to private investors. Thus, ZCDL could issue preferred or redeemable shares to qualified investors if ZCDL's Board approves the terms of such additional equity investment.

3.24 ZCDL's main activity is beef ranching. It has undertaken to build up a limited dairy operation which should contribute to its overall cash flow and profitability in the early years of beef ranch development while revenues from beef cattle operations rise. ZCDL also maintains a small sheep operation at Mbala Ranch and has taken over a profitable pig unit as an adjunct to the bull breeding ranch. ZCDL also produces maize on its dairies and on a few ranches where soil conditions and marketing make this profitable.

3.25 ZCDL would be responsible for planning, organizing and implementing the development program under the Project for the beef cattle ranches and dairy farms. Annex 10 gives further details on its corporate structure. ZCDL has now taken over the existing livestock and fixed assets from the Ministry of Rural Development and CSB. A new capital structure has been agreed between ADC and ZCDL. Authorized capital for ZCDL is now US\$5.6 million equivalent with paid-up capital standing at US\$2.7 million equivalent as of January 22, 1969. The creation of a new corporate organization and the consolidation of the assets formerly run by the Ministry of Rural Development and Cold Storage Board should make for more efficient and commercial management as well as facilitate the financing of development and permit a proper evaluation of operational and financial results.

### Management

3.26 ZCDL's policy is determined by its Board of Directors appointed separately from its parent ADC's Board. Currently ZCDL's Board has a purely nominal membership. In view of the likely size of ZCDL's operations and the importance of ZCDL's production to the future development of the livestock industry, agreement was reached with the ADC and the Permanent Secretary of the Ministry of Rural Development that ZCDL's Board would be reconstituted and strengthened to include two representatives of the Zambia cattle industry, one representative of the financial community, one representative of the Ministry of Rural Development and one representative of ADC (Chairman). Assurances were obtained during negotiations that the Board of ZCDL has been strengthened and reorganized with financial and livestock expertise acceptable to the IBRD (Annex 10 para. 12).

3.27 ZCDL's Chief Executive Officer is the General Manager who would be responsible, subject to general direction by the Board, for carrying out ZCDL's functions. His duties, responsibilities and authorities are given in Annex 10. ZCDL has filled the General Manager's position with a staff member of the Agricultural Development Service (ADS-Nairobi). An assurance was obtained during negotiations that ZCDL would appoint and maintain a General Manager whose duties, powers and qualifications as well as his terms and conditions of employment are acceptable to the IBRD from the date of signing of the loan.

3.28 The General Manager is assisted at headquarters by an accountant, a secretary and an administrative assistant (See Annex 10, Chart 1 for details of ZCDL's organization). The General Manager would select a Senior Beef Ranch Manager and a Senior Dairy Manager who, in addition to their responsibilities for running their respective beef ranch and dairy farm, would act also in a wider capacity, as deputies in these specialty fields as required. In view of the importance of senior management in ensuring the success of the Project, assurances were obtained during negotiations that ZCDL would consult the IBRD on the appointments of the Senior Dairy and Beef Ranch Managers. Individual managers, recruited in Zambia, would direct the day-to-day operations of each beef ranch and dairy farm.

### Financial Operations

3.29 ZCDL has not been operating long enough to issue any trading accounts. ZCDL's cash flow over the life of the Project is shown in Annex 11 Table 1. ZCDL's opening balance sheet (January 22, 1969) and estimates of ZCDL's projected balance sheets are given in Annex 11 Table 2.

3.30 As the accounts of most of the beef ranches and Gravetts dairy farm were part of the Ministry of Rural Development's recurrent expenditure and capital accounts and the Ministry of Finance's General Revenue Accounts, an accurate assessment of the operating costs and revenues prior to their transfer to ZCDL has been difficult to ascertain. Based on cattle inventories, capital costs, as well as trading and profit and loss accounts provided by the Ministry of Rural Development's accountant for six of the project ranches plus Gravetts dairy farm for 1967 and 1968, financial estimates have been constructed for the ranches and dairy farm as a group.

3.31 As a group, the seven beef ranch and dairy operations had an estimated gross trading profit of about US\$126,000 for 1968, due mainly to the 38% price increase for slaughter stock in effect from January 1968. If comparable standard valuations to 1967 are used, the ranching and dairy operations would have incurred a trading loss of about US\$196,000 for 1968. For 1967, the ranches and dairy showed a trading loss of about US\$177,800 when livestock was valued at the same standard values at the beginning and at the end of the year. Given current prices and if developed as planned under the proposed Project, ZCDL, with its responsible management, should be able to convert these operations into a viable company. Annex 11 Table 1 indicates that ZCDL should achieve a small cash surplus in the second year of the Project before payment of interest on borrowed capital. After payment of interest, ZCDL should achieve a cash surplus in the sixth Project year. Since ZCDL is a new untested company, an assurance was obtained during negotiations that ZCDL's debts (maturing over one year) would not be permitted to exceed the value of its paid-up capital.

#### Corporate Benefits

3.32 Given adequate management, the current pattern of beef and milk prices should ensure that ZCDL's operations are profitable. The financial rate of return on the new investment, calculated after taxes, is estimated at 12% (Annex 12). The return on capital employed varies, but after taxes and at full development in the eighth year, ZCDL should earn an estimated 11% to 14% on its paid-up share capital. The cumulative cash build up at the end of twenty years, available either for reinvestment or payable annually as dividends to the shareholder (ADC), is estimated at about US\$7 million equivalent. The paid-up capital stock of the ZCDL will be about US\$4 million at the end of the disbursement period of the proposed loan. The long-term debt of the ZCDL at the end of the sixth year of the Project would be about US\$3 million equivalent. This would result in a ratio of debt-to-equity of 1 to 1.3, which is satisfactory.

#### I. Technical Services and Training

3.33 Technical direction of ZCDL would be part of the responsibility of its General Manager. His salary and other expenses are included in the capital costs of the Project. Finance is also provided on the same basis for short term consultant services, to assist the General Manager in the establishment of a pasture improvement program on Project beef ranches, for planning the four unspecified dairy farms and the two unspecified breeding/weaning ranches and for organizing beef ranch and dairy farm watering facilities. A practical training program conducted on Project ranches would be organized to prepare candidates for assistant ranch manager positions. To be appointed assistant ranch managers, successful trainees would require completion of at least one year of a training program on a Project ranch.

IV. MARKETS AND PRICES

Beef

4.01 Producer price levels now provide adequate incentives to ZCDL to expand production. In January 1968, the CSB increased its guaranteed minimum prices by an average of 38%, with lower grades going up 45% and the higher grades about 20%. The value received by the producer (averaging US\$31 equivalent per 100 lb cold dressed weight) is now roughly equivalent to world export prices of US\$550-600 per metric ton fob, but still below the landed cost in Zambia of imported beef of equivalent grade of US\$720 per metric ton. To ensure a steady throughput to CSB abattoirs, a seasonal price differential is paid to producers. Ranchers holding their cattle through to the end of the dry season receive a 13% premium. In view of the importance of adequate prices for beef cattle and milk for the viability of the Project, an assurance was obtained during negotiations that Government would consult regularly with the IBRD concerning producer prices and would not place any restrictions on the movement of cattle, except for disease reasons within Zambia, without consulting the IBRD.

4.02 Besides the price of the finished product, there is the important consideration of credit facilities for financing the purchase and lending of breeder, weaner and fattening stock which are currently provided through the CSB's Grazier Scheme. In June 1968, some 52,000 head of cattle were held by commercial ranchers and grazier associations. The CSB retains title to the cattle and insures through the grazier agreement signed by the borrower, by branding with CSB's mark and by periodic inspections, that the cattle are well maintained. The CSB's interest, fees and principal are recouped at slaughter and the borrower receives the balance as profit. This scheme has been the principal force in stabilizing the commercial herd in recent years. The size of the credit operation is likely to grow as the industry expands, including new financing required for the increased output of the Project ranches when at full production.

4.03 The value of the cattle held by ranchers under the Grazier Scheme is currently about US\$3.0 million equivalent. The average term of the contract is about 4 years for all cattle financed. Current practice is for the CSB to borrow on 90-day Treasury Bills and to revolve them to finance this medium-term operation. The Treasury has been relatively well supplied with short-term money and the method has worked well. Nevertheless, this situation could change. Without access to credit, the Grazier Scheme would not be able to expand. Since the current Project, as well as the future expansion of the industry, is dependent in part on the smooth functioning of the Scheme, assurances were obtained during negotiations that Government would ensure that the Grazier Scheme would be refinanced within a year from the date of signing of the IBRD loan, on terms which reflect the 3 to 5 year maturity of the contracts granted ranchers participating in the Grazier Scheme. Currently, Government is organizing a subsidiary company of ADC, to be called the Cattle Finance Company of Zambia, to take over the operations of the Grazier Scheme.

### Milk

4.04 The DPB provides adequate price incentives to the efficient milk producer. Currently the price offered including quality premiums is equivalent to US\$0.52 per gallon at the farm gate. This is above the Kenya price of US\$0.35 and Uganda of US\$0.42. All milk production from Project dairies would be sold to the DPB. The DPB has ample milk tankers to make daily pickups.

### Dairy Beef

4.06 The Project dairy farms will also be fattening their Friesian steer calves. Experience on similar commercial operations in Zambia indicates that such fat steers bring nearly US\$200 equivalent sold to local butchers, giving a margin over direct and indirect costs of nearly US\$50, a profitable operation at these currently prevailing prices.

## V. ECONOMIC BENEFITS AND JUSTIFICATION

5.01 The principal direct benefits resulting from the Project would be the increased production of beef and dairy products, of weaners for fattening and of improved breeding stock. The total extra annual beef output from all the ranches due to the Project at full production is about 1,600 tons worth about US\$900,000. In addition, approximately 13,000 weaner steers and heifers and 500 improved bulls would be available for sale to Zambian ranchers annually worth together nearly US\$1 million equivalent. From the dairy farms, the five herds will be in full production in year 5, with an estimated increased output of 20 tons of whole milk per day worth about US\$750,000 annually. These farms will also have available for sale to Zambians annually 360 surplus dairy heifers in-calf worth US\$60,000. Thus the total extra value of the production generated by the Project per year at maturity is about US\$2.7 million equivalent. The return to the economy of Zambia is 16% over the twenty year life of the Project (Annex 12).

5.02 Nine of the ranches would produce annually at the seventh year of the Project about 8,500 feeder steer weaners and 4,000 surplus weaner heifers for breeding. Two ranches, located in Northern Zambia, would produce about 3,000 head of grass fattened slaughter stock per annum by the seventh year of the Project. The remaining beef ranch would be developed fully as a bull breeding ranch, making available to the industry 500 improved herd bulls and 400 surplus stud heifers by the seventh year (Annex 13). Currently, the ranches and farms are about 30% developed. They would achieve full carrying capacity in the first 10 years of the Project. On-ranch investments and application of improved management practices aim at increased beef output of approximately 10% per annum over an 8-10 year development period. This would be brought about by an increase in calving rate of 10%, a reduction of 2% in the herd mortality rate and increasing cattle oftakes to about 25% in the eighth year of the Project.

5.03 The beef and dairy output from Project ranches and farms would partially meet the rapidly rising demand for these products in Zambia. The production of beef from the ranches at Mbala, Chishinga and Solwezi is particularly required by hospitals, schools and other institutions in those districts which have no other local commercial source of meat. The production of weaners would provide emergent ranching cooperatives and individual African ranches with a source of fattening and breeding stock. Estimated foreign exchange savings, net of annual foreign exchange outlays directly attributable to the Project, would be US\$1.6 million per annum at full development.

## VI. CONCLUSIONS AND RECOMMENDATIONS

6.01 The Project is sound and suitable for an IBRD loan. The rates of return accruing to the investment in ZCDL and to the economy are satisfactory. A Loan of US\$2.5 million equivalent is appropriate. The Loan would be about 43% of the total Project cost. The Borrower would be the Government of Zambia and it would relend the funds to ZCDL.

6.02 During negotiations, assurances were obtained that:

(a) The Government would:

- (i) Submit evidence to the IBRD of ZCDL's rights of occupancy on Solwezi and Chishinga ranches located on trust lands and evidence of leasehold titles for each Project beef ranch and dairy farm prior to requesting disbursements from the IBRD for investments on that ranch or dairy (paras. 3.05 and 3.06);
- (ii) on-lend the proceeds of the loan to ZCDL for 15 years including five years of grace and contribute the residual of ZCDL's annual ranch development capital expenditures to that company in return for further equity shares (para. 3.17);
- (iii) not restrict cattle movements within Zambia except for disease nor reduce the producer price offered to ZCDL for beef cattle or for dairy produce without consultation with the IBRD (para. 4.01) and
- (iv) strengthen the financial structure of the Grazier Scheme no later than 12 months from the date of signing of the Loan Agreement (para. 4.03).

(b) The ZCDL would:

- (i) submit to the IBRD for review and approval its plans for the development of the four unspecified dairy farms and the two unspecified beef breeding/weaning ranches no later than 6 months from the date of signing of the Loan Agreement (Para. 3.08);

- (ii) undertake international competitive bidding for all goods, except livestock, purchased for Project ranches on all single contracts over US\$25,000 and subject purchases of inputs not purchased by international tender to local competitive bidding (para. 3.19);
  - (iii) submit purchases of breeding stock for the approval of ZCDL's General Manager and meet all necessary veterinary requirements according to source and kind of stock (para. 3.20);
  - (iv) maintain separate accounts for each Project beef ranch and dairy farm, arrange for the auditing of these accounts and the accounts of ZCDL by an accountant acceptable to the IBRD, and forward the audited accounts to the IBRD not later than six months after the close of ZCDL's fiscal year (para. 3.22);
  - (v) not incur any debt maturing over one year which would increase the amount of the company's debt beyond its paid-up capital (para. 3.31);
  - (vi) maintain an individual as General Manager whose duties, powers and qualifications as well as the terms and conditions of his employment would be subject to the approval of the IBRD from the date of signing to the end of the loan (para. 3.27); and
  - (vii) consult with the IBRD on the appointments of the Senior Beef Ranch Manager and Senior Dairy Manager for Project ranches (para. 3.28).
- (c) The Barclays Bank DCO would:
- (i) conclude a loan agreement acceptable to the IBRD, with ZCDL indicating that they would provide 17% of development expenditure (\$770,000 equivalent) to ZCDL; the effectiveness of this loan agreement between Barclays Bank DCO and ZCDL to be a condition of effectiveness of the IBRD loan (para. 3.18).



ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

The Cattle Industry

A. Introduction

1. The cattle industry in Zambia has a dual structure of comprising commercial and traditional type production. In the commercial sector, about 500 European beef ranchers maintain 130,000 cattle on holdings ranging from 3,000 to 100,000 acres. Currently there are about 85 commercial dairy farms with milking herds averaging 100 cows. The bulk of Zambia's cattle herd, 1.1 million head, is grazed in the traditional sector on communal and tribal lands. In the traditional sector, there is no small-scale dairy production for commercial sales in towns or urban areas.

2. As a result of growing incomes in both the urban and mining sectors, Zambia has in recent years experienced increasing deficits of meat and milk supplies, requiring substantial imports of beef and powdered milk. Government, anxious to narrow the deficit, has raised producer prices of beef substantially and is drawing up a long-range program of financial and technical encouragement to aid both the commercial and traditional producer.

B. Land Distribution

3. Land in Zambia is divided into four categories. These are State Land, Trust Land, Reserves and tribally controlled land in Barotse Province. The following table is the present distribution pattern of the four categories.

<u>Category</u>	<u>Area (Million Acres)</u>	<u>Distribution and Use</u>
1. State Land	11.7	3.5 freehold 2.5 leasehold and/or licenses 5.7 still under Government control
2. Reserves	35.7	Communal and traditional use
3. Trust Land	107.4	As for Reserves
4. Barotse Province	<u>31.2</u>	Under control of Paramount Chief of Barotse Peoples, who distribute land under a tribal law system
TOTAL	<u>186.0</u>	

At present the land tenure and distribution system is under review and a new policy may be implemented sometime in 1969.

C. The National Herd

4. Zambia's national herd of cattle is approximately 1.2 million head of which traditional producers own 1.1 million and commercial producers (mainly Europeans with some commercial Zambian farmers) the balance of some 130,000 head. Tonga, Barotse and Angoni are the three main types of cattle indigenous to Zambia, comprising about 70% of the national herd. The breakdown is as follows:

<u>Breed or Type</u>	<u>Estimated No.</u>	<u>% of National Herd</u>
TONGA - Short & Medium horned Sanga 1/ type	445,000	35
BAROTSE - Long horned Sanga	275,000	21
ANGONI - Short horned & polled humped Zebu type	<u>175,000</u>	<u>14</u>
TOTAL	<u>895,000</u>	<u>70</u>

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1/ Sanga is a type of cattle indigenous to African countries, evolved over the centuries from continuous crossing of Bos Indicus and Bos Taurus strains.

5. Of the total 895,000 head of indigenous type cattle, 99% are owned by the traditional sector. The most popular of the breeds is the Angoni, followed by the Barotse, both types having demonstrated their ability to stand up to the rigors of poor management, low levels of nutrition and traditional herding and husbandry techniques. Of the two, the Angoni appears to have the best prospects for development and improvement. Although a small animal, its fertility performance is good, coupled with its inherent tolerance of local conditions. Crossed or upgraded with Boran or Brahman bulls over several generations, this breed could become the basis of future Zambian herd development either for an animal suited to local conditions for distribution to emergent Zambian farmers or as the female side of a hybrid beef breeding program using exotic type bulls.

6. Afrikander, Boran, Hereford, Charolais, South Devon, Sussex and Brahman are the main imported breeds to Zambia, distributed mainly among the commercial ranchers. Afrikander influences in these have predominated, whereby about 90% of the commercial herd comprises Afrikander blood. Although this breed has contributed substantially to the national herd improvement, it is felt that Afrikander has severe limitations in fertility under uncontrolled breeding practices.

7. There is an increasing use of Boran which is proving beneficial in improving quality. However, general use of this breed is limited mainly by the veterinary restrictions applied to the importation of these animals from Kenya. One method to overcome this limitation is to adopt artificial insemination. It has been determined that adequate quantities of frozen Boran semen could be available from Kenya at economic prices.

8. Of the other imported breeds in use for cross-breeding, Hereford, Charolais and Sussex have demonstrated value and popularity. A greater use of these and other breeds will contribute significantly to the national tonnage output of beef over the next decade. However, careful attention is required in distributing surplus breeding females from these crosses to the Zambian farmer sector. Genetic deterioration by uncontrolled breeding policies could be rapid, as well as mortality increases due to lower levels of herd management. Careful planning and control is necessary to ensure against this.

#### D. Livestock Distribution

9. From the census taken in 1965 and 1966, the classification of the 1.2 million head national herd is approximately:

Bulls	38,500	3% of herd
Cows and heifers	573,300	48% of herd
Oxen	355,700	30% of herd
Calves	<u>232,400</u>	<u>19% of herd</u>
TOTAL	<u>1.2 million</u>	<u>100% of herd</u>

#### The Commercial Beef Herd

10. The commercial beef herd numbers have decreased from approximately 213,000 head in 1961 to 130,000 in 1966 due mainly to the exodus of European farmers, a secondary result of which was the slaughtering of female breeding stock to realize maximum capital before leaving. However, since 1966, as a result of legislation whereby female stock of departing ranchers is now rescued and also due to a renewal of confidence in the country by the remaining ranchers, the cattle population of the commercial sector has stabilized. This herd is almost exclusively concentrated along the 'line of rail' areas and in Southern Province. Of the 130,000 head in the total commercial beef herd approximately 60,000 head are breeding females, of which the Cold Storage Board (CSB) has lent out to commercial ranchers and farmers about 38,000 or 63% of the total cow herd. The balance is owned by these farmers and other private ranchers.

The Commercial Dairy Herd

11. The commercial dairy herd is small, comprising about 10,000 breeding females, of which 85% are Friesian and the remainder Jersey and Guernseys, with Southern African blood in all breeds. There is almost no milk production for sale from the traditional sector. It is not clear in which direction the expansion of dairy farming will take place, particularly in relation to the emergent Zambian farmer. However, plans are being drawn up by Government for the establishment of a series of 40-cow units in different rural areas. Experiments are currently taking place in developing dairy cross breeds suitable for small farmer production. The steer calf resulting from these crossbred animals will be suitable for beef production.

12. In the past, it was common practice in the commercial dairy herds to slaughter calves at birth. With the increase in beef prices in 1968, a number of dairymen have found it profitable to fatten their dairy steer calves for sale at 12 to 14 months. As long as the current price advantage is maintained Project ranches will feed their Friesian steer calves under an intensive rearing system to slaughter when about 12 to 14 months of age at 850 lb liveweight.

The Traditional Beef Sector

13. The traditional herd of about 1.2 million is distributed mainly through Southern and Barotse Provinces. Most of these cattle are kept under communal grazing systems. The overall distribution pattern is as follows:

<u>Province</u>	<u>No. of Head</u>	<u>% of Total Herd</u>
Southern	483,000	41
Barotse	284,000	25
Eastern	172,000	16
Central	118,200	11
Northern	50,500	5
North Western	12,300	1
Western	3,000	0.5
Luapula	<u>2,800</u>	<u>0.5</u>
TOTAL	<u>1.2 million</u>	<u>100</u>

E. Livestock Offtakes and Reproduction Rates

14. The offtakes are fairly satisfactory in the commercial sector at 17-18% per annum whilst the traditional herd is very low at 4%. By contrast the offtake rate on the Zambia Cattle Development Ltd. ranches included in the Project are expected to rise to 25% in the first 8-10 years of the Project. The low offtake in the traditional herd can be generally attributed to calf mortalities and a tendency of the sector as a whole still to regard cattle as their wealth. The following table indicates the pattern of offtakes over the past 4 years.

Commercial Sector

<u>Year</u>	<u>Total Herd ( '000 )</u>	<u>Total Slaughterings ( '000 )</u>	<u>Offtake %</u>
1964	190	29	15
1965	156	26	17
1966	150	27	18
1967	<u>150</u>	<u>27</u>	<u>18</u>
Average	<u>161</u>	<u>27</u>	<u>17</u>

Traditional Sector

<u>Year</u>	<u>Total Head ( '000 )</u>	<u>Known Slaughterings ( '000 )</u>	<u>Estimated Bush Slaughterings ( '000 )</u>	<u>Total Slaughterings ( '000 )</u>	<u>Offtake %</u>
1964	1,112	-	-	-	-
1965	1,100	16	32	68	4.3
1966	1,150	18	36	54	4.9
1967	<u>1,200</u>	<u>18</u>	<u>36</u>	<u>54</u>	<u>4.9</u>
Average	1,103	17.7	34.6	52	4.7

15. In the commercial sector effective calving percentages (weaning rates) range from about 62% to 83%, with an average of around 70%. These figures, although low by U.S. standards are comparable to efficiently managed ranches in East African and Latin American countries. In the

traditional areas, however, weaning rates are much lower. For example, in Barotse Province the calving percentage (at birth) is around 40% with an effective weaning rate of only about 24%, representing a calf mortality of about 50% of all calves born. These figures are generally the pattern throughout the traditional sector. A great deal of attention is required of Government to improve the performance of the sector, as it is a major undeveloped livestock resource.

ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

Marketing of Beef and Milk

Meat Marketing

1. The marketing of livestock and meat has evolved rapidly since 1964. The principal factors of this evolution are rapid rise in consumer demand, the drop in local supplies due to the departure of a number of non-Zambian ranchers, the expanded role of the Cold Storage Board (CSB) into live cattle marketing and beef carcass importing, and finally the decision by Government in 1968 to raise its producer support price for beef by an average of 38%.

2. Cattle are slaughtered and marketed in three ways - 37% of total consumption by CSB, about 20% by private butchers and 20% in village slaughterings. The balance is made up from imported carcasses.

Consumer Demand for Beef

3. The internal demand for beef in Zambia has been expanding. About 88,000 carcasses were consumed in 1964, increasing to 96,800 in 1967. However, domestic supplies dropped from 74,200 to 59,400 over the same period, requiring a 164% increase in beef imports. The principal reasons for this expansion have been rising incomes, the relatively low price of beef (prior to 1968) compared to protein substitutes such as mutton, pork and poultry, general population increases (3% per annum), and rapid urbanization 1/.

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1/ The projection made by the Zambian Ministry of Agriculture on the future demand for beef was based on the following assumptions: changes in aggregate national income and the price of beef relative to close substitutes for it are assumed to be the principal determinants of beef demand. These assumptions should be qualified as the use of aggregate income as an explanatory variable neglects population changes, especially since a relative increase in young population will alter the average demand for meat. In addition, shifts in population between regions and occupations can affect demand insofar as urbanization (Lusaka and Livingstone) and the expanding copper industry have an impact on consumption patterns. However, it is difficult to allow for these factors in light of the inadequate data available. Therefore, a constant income elasticity of demand for beef of 1.2 was assumed - e.g. a 1% rise in total private consumption of all commodities will give rise to a 1.2% rise in the consumption of beef. This assumption accords with FAO elasticity estimates for East African countries ranging from 0.9 to 1.3.

It is clear that the magnitude of recent increases of annual internal consumption of beef is likely to continue for some years to come.

Beef Consumption: Carcass Equivalents

	<u>Actual</u>		<u>Projected</u>
1964	88,308	1969	120,000
1965	89,662	1970	130,000
1966	85,955	1975	165,000
1967	96,810	1985	300,000
1968(est)	110,000		

Even assuming demand at 300,000 carcasses by 1985, this level would still only provide an average consumption of beef per person of roughly 20 pounds, equivalent to consumption levels now achieved in Kenya, Uganda and Tanzania.

4. From the slaughter stock sources of both the commercial and traditional sectors, about 55,000 head are available at present with prospects of increasing this to about 76,000 head by 1970, as a result of: (a) the Project ranches and dairy farm contributions at peak production levels; and (b) by the reasonable assumptions that the traditional herd will continue to increase at about 2% per annum and that offtake will be held at 4% per annum.

5. These output estimates would still be insufficient to meet the demand projected of about 130,000 head in 1970. By 1975, local supplies should rise to perhaps 80,000 head which would require about 85,000 carcass equivalents to be imported if present trends in demand persist, which is considered likely by knowledgeable Zambian agricultural planning officials.

Beef Imports

6. Imports of beef are projected to increase rapidly as domestic supplies fail to match likely internal consumption. Recent estimates indicate that import requirements (now running at nearly 40,000 carcass equivalents annually) are likely to reach 85,000 by 1975, rising to perhaps 160,000 carcasses by 1985. Based on a cif estimate of US\$700 per metric ton, the cost in foreign exchange of these imports, now averaging the equivalent of US\$6.0 million, would rise to over US\$12.0 million in 1975 and may cost the balance of payments nearly US\$25 million annually by 1985. The CSB has a monopoly on beef imports to Zambia. The bulk of imports, which are equivalent to Zambia's middle grade (standard), come from South Africa, Botswana and Swaziland.

### Cattle Movement

7. Beef cattle are moved to consuming areas by trekking, truck and rail. The offtake from Barotswe Province is normally walked out to Livingstone. Cattle in Central and Southern Provinces are normally trekked to the rail line and railed to Lusaka and the Copperbelt. While no problem is expected in shifting cattle under the proposed Project, it is likely that expanded development of the livestock industry will run into a transport bottleneck, both in the lack of adequate stock routes and the shortage of cattle transport vehicles. Government is aware of this problem and is drawing up proposals to improve the situation as part of its national livestock development program.

### The Cold Storage Board of Zambia and its Role in Meat Marketing

8. The CSB was established in January 1964 comprising in the main the Zambian prorated assets and liabilities of the former Federal Cold Storage Commission. Legally, it is constituted (under Ordinance No. 1 of 1964, and regulated by the Cold Storage Commission Act of 1960) as a Statutory Board of Government, working under a board of directors appointed by the Minister of Rural Development.

9. The CSB has no monopoly powers to buy live cattle in Zambia. There is, therefore, considerable pressure of competition for slaughter stock from local butchers who offer prices to producers above CSB minimum support price. About 17,000 cattle are purchased annually by private butchers for slaughter, approximately 20% of cattle marketed in Zambia annually in recent years. This competition in the marketing of live cattle between CSB and private butchers is praiseworthy and should be encouraged.

### Abattoirs

10. The CSB maintains abattoirs at Lusaka, Livingstone, Kitwe and Chipata. Another small abattoir is planned for Kasama in Northern Province. The CSB has established 80 saleyards throughout the major cattle centers of the country to service these abattoirs. These saleyards appear to be functioning adequately in relation to the total cattle population. After the increase in cattle prices, a noticeable increase in offtake has occurred in Barotswe Province.

11. Currently, total CSB abattoir capacity is 500 head per day, with an additional 50 head per day envisaged for Kasama. The Danish Government is assisting CSB in expanding the Lusaka abattoir to 350 head per day capacity. CSB will then have the capacity to slaughter 170,000 head per year. This would be sufficient for the foreseeable future as current live cattle supplies average 50,000 to 60,000 head per annum. Local butchers are encouraged, on a fee basis, to use the CSB facilities for slaughtering their own purchases.

12. The value of CSB's operations has almost tripled from 1964 to 1967. This expansion has been due to the overall increase in its slaughtering as well as the doubling in the number of cattle placed under grazier agreements during this period. The trading losses incurred in 1966 and 1967 were due principally to the rapid rise in imported cattle and carcasses marketed by CSB prior to the January 1968 increase in prices. These losses should be minimal since the rise. For 1968, the CSB was estimated to break even. Under the provisions of the legal ordinance establishing the Cold Storage Board as a statutory board, Government is obliged to cover any operating losses incurred by the Board. The Ministry of Finance has now instituted an overall review of the organizational and financial structure of all Government statutory boards, including the CSB. One of the issues being covered in this review is the financing of CSB's Grazier Scheme.

#### Milk and Dairy Produce Marketing

13. Similar to the marketing of beef, the marketing of milk and dairy products has undergone substantial changes since 1964. As described later, the role of the Dairy Produce Board (DPB) has greatly expanded. Most noteworthy has been the rapid expansion of milk consumption by the lower income groups through the effective introduction by Government of a Cheap Milk Scheme. This increase in demand has necessitated substantial imports of milk powder for reconstituting in Zambia into liquid milk to meet this demand. Due to the relatively low price of such powder, the DPB has carried out such reconstitution at little or no financial loss.

#### Supply and Demand for Milk and Milk Products

14. Fresh milk supply within the DPB area developed in the following manner since 1959:

(Million Gallons per Year)

<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
2.9	3.1	2.7	2.9	3.2	3.5	4.0	3.9	3.7	3.8

These figures show that more or less since 1964 fresh milk supply has been fairly constant in absolute terms, despite the fact that the number of dairy farmers decreased from 140 in 1962 to 89 in autumn of 1968. This was mainly due to the fact that smaller dairy farmers went out of business with the remaining farmers buying up their herds.

15. During the late 1950's and early 1960's the fresh whole milk market was in constant surplus at an average producer price of about US\$0.52 equivalent per gallon and consumer prices of US\$0.12 equivalent per pint in the Copperbelt and US\$0.10 equivalent elsewhere. Only about 60% of fresh milk supply was then consumed as whole milk with the balance going into butter and cheese production. This surplus was reversed after the introduction of the Cheap Milk Scheme on July 1, 1965. The average producer price was then reduced to US\$0.49 equivalent per gallon and milk

became available at US\$0.8 equivalent per pint in the high density areas, and at US\$0.10 equivalent per pint in low density areas (US\$0.12 equivalent on the Copperbelt), resulting in whole milk supply falling by about 5%, whilst total consumption of whole milk increased nearly 25%. To reverse this effect of decreasing supplies, the basic producer price was again increased to an average of US\$0.52 equivalent per gallon, with an output of more than 4 million gallons hoped for 1966 and 1967. However, this expectation did not materialize. Milk intake reached only 3.9 million gallons in 1966 and declined further to 3.7 million gallons. This decline was mainly due to farmers reluctance to invest additional capital in their operations in view of political uncertainties.

16. Since June of 1966 monthly milk consumption has increasingly exceeded whole milk supplies and the deficit had to be made up by increased reconstitution of imported ingredients. Reconstitution of milk started in June 1966 with a daily average total of 770 gallons going up to 3,200 gallons daily by December 1966, to 5,867 in September 1967 and to a daily average of 6,840 gallons in October of 1968. The corresponding supply figures for fresh whole milk intake can be seen in the following tabulation:

<u>Month</u>	<u>Daily average in- take of fresh whole milk/gallons</u>	<u>Daily average recon- stitution of milk/ gallons</u>
June/66	10,300	770
December/66	10,280	3,200
September/67	9,240	5,867
October/68	9,058	6,840

If the maximum natural herd increase is attained, the supply of fresh milk is unlikely to meet milk demand. The deficits in fresh whole milk supply are likely to increase from approximately 4.0 million gallons in 1969 to 17.5 million gallons by 1980, given an estimated increase of demand from 7.5 million gallons for 1969 to 24.2 million gallons by 1980 1/.

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1/ This demand increase is based on the following assumptions:

- (a) stability of the present (1968) retail price of 8 ngwee per pint for low density areas and 6 ngwee per pint for high density areas;
- (b) high price demand; 5% per year increase; and
- (c) low price demand: 50% per year, old price elasticity of 0.75 for 1967/68, thereafter 25% per year to 1972, then 10% per year increase to 1980.

17. Due to the success of the cheap milk scheme since 1965, the surplus of fresh whole milk that used to be processed into butter, cheese, ice cream and other dairy products no longer exists and Zambia's necessities in these fields must be 99% imported. The value of total annual imports of dairy products increased from US\$1.4 million in 1964 to US\$2.7 million by the end of 1967. Condensed milk imports increased from US\$258,500 in 1964 to US\$506,800 in 1967. Skimmed and full cream milk powder imports increased three and a half times from a total of 1.7 million lb in 1964 to 5.8 million lb by the end of 1967. Despite the likelihood that reconstituted milk will become increasingly popular in tropical countries, the recent substantial increase in production of milk powders in Europe should ensure that the price of ingredients does not rise appreciably in excess of US\$0.49 per gallon in the immediate future. It has been calculated that Zambia can produce milk competitively with this import parity price, although it is unlikely that it will have either the capital or enough organizational ability to displace imports for some years yet. On the assumptions that commercial production is unlikely to increase rapidly in the near future, and that Zambia shall be unable to develop dairy production rapidly enough to offset the expected short-fall in supply, the reconstitution of imported ingredients will continue to be an important source of supply of milk, certainly until after 1970.

The Dairy Produce Board (DPB)

18. The Dairy Produce Board was created by Ordinance in 1964 as a statutory Government body. The members of its Board are appointed by the Minister of Rural Development. Its main functions are (a) to guarantee minimum prices to producers which are normally reviewed and set annually by Government; (b) to ensure an adequate supply of milk and of other dairy products to consumers on a national scale; (c) to control and guarantee the quality of dairy produce; (d) to administer the different subsidies of Government paid to consumers and producers.

19. The DPB is managed by a General Manager, a Secretary/Chief Accountant, a Marketing Manager, a Production Manager and three Factory Managers. They operate four factories in Kitwe, Broken Hill, Lusaka and Mazabuka and handle a fairly complete range of dairy products, selling butter, 12 different types of cheese, condensed milk, skim milk powder, full cream milk powder, ice cream, fresh whole milk (principally packed in tetrapak cartons) and yoghurt ("Lacto").

20. The DPB made a trading profit of US\$260,000 equivalent during fiscal 1967/68 compared to a loss of US\$74,000 equivalent during the previous year. As a result, the accumulated deficit of the first three years of operation was eliminated with US\$24,000 equivalent carried forward on the balance sheet. The improved trading position was brought about by two main factors. First, the increased volume of activity of the Dairy Produce Board during fiscal 1967/68 had reduced operating costs per unit, and second, the DPB was able to gain from the continued slump of world market prices of dairy products, which it has been importing in increasing

amounts, mainly for reconstitution of milk. The Dairy Produce Board collects, partially with its own trucks, milk from farmers in the four producing areas around Kitwe, Broken Hill, Lusaka and Mazabuku.

### Producer Prices

21. Farmers are being paid monthly by DPB. The present producer price paid for farm-fresh whole milk to dairy farmers on average is US\$0.49 equivalent per gallon. In addition, premiums of US\$0.03 equivalent per gallon (payable by the DPB) are given for quality tested milk. On average only about one-third of the farmers receive these premiums. This producer price, on average, meets a farmer's cost and with a well-managed operation, provides him with an adequate incentive and return on his capital.

### Milk Distribution

22. Distribution of milk in Zambia is difficult due to the wide geographic spread of its population. DPB has tried to reach the target fixed by the Government and to supply the greatest number of consumers possible with a reasonable quantity of milk of good quality. Before the Cheap Milk Scheme was launched in June 1965, the demand for fluid milk was remarkably steady but with regular variances resulting from:

- (a) the habits of population, especially the Zambian sector which spends, mainly in the Copperbelt, a great amount of its monthly wages within the first week after the first of the month when they receive their paycheck. This leads to a much greater demand during the first ten days of each month with the consumption then slowing down to a rather constant level for the rest of the month, and
- (b) the effects of the seasonal temperature differences which increase demand during summer and lower it during the rainy season between November and April.

23. In addition, there are only a few suppliers in the Copperbelt. Demand being greatest in this area, necessitates that milk from Mazabuku and Lusaka factories be transported by road tanker to the Kitwe factory. To a certain extent this problem is counteracted by a price differential paid to Copperbelt producers of US\$0.06 equivalent per gallon in order to encourage them to enlarge their dairy herds. This area differential is likely to be paid as long as Copperbelt demand outstrips local fresh milk supply.

24. In order to increase its sales coverage as much as possible, the Dairy Produce Board plans considerable investments in the near future. Between now and 1971 the Board plans to invest approximately US\$1.4 million equivalent for new machinery, new buildings, land acquisition and a long-life milk factory to be operational by 1972, which will permit the marketing

in the outlying areas so far not served by DPB of milk that can be exposed to heat and be stored for up to six weeks without souring. The start-up capacity of this factory, which will be located in Lusaka, will be 16,000 gallons per shift and could easily be doubled to 32,000 gallons by introduction of a second shift.

ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

The Grazier Scheme

Introduction

1. Since 1964 the Cold Storage Board (CSB) has played a major role in the development of the beef cattle industry. One of its most important functions has been the distribution of live cattle through its Grazier Scheme, under which it undertakes to:

- (a) purchase weaners and store cattle for lending as feeders at commercial interest rates to individual ranchers and grazing associations;
- (b) guarantee minimum prices to producers for live cattle which are reviewed annually by Government; and
- (c) preserve female stock from slaughter in order to stabilize the national herd, on-lending them to ranchers at commercial rates of interest.

The Scheme at Present

2. Under the operating structure of the CSB Grazier Scheme, surplus cattle are purchased from commercial ranchers and the traditional sector for lending at commercial interest rates to qualified individual ranchers and grazing associations. The CSB retains title to the cattle and ensures, through the grazier agreement signed by the borrower, by branding with CSB's brand, and by periodic inspections, that the cattle are well maintained and are only marketed through the CSB slaughter facilities. The CSB interest, fees and principal are recovered at slaughter with the residual profit (or loss) accruing to the borrower.

3. This Scheme has been the principal force in stabilizing the commercial herd in recent years. It will also be playing a key role in any significant expansion of the beef cattle industry, unless alternative, competitive functions develop within the framework of the national livestock industry to provide credit along ordinary banking lines.

4. There are five types of cattle operations conducted under the Grazier Scheme. These are:

- (a) weaner steers for growing out and fattening;
- (b) store cattle for grass fattening or maize finishing;
- (c) weaner heifers for growing, breeding and fattening when culled;

- (d) adult females for breeding and fattening when culled; and
- (e) the financing of bull breeding stock.

This system of operation has developed successfully insofar as it has widened significantly the continuity of supply of the right type of beef at the right time of year to the CSB and that it has done so in a manner which ensures the CSB's ability to recoup its capital investment.

5. At present the Grazier Scheme has a total of 256 accounts involving an encumbered herd to CSB of 52,538 head worth about US\$3.1 million equivalent. The borrowers' categories are as follows:

<u>Category</u>	<u>Number</u>	<u>Number of Head</u>
Emergent African farmers, Ranchers and Cooperatives	11	2,037
Europeans	197	35,891
Private Companies	22	5,866
Government Ranches, Institutions, etc.	<u>26</u>	<u>8,744</u>
Total	<u>256</u>	<u>52,538</u>

The breakdown of the cattle and funds employed under this scheme is:

<u>Cattle Class</u>	<u>Number</u>	<u>Loan Value Outstanding</u>	
		<u>(K)</u>	<u>(US\$ Equivalent)</u>
Steers	14,219	587,106	821,948
Females	<u>38,319</u>	<u>1,605,934</u>	<u>2,248,308</u>
Total	<u>52,538</u>	<u>2,193,040</u>	<u>3,070,256</u>

#### Credit Mechanism

6. The normal livestock limits allowed to ranchers are approximately 300 head to a new subscriber representing an approximate value of K 14,000 (US\$19,600) and 450 head to an established and proven rancher representing an approximate value of K 20,000 (US\$28,000). A balanced loan of 50% males on a short term agreement and 50% females on a medium term agreement (up to 5 years) is usually applied to a rancher application. Ideally, if the weaners and store cattle were available, the scheme could evolve into a fast moving steer fattening credit system. However, the steers are not currently available to achieve this. The longest period of agreement for a livestock loan is 5 years.

7. Secondly, the CSB undertakes credit financing to the producer known as "advance deals". Advance credit is made against a producer's own unencumbered stock, as distinct from stock purchased with Board assistance from another producer. Livestock under evaluation for advanced credit to a producer are assessed on the same basis as for the normal support credit. However, a maximum limit is set of two-thirds of the total value of current livestock prices. Finally, bull purchases can be financed on the basis of equivalent liveweight prices/100 lb of commercial grade cattle.

8. In all three forms of credit, livestock covered by advances are branded with the CSB registered brand and CSB retains the legal title of the livestock. Interest on the outstanding balances financed by CSB on behalf of the grazier is charged at 7% per annum. The grazier, in the case of females, also agrees to produce 18 months after the signing of an agreement, a certain number of weaners (male and female) and thereafter each breeding year, until such time as the female is fattened and sold back to the CSB as a cull. These weaners will also be branded by CSB. All calves born during the agreement become the property of CSB. If cattle should die, be lost, stolen or otherwise, the amount of loss is met by CSB and deducted from proceeds due to the rancher when stock under the scheme is remarketed through the CSB. In practice, usually the first calf only is branded by CSB and none at all are branded if the outstanding commitment on the cow by the grazier is less than US\$28.

#### Current and Future Financial Structure

9. The CSB has built up the Grazier Scheme to its present level (US\$3 million equivalent) by revolving 90-day Treasury bills costing 6½%. Each 90 days the CSB and Government automatically revolve the notes and frequently add to the outstanding balance as the Scheme expands. While the copper price has been high and Government has been relatively well supplied with surplus funds from tax revenues and commercial banks taking up Treasury bills, the CSB has been relatively safe in relying on such short-term financing.

10. However, there are two dangers in continued reliance on such financing. First, the Grazier Scheme itself has expanded into lending females which are a longer term (up to 5 years) loan operation than revolving fattening stock (6 to 18 months). And second, the surpluses in commercial banks can easily be lent directly by them as new credit demands arise in the private and public sector and copper prices, always volatile, could fall precipitously, both factors contributing to a future possible Government inability to continue to revolve and expand its short term financing of a basically medium-term (average 3 years) cattle lending operation.

11. Since the Scheme has contributed substantially to the stabilization of the commercial breeding herd and is likely to play a major credit role in the future expansion of the livestock industry, it is important that the Scheme be financed with a loan whose term is appropriately matched with the term of the cattle loans outstanding. Informal discussions were held with

Government, CSB and commercial banks in Zambia and London. The banks indicated their willingness to discuss with Government appropriate financial and institutional arrangements, including provision of both loan and equity finance, to a possible restructured Grazier Scheme organized as a company (with minority or majority government participation) whose main business would be to purchase and lend cattle to carefully selected and supervised ranchers.

ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

Government Policies for Livestock Development

Existing Government Policy

1. The total Government authorized development expenditure for 1966-1968 was US\$458 million equivalent. Of this, about 10% (US\$48 million equivalent) was earmarked for agricultural development; from this amount US\$2.3 million equivalent was allotted for livestock development. The range of Government sponsored livestock projects underway to date is reflected below:

- (a) The CSB Grazier Scheme: (See Annex 3)
- (b) Southern Province Grazing Associations: Currently, there are two grazing associations in operation in Southern Province. Each has a membership of about 60 members with long waiting lists. About 300 cattle are involved in each association, 100 of which are store cattle on loan from the CSB Grazier Scheme. The minimum inputs of fencing, dips and water facilities are supplied by the Ministry of Rural Development on credit. Direct management is the responsibility of the association membership, assisted by the Ministry's extension staff. The participants are enthusiastic to expand this type of scheme. Land tenure and the shortage of weaner steers and heifers appear to be the principal constraints in the short run to such expansion.
- (c) The Eastern Province Grazier Scheme: This Scheme is designed to convert surplus maize and groundnut cake grown in Eastern Province into beef and to expand the already successful Zambian farmer's role in Eastern Province in growing out weaner stock and finishing them for slaughter under feedlot conditions. Under this scheme cattle are lent out to selected Zambian farmers as weaners which, in turn, are grazed and grown out to about 3½ year olds in the farmers' own herd, after which the farmers put these steers on feed under lot conditions for about 120 days. The ration consists of snapped corn and groundnut cake. The whole growing/fattening cycle is conducted under the supervision of the Provincial Animal Husbandry Officer, who also assists in designing the facilities. The average size of the operation involves between 5-10 head with a total cycle time of about 3 years. When cattle are slaughtered, all costs including purchase price, interest, feed costs and administration are deducted and the balances are distributed to the farmer. Experience has shown that the farmer nets between US\$35 and US\$40 equivalent per head. The major constraint acting on the development of this successful scheme is the shortage of weaner stock to meet the African farmers' demand in Eastern Province.

- (d) Cooperative Ranches: Except for one scheme adjoining the Chisamba Ranch in Central Province and two in Southern Province, cooperative schemes in livestock have proven difficult to organize.
- (e) The Barotse Summer Grazing Scheme: This Scheme was devised to ease grazing pressure on flood plain areas of Barotse. Suitable high region timbered grazing areas were negotiated by Government with the Paramount Chief, on which Government supplied inputs of management, water, dips, fences, etc. Stock is moved on to these areas by the owner, when the flood plain country is seasonally flooded from the Zambesi river. This scheme, although meeting difficulties in securing farmer support, is beginning to become effective.
- (f) The Barotse Ranching Development Scheme: This Scheme is an attempt to establish a large scale dry area unit ranch of approximately 400 sq miles in size. The site adjoins the Angola border in a sand veldt area estimated to carry about 1 head to 60 acres. 2,000 sq ml is available to expand this concept. No results are available, as fencing and water improvements are still being installed.

2. Among the policies and projects (now being reviewed and worked up by the Ministry of Rural Development) which are likely to form the basis for a second phase program are the following:

- (a) a final review and formalization of the land tenure system, necessary to ensure an orderly expansion of livestock development;
- (b) the encouragement (financial and technical) of qualified individual Zambian cattle owners to expand and/or to take up suitable abandoned ranches located in Central and Southern Provinces;
- (c) an expansion of the Eastern Province Grazing Scheme;
- (d) financial and management consolidation of CSB Grazier Scheme as a marketing mechanism for live cattle, both feeder and breeding stock;
- (e) an expanded ranching Project in Western Barotse to embrace a 2,000 sq ml ranch unit, developed initially on the North Australian large scale ranch concept;
- (f) technical and economic research into improved pasture systems, leading to large scale land clearing and pasture establishment projects, with priority emphasis on tsetse clearances and consolidation in Eastern Province;
- (g) the establishment of ranching settlement schemes in Eastern and Southern Provinces similar in concept to the successful Ankole/Masaka scheme in Uganda;

- (h) the improvement of cattle movement facilities, both through better stock routes and improved roads for trucking cattle out of Barotse Province; and
- (i) the technical and financial support of additional grazing associations in Southern and Central Provinces.

3. To assist the recently created National Livestock Development Group in reviewing these proposals and in incorporating the most viable projects and policies (with detailed physical and financial breakdowns) into a program of national livestock development, with subprojects suitable for financing, funds have been made available in the proposed loan for three-man-years of internationally qualified consultant services.



ZAMBIALIVESTOCK DEVELOPMENT PROJECTProject Technical Aspects: Maize Feeding, Pasture  
Improvement and Artificial InseminationMaize for Beef Feeding

1. In Zambia it is Government policy to maintain an annual reserve of 100,000 tons of maize as well as to satisfy other needs within the country and to take advantage of possible export opportunities, particularly in the Congo. Between 1958 and 1963 deliveries of maize to the Grain Marketing Board increased from 143,000 short tons to 203,000 tons. After Independence Government price encouragement (and the provision of hybrid seed-(S.R. 52)- and fertilizer through credit schemes to large and small farmers) caused deliveries to rise as follows:

1964/65	214,000 short tons
1965/66	280,000 short tons
1966/67	410,000 short tons

The Central and Southern Provinces account for 60% of all maize grown. At the subsistence 'chitimene' <sup>1/</sup> level of farming, yields may amount to only one bag (200 lb) to the acre; yields can be raised to 14 bags with fertilizer and hybrid seed. On good land under commercial production yields are much higher - 25 bags on average and up to 45 bags with good soils and management.

2. The ratio of the price of maize to the price of cattle has moved in favor of maize-feeding as a result of the 1968 increase in the beef price. This as much as any other factor is causing a renewed interest in the practice on both commercial and traditional farms. The comparative beef/maize price ratios of several beef producing countries are as follows:

Spain 1:7.7	France 1:8
U.S. 1:11.8	Zambia (a) cost of production of maize 1:14.5
	(b) selling price of maize 1:12

From the above, it appears that price returns are relatively favorable, in which farmers grow maize and keep cattle or as maize growers, farmers and cooperatives can buy cattle for finishing. The amount of grain needed to

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<sup>1/</sup> Chitimene is a cropping rotation system used by the traditional sector. The individuals clear a circle of bush, crop the cleared area until the soil fertility declines and then move on to new areas on which the process is repeated.

produce 1 lb of liveweight gain at a typical fattening age is 8-8½ lb, so that a unit price ratio of 1:8 or lower is not likely to be profitable. The implications of maize feeding in relation to the Project are of importance in raising dairy calves to slaughter weight at 12 to 14 months of age and in finishing steers for slaughter.

### Pasture Improvement

3. Considerable areas of legume trials have been undertaken throughout Zambia in recent years, both in Government research institutions and on private ranches. Legumes such as stylothanes guyanensis (s. gracilis), phaseolus atropurpureus (siratro) and glycine javanica are on trial, as well as introductions to veldt and established pastures of Rhodes, Buffel and Star Grasses. Success has been achieved from the technical view point, certainly enough to warrant economic proving trials on Zambia Cattle Development Ltd. ranches. Provision has been made in the loan to test the following:

- (a) the economics of a pasture improvement experimental program under ranch conditions;
- (b) the most suitable species of grasses and legumes for large scale applications;
- (c) a multiplication scheme for selected types with which to extend the trials to a commercial scale; and
- (d) fertilizer applications (qualitative and quantitative) for an expanded project and cost determinations on a ranch broad acre basis.

4. Little work has been done by the research organizations or ranchers on determining viable cost inputs in land clearing, seed-bed preparation, fertilizer levels, regrowth control, pasture maintenance, expected carrying capacities, all of which are necessary before considering an extended use of pasture improvement principles. Accordingly, funds would be made available under the Project to undertake the following;

- (a) prepare trial plots of about 80-100 acres on each ranch, broken down into 4 sub-plots, in order to test for pasture responses to the varying soil conditions which exist on each ranch;
- (b) supplying sufficient seed and fertilizer and application costs for the proving trials on all of the ranches; and
- (c) sufficient funds for seed bed preparation, including land clearing, burning, windrowing etc. The results of these experiments should be recorded closely and compared with other areas of the world. Modern up-to-date techniques should be evaluated.

International sources of legume and grass seed should also be identified and priced for use in any second stage project, which may be justified as a result of these proving trials. Provision would also be made for the services of an experienced pasture consultant as well as a short-term consultant experienced in large scale, low-cost land clearing and preparation techniques.

#### Artificial Insemination

5. Two years ago the Zambian Government established an artificial breeding center at Mazabuku Research Station. Facilities were established to:

- (a) receive and store semen imported from U.K., U.S.A., and Europe;
- (b) manufacture and distribute liquid nitrogen, with sufficient capacity to meet the Project's requirements and make available surplus production to meet future demand;
- (c) train ranch managers and personnel, commercial farmers etc. in artificial breeding techniques; and
- (d) eventually expand into semen collection, dilution and preservation.

Local responses to this new facility have been good in that about 4,000 head of cows in the national dairy herd were settled last year with imported semen. Initial target for this program have been determined at settling 75% of the national dairy herd of 10,000 head and increasing quantities of beef cows. The overall average conception rate appears to be about 60% to date on the limited information available to the mission. This is fairly satisfactory considering the newness of the Project and the inexperience of the personnel associated with it in Zambia. Liquid nitrogen supplies are available at 4 centers throughout the country, Mazabuku Research Station, Lusaka, Kitwe and Livingstone, which is adequate for an expanded project.

6. To complement the lack of suitable bulls for the Project ranches, an artificial inseminating scheme costing about US\$113,000 equivalent has been included. 35,000 ampules of imported beef and dairy semen would be financed including equipment and services costs, representing 690 bull equivalents over the 5 years of the program. An experienced Australian technician is available in the proposed management of the Project, who gained his experience in Brazil as a ranch manager with King Ranch, breeding 4,000 Zebu beef cows per annum by artificial insemination.

7. This program will assist greatly in accelerating at economic cost the herd improvement program of ZCDL ranches.



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

ANNEX 6  
Table 1

Seven Breeding/Weaning Ranches - Consolidated - 408,800 Acres  
(38,000 Animal Units)

UNITS	Value (K)	END OF YEARS									
		Before Development	1	2	3	4	5	6	7	8-20	
<b>HERD COMPOSITION</b>											
Breeding Cows	No.	70	6,810	7,949	10,507	12,660	15,629	18,671	19,000	19,000	19,000
Bulls	No.	150	369	397	525	633	781	930	950	950	950
Calves <sup>1/</sup>	No.	15	(3,337)	(5,167)	(7,355)	(8,862)	(10,940)	(13,070)	(13,300)	(13,300)	(13,300)
9 - 24 month Heifers	No.	30	1,359	3,168	3,433	4,728	5,481	5,470	3,821	3,821	3,821
9 - 24 month Steers	No.	35	667	1,669	2,584	3,677	4,431	5,470	6,535	6,650	6,650
24 - 36 month Heifers	No.	75	-	-	-	-	-	-	-	-	-
24 - 36 month Steers	No.	50	36	-	-	-	-	-	-	-	-
36 - 48 month Steers	No.	80	19	34	-	-	-	-	-	-	-
Fattening Cull Females	No.	35	344	647	763	1,009	1,228	2,274	2,717	2,765	2,765
<b>TOTAL NUMBERS</b>			12,941	19,031	25,167	31,569	38,490	45,887	46,323	46,486	46,436
<b>TOTAL ANIMAL UNITS (A/Us)</b>			9,452	13,541	17,030	22,202	28,936	31,682	31,664	31,803	31,803
<b>DEATHS</b>											
Cows	No.		340	340	318	420	380	469	560	570	570
Bulls	No.		18	18	16	21	19	23	28	29	29
9 - 24 month Heifers	No.		68	68	127	137	142	164	164	115	115
9 - 24 month Steers	No.		33	33	67	103	110	133	164	196	200
24 - 36 month Heifers	No.		-	-	-	-	-	-	-	-	-
24 - 36 month Steers	No.		2	2	-	-	-	-	-	-	-
36 - 48 month Steers	No.		1	1	1	-	-	-	-	-	-
Fattening Cull Females	No.		17	17	26	31	30	37	58	82	83
<b>TOTAL</b>	<b>No.</b>		479	479	555	712	681	826	984	992	997
<b>PURCHASES</b>											
Breeding Females 9 - 24 months	No.	50	-	1,500	850	1,050	1,050	-	-	-	-
Breeding Cows	No.	90	-	900	750	450	450	-	-	-	-
Breedable Bulls (Local) <sup>2/</sup>	No.	300	-	134	182	179	228	252	180	168	168
<b>TOTAL</b>	<b>No.</b>		-	2,534	1,782	1,679	1,728	252	180	168	168
<b>SALES</b>											
Steers 9 - 24 months <sup>3/</sup>	No.	60	-	634	1,602	2,481	3,567	4,298	5,306	6,339	6,450
Surplus Heifers 9 - 24 months	No.	50	-	-	-	-	-	-	2,714	2,829	2,829
Surplus Heifers 24 - 36 months	No.	75	-	-	-	-	-	-	1,269	-	-
Steers 36 - 48 months	No.	110	18	18	33	-	-	-	-	-	-
Cull Heifers 9 - 24 months	No.	30	65	65	152	165	459	532	531	371	371
Cull Breeding Cows	No.	95	324	327	621	732	979	1,191	2,206	2,635	2,682
Bulls	No.	90	18	88	38	50	61	76	136	139	139
<b>TOTAL</b>	<b>No.</b>		425	2,132	2,446	3,428	5,066	6,097	12,162	12,312	12,471
<b>HIDES (50% of deaths)</b>			240	240	278	356	340	413	492	496	498
<b>PRODUCTION DATA</b>											
<b>Technical Co-efficients (%)</b>											
Mortality (adult cattle)	%		5	5	4	4	3	3	3	3	3
Calves weaned rate	%		60	60	65	70	70	70	70	70	70
Cows and Bulls culled <sup>4/</sup>	%		5	25 <sup>5/</sup>	10	10	10	15	15	15	15
Heifers culled (9-24 months)	%		5	5	5	5	10	10	10	10	10
Carrying Capacity	Animal Units/acre		1:20	1:20	1:20	1:17	1:15	1:13	1:13	1:13	1:13
Stocking Rate	Animal Units/acre		1:43	1:30	1:23	1:19	1:15	1:13	1:13	1:13	1:13
Offtake	%		3	6	10	11	13	13	26	27	27
Bulls joined	No./Breeding Cows		1:18	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20
<b>VALUE OF SALES AND PURCHASES (in MWACHA)</b>											
<b>A. Purchases</b>											
Breeding Females 9 - 24 months		50	-	75,000	42,500	52,500	52,500	-	-	-	-
Breeding Cows		90	-	81,000	67,500	40,500	40,500	-	-	-	-
Breedable Bulls		300	-	40,200	54,600	53,700	68,400	75,600	54,000	50,400	50,400
<b>TOTAL PURCHASES</b>			-	196,200	164,600	146,700	161,400	75,600	54,000	50,400	50,400
<b>B. Sales</b>											
Steers 9-24 months		60	-	38,040	96,120	148,860	214,020	257,880	318,360	380,340	387,000
Surplus Heifers 9-24 months		50	-	-	-	-	-	-	135,700	141,450	141,450
Surplus Heifers 24-36 months		75	-	-	-	-	-	-	95,175	-	-
Steers 36-48 months		110	1,980	-	-	-	-	-	-	-	-
Cull Heifers 9-24 months		30	1,950	1,950	4,560	4,950	13,770	15,960	15,930	11,130	11,130
Cull Breeding Cows		95	30,780	31,065	58,995	69,540	93,005	113,145	209,570	250,325	254,790
Cull Bulls		90	1,620	7,920	3,420	4,500	5,490	6,840	12,240	12,510	12,510
<b>TOTAL SALES</b>			36,330	78,975	163,095	227,850	326,285	393,825	786,975	795,755	806,880

1/ "Before development" represents the date of appraisal and is the beginning of the first development year with the herd composition shown as opening inventory  
2/ At appraisal approximately 50% of cows had calved. Therefore, calving figures are estimates applied to the breeding herd during that year  
3/ Heifers are reclassified into the breeding herd and are in calf as 2-3 year olds  
4/ Breedable bulls include artificial insemination supplementation for the first 5 years of the project  
5/ Steers are sold at about 14 months of age at about 500 lb liveweight  
6/ During Year 1 of the project, in order to clean up the herd, 25% of bull battery is culled and 10% of cow herd. Thereafter 10-15% peak for both bulls and cows



## ZAMBIA

## LIVESTOCK DEVELOPMENT PROJECT

Bull Breeding Ranch - 18,400 acres  
(2,630 Animal Units)

UNITS	Value (K)	Before Development <sup>1/</sup>	END OF YEARS							
			1	2	3	4	5	6	7-20	
<b>HERD COMPOSITION</b>										
Stud Breeding Cows	No.	100	1,272	1,266	1,385	1,380	1,300	1,300	1,300	1,300
Bulls	No.	200	64	63	69	69	65	65	65	65
Calves <sup>2/</sup>	No.	25	( 979)	( 974)	(1,089)	(1,105)	(1,105)	(1,105)	(1,105)	(1,105)
9-24 month Heifers	No.	50	354	489	169	99	163	163	163	163
9-24 month Bulls	No.	130	102	490	478	544	553	553	553	553
9-24 month Steers	No.	55	292	-	-	-	-	-	-	-
24-36 month Heifers <sup>3/</sup>	No.	100	-	-	-	-	-	-	-	-
24-36 month Bulls	No.	200	61	95	456	446	507	542	542	542
24-36 month Steers	No.	80	92	-	-	-	-	-	-	-
Fattening Cull Females	No.	85	318	312	310	136	135	128	128	128
TOTAL NUMBERS			3,534	2,689	3,956	3,779	3,828	3,856	3,856	3,856
TOTAL ANIMAL UNITS (A/Us)			2,396	2,559	2,712	2,606	2,656	2,687	2,687	2,687
<b>DEATHS</b>										
Cows	No.		25	25	25	27	27	26	26	26
Bulls	No.		1	1	2	2	2	2	2	2
9-24 month Heifers	No.		7	7	10	10	9	10	10	10
9-24 month Bulls	No.		2	2	10	9	11	11	11	11
9-24 month Steers	No.		6	6	-	-	-	-	-	-
24-36 month Heifers	No.		-	-	-	-	-	-	-	-
24-36 month Bulls	No.		1	1	2	9	9	10	10	10
24-36 month Steers	No.		1	1	-	-	-	-	-	-
Fattening Cull Females	No.		6	6	6	6	3	3	3	3
TOTAL	No.		49	49	55	63	61	62	62	62
<b>PURCHASES</b>										
Breeding Heifers 9-24 months	No.	-	-	-	-	-	-	-	-	-
Breeding Cows	No.	-	-	-	-	-	-	-	-	-
Breedable Bulls (Local)	No.	300	8	10	18	12	8	12	12	12
Breedable Bulls (Imports) <sup>4/</sup>	No.	-	-	-	-	-	-	-	-	-
TOTAL	No.		8	10	18	12	8	12	12	12
<b>SALES</b>										
Surplus Heifers 9-24 months	No.	60	-	-	-	287	494	363	363	363
Surplus Heifers 24-36 months	No.	100	-	-	-	-	-	-	-	-
Surplus Bulls 9-24 months	No.	200	-	-	-	-	-	-	-	-
Surplus Bulls 24-36 months	No.	300	-	-	93	447	437	497	531	531
Steers 9-24 months	No.	65	286	286	-	-	-	-	-	-
Cull Heifers 9-24 months	No.	40	16	16	25	23	24	27	27	27
Cull Bulls 9-24 months	No.	65	5	5	25	23	26	27	27	27
Cull Bulls (aged and sterile)	No.	90	9	9	10	10	10	10	11	11
Cull fattening Cows	No.	95	312	312	306	304	133	132	125	125
Steers 24-36 months	No.	85	92	92	-	-	-	-	-	-
TOTAL	No.		720	720	459	1,094	1,124	1,056	1,084	1,084
HIDES (50% of deaths)			24	24	27	32	30	31	31	31
<b>PRODUCTION DATA</b>										
<b>Technical Co-efficients</b>										
Mortality (all cattle)	%		2	2	2	2	2	2	2	2
Calves Weaned Rate	%		77	77	80	80	85	85	85	85
Cows culled	%		25	25	25	10	10	10	10	10
Bulls culled	%		10	10	15	15	15	15	15	15
Bull Calves culled	%		5	5	5	5	5	5	5	5
Heifers culled (9-24 months)	%		5	5	5	5	5	5	5	5
Carrying Capacity	Animal Units/acre		1:7	1:7	1:7	1:7	1:7	1:7	1:7	1:7
Stocking Rate	Animal Units/acre		1:7	1:7	1:7	1:7	1:7	1:7	1:7	1:7
Offtake	%		20	16	12	29	29	27	28	28
Bulls joined	No./Breeding Cow		1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20
<b>VALUE OF PURCHASES AND SALES (in Kwacha)</b>										
<b>A. Purchases</b>										
Breedable Bulls			2,400	3,000	5,400	3,600	2,400	3,600	3,600	3,600
<b>B. Sales</b>										
Surplus Heifers 9-24 months	60	-	-	-	-	17,220	29,640	21,780	21,780	21,780
Surplus Bulls 24-36 months	300	-	-	-	-	89,400	87,400	99,400	106,200	106,200
Steers 9-24 months	65	18,590	18,590	19,600	-	-	-	-	-	-
Cull Heifers	40	640	640	1,000	920	960	1,080	1,080	1,080	
Cull Bulls 9-24 months	65	325	325	1,625	1,495	1,560	1,755	1,755	1,755	
Cull Bulls (sterile)	90	810	810	900	900	900	900	900	900	
Cull Cows	95	29,640	29,640	29,070	28,880	12,635	12,510	11,875	11,875	
Steers 24-36 months	85	7,820	7,820	-	-	-	-	-	-	
TOTAL SALES			57,825	57,825	52,195	138,815	133,095	137,455	143,590	143,590

<sup>1/</sup> "Before development" represents the date of appraisal and is the beginning of the first development year with the herd composition shown as opening inventory

<sup>2/</sup> At appraisal approximately 50% of cows had calved. Therefore, calving figures are estimates applied to the breeding herd during that year

<sup>3/</sup> Heifers are reclassified into the breeding herd and are in calf as 2-3 year olds

<sup>4/</sup> Breedable bulls include artificial insemination supplementation for the first 5 years of the project



## LIVESTOCK DEVELOPMENT PROJECT

Two Breeding/Developing Herds - Consolidated - 2,445,000 acres  
(11,316 ha) (27.6 Mha)

ITEM DESCRIPTION	UNITS	END OF YEARS																		
		1	2	3	4	5	6	7	8	9	10-20									
<b>BEFORE DEVELOPMENT</b>																				
Value (Z)																				
<b>HERD COMPOSITION</b>																				
Breeding Cows	No.	1,093	2,704	3,781	4,436	4,813	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Bulls	No.	101	135	189	222	241	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Calves 2/	No.	(656)	(1,758)	(2,647)	(3,105)	(3,369)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)	(3,500)
9-24 month Heifers	No.	753	1,584	2,179	2,323	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452
3-24 month Steers	No.	131	1,884	2,179	2,323	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452
24-36 month Heifers 2/	No.	75	358	479	512	552	552	552	552	552	552	552	552	552	552	552	552	552	552	552
24-36 month Steers	No.	419	315	165	853	1,284	1,505	1,633	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
36-48 month Steers	No.	51	398	302	151	827	1,245	1,460	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
36-48 month Cull Females	No.	51	104	260	550	645	700	728	728	728	728	728	728	728	728	728	728	728	728	728
TOTAL NUMBERS		3,577	7,514	9,402	12,864	14,280	15,568	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462	15,462
TOTAL ANIMAL UNITS (4/0/0)		2,978	5,878	6,875	8,034	10,593	11,718	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392	11,392
<b>DRAINS</b>																				
News	No.	55	65	108	113	133	144	150	150	150	150	150	150	150	150	150	150	150	150	150
Bulls	No.	5	3	5	6	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9-24 month Heifers	No.	37	57	63	26	40	47	51	53	53	53	53	53	53	53	53	53	53	53	53
9-24 month Steers	No.	21	16	19	26	40	47	51	51	51	51	51	51	51	51	51	51	51	51	51
24-36 month Heifers	No.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-36 month Steers	No.	21	16	13	14	26	15	39	49	51	51	51	51	51	51	51	51	51	51	51
36-48 month Steers	No.	3	13	15	9	14	25	38	44	49	47	47	47	47	47	47	47	47	47	47
Facilitating Cull Females	No.	5	4	6	8	17	19	21	21	22	22	22	22	22	22	22	22	22	22	22
TOTAL	No.	147	324	229	202	277	335	358	379	386	386	386	386	386	386	386	386	386	386	386
<b>PURCHASES</b>																				
Breeding Heifers 9-24 months	No.	-	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Breeding Cows	No.	-	64	72	66	58	51	43	43	43	43	43	43	43	43	43	43	43	43	43
Breedable Bulls (Local) 1/	No.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	No.	-	1,164	72	66	58	51	43	43	43	43	43	43	43	43	43	43	43	43	43
<b>SALES</b>																				
Surplus Heifers 9-24 months	No.	50	65	363	293	137	433	619	647	647	647	647	647	647	647	647	647	647	647	647
Steers 36-48 months	No.	110	36	69	76	95	123	163	170	170	170	170	170	170	170	170	170	170	170	170
Cull Heifers 9-24 months	No.	36	36	69	76	95	123	163	170	170	170	170	170	170	170	170	170	170	170	170
Cull Breeding Cows	No.	52	85	100	150	252	533	626	679	726	726	726	726	726	726	726	726	726	726	726
Bulls (Culls)	No.	5	5	8	13	32	35	36	36	36	36	36	36	36	36	36	36	36	36	36
TOTAL	No.	95	195	559	602	657	1,130	2,065	2,741	2,987	3,117	3,117	3,117	3,117	3,117	3,117	3,117	3,117	3,117	3,117
<b>VALUES (50% of Market)</b>																				
Breeding Heifers	Fl.	71	87	115	101	139	163	179	185	185	185	185	185	185	185	185	185	185	185	185
Breedable Bulls (Local) 1/	No.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	No.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>PRODUCTION DATA</b>																				
Technical Co-efficients	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mortality (all cattle)	%	5	60	65	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Calves weaned rate	%	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Cows and Bulls culled 2/	%	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Heifers culled (9-24 months)	%	1:20	1:20	1:20	1:20	1:18	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15	1:15
Carrying Capacity	Animal Units/acre	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Stocking Rate	Animal Units/acre	1:11	1:17	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20	1:20
Griffaker	No./Breeding Cow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bulls joined	No./Breeding Cow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>VALUE OF SALES AND PURCHASES (in MZEMBA)</b>																				
<b>A. PURCHASES</b>																				
Breeding Heifers	50	55,000	55,000	21,500	19,800	17,400	15,300	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900
Breedable Bulls	300	3,300	19,200	21,500	19,800	17,400	15,300	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900
TOTAL PURCHASES		58,300	74,200	21,500	19,800	17,400	15,300	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900
<b>B. SALES</b>																				
Surplus Heifers 9-24 months	50	5,300	48,000	39,330	38,830	21,850	21,950	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450	32,450
Steers, Fat 36-48 months	110	1,050	1,070	2,280	2,450	3,040	46,230	10,570	15,400	15,400	15,400	15,400	15,400	15,400	15,400	15,400	15,400	15,400	15,400	15,400
Cull Heifers 9-24 months	30	8,675	5,500	14,250	23,910	50,635	52,170	61,555	58,970	61,555	61,555	61,555	61,555	61,555	61,555	61,555	61,555	61,555	61,555	61,555
Cull Breeding Cows	35	2,250	720	1,170	2,430	2,880	3,150	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250
Cull Bulls	70	6,690	16,795	54,310	57,630	61,150	105,425	177,680	238,065	264,120	278,720	285,130	285,130	285,130	285,130	285,130	285,130	285,130	285,130	285,130
TOTAL SALES		6,690	16,795	54,310	57,630	61,150	105,425	177,680	238,065	264,120	278,720	285,130	285,130	285,130	285,130	285,130	285,130	285,130	285,130	285,130

1/ "Before development" represents the date of appraisal and is the beginning of the first development year with the herd composition shown as opening inventory

2/ At appraisal approximately 50% of cows had calved. Therefore, calving figures are estimates applied to the breeding herd during that year.

3/ Heifers are reclassified into the breeding herd and are in calf at 2-3 year olds

4/ Breedable bulls include artificial insemination implementation for the first 5 years of the project

5/ During Year 1 of the project, in order to clean up the herd, 25% of bull battery is culled and 10% of cow herd. Thereafter 10-15% peak for both bulls and cows



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECTTwo Model Unspecified Breeding Weaning Ranches - 110,000 acres  
(11,000 Animal Units)

UNITS	Value (K)	Before Development <sup>1/</sup>	END OF RANCH YEARS							
			1	2	3	4	5	6	7-20	
<b>HERD COMPOSITION</b>										
Breeding Cows	No.	70	1,160	1,456	2,680	4,122	4,915	6,300	6,300	6,300
Bulls	No.	150	44	73	134	206	248	315	315	315
Calves <sup>2/</sup>	No.	15	(696)	(874)	(1,608)	(2,679)	(3,441)	(4,410)	(4,410)	(4,410)
9-24 month Heifers	No.	30	348	648	1,467	1,851	2,574	1,267	1,267	1,267
24-36 month Heifers <sup>3/</sup>	No.	35	348	348	437	804	1,339	1,721	2,205	2,205
24-36 month Steers	No.	75	-	-	-	-	-	-	-	-
36-48 month Steers	No.	50	338	-	-	-	-	-	-	-
Fattening Cull Females	No.	80	328	-	-	-	-	-	-	-
	No.	85	113	110	138	257	602	715	917	917
<b>TOTAL NUMBERS</b>			3,375	3,509	6,184	9,922	13,119	14,728	15,411	15,411
<b>TOTAL ANIMAL UNITS (A/Us)</b>			2,623	2,580	4,807	7,114	9,377	9,950	10,545	10,545
<b>DEATHS</b>										
Cows	No.		58	58	73	107	165	147	189	189
Bulls	No.		3	2	4	5	8	7	9	9
9-24 month Heifers	No.		17	17	32	59	74	77	38	38
9-24 month Steers	No.		17	17	17	17	32	10	52	66
24-36 month Heifers	No.		-	-	-	-	-	-	-	-
24-36 month Steers	No.		17	17	-	-	-	-	-	-
Fattening Cull Females	No.		6	6	6	6	10	18	21	28
Steers (36-48 months)	No.		16	16	-	-	-	-	-	-
<b>TOTAL</b>	No.		134	133	132	194	289	289	309	330
<b>PURCHASES</b>										
Breeding Heifers 9-24 months	No.	50	-	300	1,050	1,050	1,234	-	-	-
Breeding Cows	No.	90	-	150	450	450	-	-	-	-
Breedable Bulls (Local) <sup>4/</sup>	No.	300	-	42	75	90	72	98	40	40
<b>TOTAL</b>	No.		-	492	1,575	1,590	1,306	98	40	40
<b>SALES</b>										
Steer Weaners 9-24 months	No.	60	-	331	331	420	772	1,299	1,669	2,139
Surplus Heifers 9-24 months <sup>5/</sup>	No.	50	-	-	-	-	-	453	938	938
Surplus Heifers 24-36 months	No.	75	-	-	-	-	-	-	-	-
Cull Heifers 9-24 months	No.	30	17	17	31	72	178	250	123	123
Cull Fattened Cows	No.	95	55	107	104	132	247	584	694	689
Cull Bulls	No.	90	3	11	7	13	20	24	31	31
Steers 24-36 months	No.	82	-	321	-	-	-	-	-	-
Steers 36-48 months	No.	110	312	312	-	-	-	-	-	-
<b>TOTAL</b>	No.		387	1,099	473	637	1,217	2,610	3,495	4,120
<b>HIDES</b> (50% of deaths)			67	66	66	97	145	145	151	165
<b>PRODUCTION DATA</b>										
Technical Co-efficients										
Mortality (all cattle)	%		5	5	5	4	4	3	2	3
Calves (weaned rate)	%		60	60	60	65	70	70	70	70
Cows and Bulls culled <sup>6/</sup>	%		5	25	10	10	15	15	15	15
Heifers culled (9-24 months)	%		5	5	5	5	10	10	10	10
Carrying Capacity	Animal Units/acre		1:12	1:12	1:12	1:10	1:10	1:10	1:10	1:10
Stocking Rate	Animal Units/acre		1:42	1:43	1:23	1:15	1:12	1:11	1:10	1:10
Offtakes	%		12	31	7	6	9	18	22	27
Bulls joined	No./Breeding Cows		1:26	1:20	1:20	1:20	1:20	1:20	1:20	1:20
<b>VALUE OF SALES AND PURCHASES (in Kwacha)</b>										
<b>A. Purchases</b>										
Breeding Heifers		50	-	15,000	52,500	52,500	61,700	-	-	-
Breeding Cows		90	-	13,500	40,500	40,500	-	-	-	-
Breedable Bulls		300	-	12,600	22,500	27,000	21,600	29,400	12,000	12,000
<b>TOTAL PURCHASES</b>			-	41,100	115,500	120,000	83,300	29,400	12,000	12,000
<b>B. Sales</b>										
Steer Weaners 9-24 months		60	-	19,860	19,861	25,200	46,320	77,940	100,140	128,040
Surplus Heifers 9-24 months		50	-	-	-	-	-	22,650	46,900	46,900
Cull Heifers 9-24 months		30	510	510	930	2,160	5,340	7,500	3,690	3,690
Cull Fattened Cows		95	5,225	10,165	9,880	12,540	23,465	55,480	65,930	84,455
Cull Bulls		90	270	990	630	1,170	1,800	2,280	2,915	2,945
Steers 24-36 months		82	-	26,322	-	-	-	-	-	-
Steers (fat) 36-48 months		110	36,320	36,320	-	-	-	-	-	-
<b>TOTAL SALES</b>			40,325	92,167	31,301	41,070	76,925	165,850	219,605	266,030

- <sup>1/</sup> "Before development" represents the date of appraisal and is the beginning of the first development year with the herd composition shown as opening inventory
- <sup>2/</sup> At appraisal approximately 50% of cows had calved. Therefore, calving figures are estimates applied to the breeding herd during that year
- <sup>3/</sup> Heifers are reclassified into the breeding herd and are in calf as 2-3 year olds
- <sup>4/</sup> Breeder bulls include artificial insemination supplementation for the first 5 years of the project
- <sup>5/</sup> Steers are sold at about 14 months of age at about 500 lb liveweight
- <sup>6/</sup> During Year 1 of the project, in order to clean up the herd, 25% of bull battery is culled and 10% of cow herd. Thereafter 10-15% peak for both bulls and cows



**ZAMBIA**  
**LIVESTOCK DEVELOPMENT PROJECT**

ANNEX 6  
Table 5

**Dairy Farm Model - 400 Milking Cows**  
(3,500 Acres)

	--- Dairy Farm Years ---						
	1	2	3	4	5	6	7 - 21
<b>Herd Composition (end of year)</b>							
Cows in Milking Herd	265	472	519	571	571	571	571
(Cows in Milk Daily) <sup>1/</sup>	(132) <sup>2/</sup>	(302) <sup>3/</sup>	(330)	(363)	(400)	(400)	(400)
Calves <sup>4/</sup>	260	365	415	457	502	502	502
Heifers (8-24 months)	114	118	166	189	208	223	223
Steers (8-14 months)	-	119	166	189	208	223	223
<b>Total</b>	<b>639</b>	<b>1,074</b>	<b>1,266</b>	<b>1,406</b>	<b>1,489</b>	<b>1,530</b>	<b>1,530</b>
<b>Animal Units</b>	<b>431</b>	<b>782</b>	<b>934</b>	<b>1,040</b>	<b>1,089</b>	<b>1,128</b>	<b>1,128</b>
<b>Purchases (No.)</b>							
Heifers (in-calf) Improved (180K)	165	100	-	-	-	-	-
Heifers (in-calf) Local (120K)	100	35	-	-	-	-	-
Heifers (8-24 months) (80K)	114	-	-	-	-	-	-
<b>Total</b>	<b>379</b>	<b>135</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Deaths</b>							
Milking Herd	4 <sup>6/</sup>	5	9	10	11	11	11
Calves	10	23	33	37	41	45	45
Heifers (8-24 months)	1	3	3	5	6	6	7
Steers (8-14 months)	-	4	5	6	6	7	7
<b>Total</b>	<b>15</b>	<b>35</b>	<b>40</b>	<b>58</b>	<b>64</b>	<b>69</b>	<b>70</b>
<b>Technical Coefficients</b>							
Calving Interval (months) <sup>7/</sup>	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Calving Rate (%) (annual) <sup>7/</sup>	88	88	88	88	88	88	88
Lactation Length (months)	10	10	10	10	10	10	10
Cows in Milk (%)	70	70	70	70	70	70	70
Mortality Rate - calves (%)	9	9	9	9	9	9	9
Mortality Rate - cows (%)	2	2	2	2	2	2	2
Mortality Rate - heifers (%)	3	3	3	3	3	3	3
Mortality Rate - steers (%)	3	3	3	3	3	3	3
Culling Rate - cows (%)	10	10	10	10	20	20	20
Culling Rate - heifers (%)	10	10	10	10	10	10	10
Average Marketed Milk Production per Milking Cow - daily/gallons	1.6	1.8	1.9	1.9	1.9	1.9	1.9
Average Marketed Milk Production per Milking Cow - annual/gallon	600	650	700	700	700	700	700
<b>Sales (No.)</b>							
Milk (gallons) <sup>8/</sup>	79,200	196,300	231,000	254,100	280,000	280,000	280,000
Cull Cows	-	26	46	51	112	112	112
Cull Heifers	-	11	11	16	18	20	27
Surplus Heifers	-	-	-	32	42	53	77
Fattened Steers	-	115	161	183	202	222	222
<b>Revenue (K)</b>							
Milk (0.37 per gallon) <sup>9/</sup>	29,300	72,600	85,500	94,100	103,600	103,600	103,600
Cull Cows (110) <sup>10/</sup>	-	2,900	5,100	5,600	12,300	12,300	12,300
Cull Heifers (70)	-	800	800	1,100	1,300	1,400	1,500
Surplus Heifers (120) <sup>11/</sup>	-	-	-	3,800	5,000	6,400	9,200
Fattened Steers (125) <sup>11/</sup>	-	14,400	20,100	22,200	25,200	27,800	27,800
<b>Total</b>	<b>29,300</b>	<b>90,700</b>	<b>111,500</b>	<b>127,500</b>	<b>147,400</b>	<b>151,500</b>	<b>154,400</b>

- <sup>1/</sup> Of total "Cows in Milking Herd" 70% will be in milk as a daily average during the year except for the first year when 50% of down calving heifers (purchased) will be in milk. Calving is all the year and not seasonally.
- <sup>2/</sup> In Year 1, 260 out of 265 purchased in-calf heifers will calve down during the year. On average, 50% (132) of these purchases will be in milk daily during this year. The 114 heifers (8-24 months) purchased in this year will be inseminated to calve in Year 2.
- <sup>3/</sup> About 70% (234) of herd carried forward from previous year (334) will be in milk daily during year plus 50% (68) of in-calf heifers purchased (135) during year.
- <sup>4/</sup> Calves equal to 0.2 of animal unit.
- <sup>5/</sup> About 98% of purchased in-calf heifers calve in year plus 88% of milking herd brought forward from previous year.
- <sup>6/</sup> Deaths in Year 1 are equal to one-half of normal mortality for full year as it is estimated that the full number of purchases will be phased in over the year.
- <sup>7/</sup> All replacement heifers assumed to be in calf.
- <sup>8/</sup> On average, cows in milk will produce 750 gallons per annum of which 50 gallons will be needed for calf rearing.
- <sup>9/</sup> Basic producer price of K 0.35 plus K 0.02 per gallon premium for quality test.
- <sup>10/</sup> Cull cows = 1,100 lb liveweight X 50% cdw X K 0.20/lb = K 110.
- <sup>11/</sup> Fattened dairy steers = 850 lb liveweight X 56% cdw X K 26 = K 125 sold to Cold Storage Board.



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECTGravette Dairy Farm  
(1,500 Acres)

	Before Development	Project Years						
		1	2	3	4	5	6	7-10
<b>Herd Composition (end of year)</b>								
Cows in Milking Herd <sup>1/</sup> (Cows in Milk Daily) <sup>2/</sup>	72 (50)	400 (214) <sup>2/</sup>	377 (280)	400 (280)	400 (280)	400 (280)	400 (280)	400 (280)
Calves <sup>3/</sup>	63	386	352	332	352	352	352	352
Heifers (8-24 months)	28	28	175	160	150	160	160	160
Steers (8-14 months)	29	29	176	160	151	160	160	160
Total	192	843	1,080	1,052	1,053	1,072	1,072	1,072
Animal Units (a.u.)	142	534	798	786	771	790	790	790
<b>Purchases (No.)</b>								
Heifers (in-calf) Improved (150K)	-	280	-	-	-	-	-	-
Heifers (in-calf) Local (120K)	-	40	-	-	-	-	-	-
Heifers (8-24 months) (80K)	-	-	-	-	-	-	-	-
Total	-	320	-	-	-	-	-	-
<b>Deaths (No.)</b>								
Milking Herd	2	2	8	7	8	8	8	8
Calves	6	6	35	32	30	32	32	32
Heifers (8-24 months)	1	1	1	5	5	4	5	5
Steers (8-14 months)	1	1	5	5	4	5	5	5
Total	10	10	46	47	47	49	50	50
<b>Technical Coefficients</b>								
Calving Interval (months) <sup>4/</sup>	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Calving Rate (%) (annual)	88	88	88	88	88	88	88	88
Lactation Length (months)	10	10	10	10	10	10	10	10
Cows in Milk (%)	70	70	70	70	70	70	70	70
Mortality Rate - calves (%)	9	9	9	9	9	9	9	9
Mortality Rate - cows (%)	2	2	2	2	2	2	2	2
Mortality Rate - heifers (%)	3	3	3	3	3	3	3	3
Mortality Rate - steers (%)	3	3	3	3	3	3	3	3
Culling Rate - cows (%)	20	20	10	20	20	20	20	20
Culling Rate - heifers (%)	10	10	10	10	10	10	10	10
Average Marketed Milk Production per Milking Cow - daily/gallons	1.9	1.6	1.8	1.9	1.9	1.9	1.9	1.9
Average Marketed Milk Production per Milking Cow - annual/gallons	700	600	650	700	700	700	700	700
<b>Sales (No.)</b>								
Milk (gallons) <sup>5/</sup>	35,000	128,100	196,000	196,000	196,000	196,000	196,000	196,000
Cull Cows	14	14	40	74	78	78	78	78
Cull Heifers	3	3	3	17	16	15	16	16
Surplus Heifers	8	-	-	50	53	45	53	53
Fattened Steers	28	28	171	155	147	155	155	154
<b>Revenue</b>								
Milk (K 0.37 per gallon) <sup>6/</sup>	12,900	47,500	72,500	72,500	72,500	72,500	72,500	72,500
Cull Cows (K 110) <sup>7/</sup>	1,500	1,500	4,400	8,100	8,600	8,600	8,600	8,600
Cull Heifers (K 70)	200	200	200	1,200	1,100	1,100	1,100	1,100
Surplus Heifers (K 120) <sup>8/</sup>	1,000	-	-	6,000	6,400	5,400	6,400	6,400
Fattened Steers (K 125) <sup>8/</sup>	3,500	3,500	21,400	19,400	18,400	19,400	19,400	19,400
Total	19,100	52,700	98,500	107,200	107,000	107,000	108,000	108,200

- 1/ Of total "Cows in Milking Herd" 70% will be in milk as a daily average during the year except for the first year when 50% of purchased in-calf heifers will be in milk. Calving is all the year and not seasonally.
- 2/ In Year 1, 316 out of the 320 purchased in-calf heifers will calve down during the first year of the Project. On average, 50% (158) of these will be in milk daily during the year plus 70% (56) of the milking herd carried forward (80) from the previous year.
- 3/ Calves equal to 0.2 of an animal unit.
- 4/ All replacement heifers assumed to be in calf.
- 5/ On average, cows in milk will produce 750 gallons per annum of which 50 gallons will be needed for calf rearing. About 20% will give 600 gallons, 20% 700 gallons and 60% 800 gallons.
- 6/ Basic producer price of K 0.35 plus K 0.02 per gallon premium for quality test.
- 7/ Cull cows = 1,100 lb liveweight X 50% cdw X K 0.20/lb = K 110.
- 8/ Fattened dairy steers = 850 lb liveweight X 56 cdw X K 26 = K 125 sold to Cold Storage Board.



ZAMBIALIVESTOCK DEVELOPMENT PROJECTRanch and Dairy Farm Areas and Capacities

<u>Category and Name</u>	<u>Province</u>	<u>Area (Acres)</u>	<u>Carrying Capacity (Animal Units)</u>
<u>Breeding/Weaning Ranches</u>			
Chisamba	Central	37,510	2,800
Kitwe	North Western	70,000	5,300
Mkushi	Central	46,250	3,500
Solwezi	North Western	106,770	7,000
Kalomo	Southern	80,000	6,000
Mugoto/Wolverton	Southern	20,000	2,800
Katete/Chinjara	Eastern	48,260	4,700
No. 8	Southern or Central	55,000	5,300
No. 9	Southern or Central	55,000	5,300
<u>Breeding/Fattening Ranches</u>			
Mbala	Northern	109,000	6,000
Chishinga	Luapula	104,770	5,800
<u>Bull Breeding Ranch</u>			
Monze	Southern	20,000	2,700
<u>Dairy Farms</u>			
Gravetts	Central	1,500	800
No. 2	Southern or Central	3,500	1,000
No. 3	Southern or Central	3,500	1,000
No. 4	Southern or Central	3,500	1,000
No. 5	Southern or Central	3,500	1,000



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

Beef Ranches - Operating Costs  
(K)

Animal Units	Project Years							
	1	2	3	4	5	6	7	8-20
<b>Breeding Weaning Ranches (408,790 acres)</b>								
Headquarters Cost	35,800	35,800	35,800	35,800	35,800	35,800	35,800	35,800
Ranch Management	70,280	70,280	70,280	70,280	70,280	70,280	70,280	70,280
Rent	4,088	4,088	4,088	4,088	4,088	4,088	4,088	4,088
Labor	43,890	47,888	56,875	68,892	74,067	77,003	74,529	74,529
Dipping	0.57	7,902	10,153	12,655	15,354	18,059	19,596	19,139
Veterinary	0.60	8,318	10,687	13,321	16,162	19,009	20,627	19,139
Supplementary Feeding and Minerals	3.00	41,592	53,436	66,606	80,808	95,246	103,134	95,697
Tractor Operating	0.33	4,575	5,878	7,327	8,889	10,455	11,345	10,527
Water Operating	0.20	2,773	3,562	4,440	5,387	6,336	6,876	6,380
Ranch Transport <sup>1/</sup>		8,900	8,900	8,900	8,900	8,900	8,900	8,900
Maintenance <sup>2/</sup>		15,410	23,538	27,738	29,740	30,810	30,986	30,986
Horses		1,800	2,070	2,190	2,490	2,490	2,490	2,490
Replacement Costs		-	-	-	-	-	18,016	18,016
Bull Purchases		-	-	-	-	-	50,400	50,400
Subtotal		245,328	276,280	310,220	346,790	375,340	463,446	445,414
Contingencies (10%)		24,533	27,628	31,022	34,679	37,534	46,345	44,541
Total		269,861	303,908	341,242	381,469	412,874	509,791	489,955
Average Cost in K per A.U.		19.5	17.1	15.4	14.2	13.0	14.8	15.4
<b>Breeding Fattening Ranches (214,000 acres)</b>								
Headquarters Cost	13,400	13,400	13,400	13,400	13,400	13,400	13,400	13,400
Ranch Management	26,160	26,160	26,160	26,160	26,160	26,160	26,160	26,160
Rent	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140
Labor	12,673	14,056	15,003	21,027	22,645	27,626	27,166	27,716
Dipping	0.60	2,577	3,407	3,975	5,330	6,301	7,031	6,935
Veterinary	0.63	2,706	3,577	4,174	5,597	6,616	7,382	7,085
Supplementary Feeding and Minerals	4.20	18,039	23,848	27,825	37,313	44,108	49,216	49,594
Tractor Operating	0.37	1,589	2,101	2,451	3,287	3,886	4,336	4,369
Water Operating		301	397	464	622	735	820	827
Ranch Transport <sup>1/</sup>	0.07	2,700	2,700	2,700	2,700	2,700	2,700	2,700
Maintenance <sup>2/</sup>		6,022	8,600	9,797	10,455	10,944	11,476	11,476
Horses		480	540	720	840	840	840	840
Replacement Costs		-	-	-	-	-	6,047	6,047
Bull Purchases		-	-	-	-	-	15,300	12,900
Subtotal		88,787	100,926	108,809	128,751	140,475	174,474	170,975
Contingencies (10%)		8,879	10,093	10,881	12,875	14,047	17,447	17,270
Total		97,666	111,019	119,690	141,626	154,522	191,921	188,245
Average Cost in K per A. U.		22.7	19.6	18.1	15.9	14.7	16.4	16.1
<b>Breeding Weaning Ranches (110,000 acres)</b>								
Headquarters Cost	-	14,000	14,000	14,000	14,000	14,000	14,000	14,000
Ranch Management	-	15,280	15,280	15,280	15,280	15,280	15,280	15,280
Rent	-	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Labor	-	10,958	13,185	16,002	22,173	23,124	24,077	24,077
Dipping	0.57	-	1,471	2,740	4,055	5,345	6,011	6,011
Veterinary	0.60	-	1,548	2,884	4,268	5,626	6,327	6,327
Supplementary Feeding and Minerals	3.00	-	7,740	11,421	22,342	28,131	29,880	31,635
Tractor Operating	0.33	-	851	1,586	2,348	3,094	3,480	3,480
Water Operating	0.20	-	516	961	1,423	1,875	2,109	2,109
Ranch Transport <sup>1/</sup>		-	2,400	2,400	2,400	2,400	2,400	2,400
Maintenance <sup>2/</sup>		-	4,264	6,368	9,212	9,778	9,826	9,826
Horses		-	480	480	840	840	840	840
Replacement Costs		-	-	-	-	-	4,807	4,807
Bull Purchases		-	-	-	-	-	12,000	12,000
Subtotal		-	60,608	87,405	104,270	121,642	142,189	145,892
Contingencies (10%)		-	6,061	8,740	10,427	12,164	14,219	14,589
Total		-	66,669	96,145	114,697	133,806	156,408	160,481
Average Cost in K per A. U.		-	25.8	20.0	16.1	14.3	15.7	15.2
<b>Bull Breeding Ranch (18,400 acres)</b>								
Headquarters Cost	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Ranch Management	11,600	11,600	11,600	11,600	11,600	11,600	11,600	11,600
Rent	184	184	184	184	184	184	184	184
Labor	7,825	7,122	7,026	7,066	7,097	7,097	7,097	7,097
Dipping	0.57	1,947	1,546	1,485	1,514	1,532	1,532	1,532
Veterinary	0.60	2,049	1,627	1,564	1,594	1,612	1,612	1,612
Supplementary Feeding and Minerals	3.60	12,294	9,763	9,382	9,562	9,673	9,673	9,673
Tractor Operating	0.33	1,127	895	860	876	887	887	887
Water Operating	0.20	683	542	521	531	537	537	537
Ranch Transport <sup>1/</sup>		1,500	1,500	1,500	1,500	1,500	1,500	1,500
Maintenance <sup>2/</sup>		3,042	4,500	4,500	4,500	4,500	4,500	4,500
Horses		480	480	480	480	480	480	480
Replacement Costs		-	-	-	-	-	2,205	2,205
Bull Purchases		-	-	-	-	-	3,600	3,600
Subtotal		45,731	42,759	42,092	42,407	42,602	48,407	48,407
Contingencies (10%)		4,573	4,276	4,209	4,241	4,260	4,841	4,841
Total		50,304	47,035	46,301	46,648	46,862	53,248	53,248
Average Cost in K per A. U.		14.7	17.3	17.8	17.6	17.4	19.8	19.8
Total Operating Costs		417,831	528,631	603,378	684,440	748,064	911,038	893,653

1/ Farm management and general vehicle running costs including fuel, oils, repairs. Replacement cost is included below.  
2/ Calculated on capital costs at the following percentages - fencing 4%, roads 1%, water 5%, buildings 2%, handling units and spray races 5%, fast-moving machinery 10%, slow-moving machinery 5%.



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECTDairy Farms - Operating Costs  
(K)

	0	1	2	3	4	5	6	7	8-20
<b>Gravettes Dairy Farm</b>									
Headquarters Cost	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Farm Management	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Rent	15	15	15	15	15	15	15	15	15
Labor	750	3,150	3,960	4,200	4,200	4,200	4,200	4,200	4,200
Veterinary and Spraying	150	630	790	840	840	840	840	840	840
Purchased Feed	1,000	4,200	5,280	5,600	5,600	5,600	5,600	5,600	5,600
Cropping and Pasture Feed	2,000	8,400	10,560	11,200	11,200	11,200	11,200	11,200	11,200
Transport	250	1,050	1,320	1,400	1,400	1,400	1,400	1,400	1,400
Maintenance	850	3,570	4,490	4,760	4,760	4,760	4,760	4,760	4,760
Replacement Costs	900	-	-	-	-	-	-	-	-
Artificial Insemination	200	-	-	-	-	-	1,200	1,700	1,700
Heifer Rearing	1,400	1,400	8,000	7,200	8,000	8,000	8,000	8,000	8,000
Steer Rearing	2,030	2,030	11,200	10,150	11,200	11,200	11,200	11,200	11,200
Subtotal	17,845	27,345	53,915	53,665	55,150	55,150	61,755	61,755	61,755
Contingencies (10%)	1,800	2,700	5,400	5,400	5,500	5,500	6,200	6,200	6,200
Total (rounded)	19,600	30,000	59,300	59,100	60,700	60,700	68,000	68,000	68,000
<b>Dairy Farm No. 1</b>									
Headquarters Cost	-	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Farm Management	-	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Rent	-	25	25	25	25	25	25	25	25
Labor	-	3,000	5,200	4,600	5,700	6,000	6,000	6,000	6,000
Veterinary and Spraying	-	600	1,000	900	1,200	1,200	1,200	1,200	1,200
Purchased Feed	-	4,000	6,900	6,100	7,600	8,000	8,000	8,000	8,000
Cropping and Pasture Feed	-	8,000	13,800	12,200	15,100	16,000	16,000	16,000	16,000
Transport	-	1,000	1,700	1,500	1,900	2,000	2,000	2,000	2,000
Maintenance	-	-	-	-	6,800	6,800	6,800	6,800	6,800
Replacement Costs	-	-	-	-	-	5,000	5,000	5,000	5,000
Artificial Insemination	-	-	-	-	-	1,700	1,700	1,700	1,700
Heifer Rearing	-	5,700	5,900	8,300	9,400	11,400	11,400	11,400	11,400
Steer Rearing	-	-	8,300	11,600	13,200	14,600	16,000	16,000	16,000
Subtotal	-	32,225	52,725	55,125	63,925	75,925	84,025	84,025	84,025
Contingencies (10%)	-	3,200	5,300	5,500	6,400	7,600	8,400	8,400	8,400
Total (rounded)	-	35,400	58,000	60,700	70,300	83,500	92,400	92,400	92,400
<b>Dairy Farm No. 2</b>									
Headquarters Cost	-	-	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Farm Management	-	-	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Rent	-	-	25	25	25	25	25	25	25
Labor	-	-	3,000	5,200	4,600	5,700	6,000	6,000	6,000
Veterinary and Spraying	-	-	600	1,000	900	1,200	1,200	1,200	1,200
Purchased Feed	-	-	4,000	6,900	6,100	7,600	8,000	8,000	8,000
Cropping and Pasture Feed	-	-	8,000	13,800	12,200	15,100	16,000	16,000	16,000
Transport	-	-	1,000	1,700	1,500	1,900	2,000	2,000	2,000
Maintenance	-	-	-	-	-	6,800	6,800	6,800	6,800
Replacement Costs	-	-	-	-	-	5,000	5,000	5,000	5,000
Artificial Insemination	-	-	-	-	-	1,700	1,700	1,700	1,700
Heifer Rearing	-	-	5,700	5,900	8,300	9,400	11,400	11,400	11,400
Steer Rearing	-	-	-	8,300	11,600	13,200	14,600	16,000	16,000
Subtotal	-	-	32,225	52,725	55,125	63,925	75,925	84,025	84,025
Contingencies (10%)	-	-	3,200	5,300	5,500	6,400	7,600	8,400	8,400
Total (rounded)	-	-	35,400	58,000	60,700	70,300	83,500	92,400	92,400
<b>Dairy Farm No. 3</b>									
Headquarters Cost	-	-	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Farm Management	-	-	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Rent	-	-	25	25	25	25	25	25	25
Labor	-	-	3,000	5,200	4,600	5,700	6,000	6,000	6,000
Veterinary and Spraying	-	-	600	1,000	900	1,200	1,200	1,200	1,200
Purchased Feed	-	-	4,000	6,900	6,100	7,600	8,000	8,000	8,000
Cropping and Pasture Feed	-	-	8,000	13,800	12,200	15,100	16,000	16,000	16,000
Transport	-	-	1,000	1,700	1,500	1,900	2,000	2,000	2,000
Maintenance	-	-	-	-	-	6,800	6,800	6,800	6,800
Replacement Costs	-	-	-	-	-	5,000	5,000	5,000	5,000
Artificial Insemination	-	-	-	-	-	1,700	1,700	1,700	1,700
Heifer Rearing	-	-	5,700	5,900	8,300	9,400	11,400	11,400	11,400
Steer Rearing	-	-	-	8,300	11,600	13,200	14,600	16,000	16,000
Subtotal	-	-	32,225	52,725	55,125	63,925	75,925	84,025	84,025
Contingencies (10%)	-	-	3,200	5,300	5,500	6,400	7,600	8,400	8,400
Total (rounded)	-	-	35,400	58,000	60,700	70,300	83,500	92,400	92,400
<b>Dairy Farm No. 4</b>									
Headquarters Cost	-	-	-	2,900	2,900	2,900	2,900	2,900	2,900
Farm Management	-	-	-	7,000	7,000	7,000	7,000	7,000	7,000
Rent	-	-	-	25	25	25	25	25	25
Labor	-	-	-	3,000	5,200	4,600	5,700	6,000	6,000
Veterinary and Spraying	-	-	-	600	1,000	900	1,200	1,200	1,200
Purchased Feed	-	-	-	4,000	6,900	6,100	7,600	8,000	8,000
Cropping and Pasture Feed	-	-	-	8,000	13,800	12,200	15,100	16,000	16,000
Transport	-	-	-	1,000	1,700	1,500	1,900	2,000	2,000
Maintenance	-	-	-	-	-	-	6,800	6,800	6,800
Replacement Costs	-	-	-	-	-	-	5,000	5,000	5,000
Artificial Insemination	-	-	-	-	-	-	1,700	1,700	1,700
Heifer Rearing	-	-	-	5,700	5,900	8,300	9,400	11,400	11,400
Steer Rearing	-	-	-	-	8,300	11,600	13,200	14,600	16,000
Subtotal	-	-	-	32,225	52,725	55,125	63,925	75,925	84,025
Contingencies (10%)	-	-	-	3,200	5,300	5,500	6,400	7,600	8,400
Total (rounded)	-	-	-	35,400	58,000	60,700	70,300	83,500	92,400



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

Project Investments  
(K)

CATEGORY	Chisamba	Mogoto/ Wolverton	Mushi	Kalomo	Kitwe	Solwezi	Mbala	Chishinga	Katoto/ Chinjara	Bull Breeding Ranch	Breeding/ Weaning Ranch	Breeding/ Weaning/ Ranch	Gravatta Dairy Farm	Dairy Farm I	Dairy Farm II	Dairy Farm III	Dairy Farm IV	Total	US Dollar Equivalent	Foreign Exchange \$	Total Foreign Exchange
<b>Physical Inputs<sup>a/</sup></b>																					
Fencing	3,640	-	4,280	30,000	12,300	39,000	10,900	36,500	17,700	-	13,000	13,000	500	11,100	11,100	11,100	11,100	225,220	315,310	80	252,240
Firebreaks	640	3,000	700	8,500	4,200	8,200	1,700	6,200	4,500	-	3,100	3,100	100	-	-	-	-	43,940	61,520	60	36,910
Roads	250	330	2,020	8,600	2,400	10,700	200	6,500	600	-	2,500	2,500	-	1,300	1,300	1,300	1,300	41,800	58,520	70	40,960
Water	12,310	5,000	12,950	17,000	27,600	25,800	21,900	9,700	16,100	15,300	13,400	13,400	5,200	15,500	15,500	15,500	15,500	257,660	360,720	70	252,500
Buildings	7,500	-	9,500	17,900	19,600	39,200	16,800	28,200	13,100	-	13,100	13,100	14,500	53,400	53,400	53,400	53,400	406,100	568,540	50	284,270
Spray Races and Handling Yards	2,000	-	2,000	10,200	2,000	9,500	2,100	8,400	4,000	-	3,100	3,100	-	-	-	-	-	47,000	65,800	50	37,300
Tractors, vehicles, machinery	5,820	7,870	5,250	29,400	8,600	13,200	12,700	9,300	19,800	32,400	18,300	18,300	9,900	42,200	42,200	42,200	42,200	359,640	503,500	100	503,500
Office equipment	-	-	-	4,100	1,000	1,500	-	1,700	3,000	4,100	3,100	3,100	-	2,100	2,100	2,100	2,100	30,000	42,000	60	25,200
Horses and equipment	240	600	-	2,800	600	1,000	1,900	2,300	2,100	300	2,100	2,100	-	-	-	-	-	16,040	22,460	30	6,738
Radio equipment	1,000	-	1,000	1,300	-	1,000	1,100	1,000	1,000	-	1,000	1,000	-	-	-	-	-	9,100	13,160	100	13,160
Land clearing	-	-	-	-	-	-	-	-	-	-	-	-	5,600	-	-	-	-	5,600	7,840	90	7,056
Silage pits	-	-	-	-	-	-	-	-	-	-	-	-	1,900	3,600	3,600	3,600	3,600	16,300	22,820	50	11,410
Dairy equipment	-	-	-	-	-	-	-	-	-	-	-	-	-	17,900	17,900	17,900	17,900	71,600	100,240	90	70,220
Electricity installation	-	-	-	-	-	-	-	-	-	-	-	-	-	2,000	2,000	2,000	2,000	8,000	11,200	40	4,130
Sub-Total	33,400	16,800	37,700	129,800	78,300	149,100	69,300	109,800	81,900	52,100	73,000	73,000	37,900	149,100	149,100	149,100	149,100	1,538,300	2,153,630	-	1,561,544
<b>Livestock</b>																					
Beef	33,600	24,000	58,300	217,400	121,400	163,000	101,000	89,800	126,600	18,000	179,400	179,400	-	-	-	-	-	1,312,600	1,837,640	-	-
Dairy	-	-	-	-	-	-	-	-	-	-	-	-	50,600	73,100	73,100	73,100	73,100	343,000	480,200	70	336,140
Total	67,000	40,800	96,000	347,800	199,700	312,100	171,100	199,600	208,500	70,100	252,800	252,800	88,300	222,200	222,200	222,200	222,200	3,194,000	4,471,470	-	1,897,684
<b>Contingencies</b>																					
	6,700	4,100	9,600	35,000	20,000	31,200	17,100	20,000	21,000	7,000	25,200	25,200	8,900	22,200	22,200	22,200	22,200	320,000	448,000	-	210,000
Total	73,700	44,900	105,600	382,200	219,700	343,300	188,200	219,600	229,500	77,100	277,600	277,600	97,200	244,400	244,400	244,400	244,400	3,514,000	4,919,470	-	2,107,684
<b>Pilot Pasture Development and Legume Seed Scheme</b>																					
																		87,600	122,640	60	70,000
<b>Artificial Insemination Breeding Program</b>																					
																		81,300	113,820	100	113,820
<b>Technical and Consultant Services<sup>b/</sup></b>																					
Sub-Total																		147,000	205,800	100	205,800
<b>Working Capital</b>																					
																		300,000	420,000	-	-
Total																		4,129,900	5,781,730	43	2,497,304

a/ Physical Inputs, Units and Costs	Units	Cost/Unit (K)	No. of Units
Fencing <sup>1/</sup>	Miles	246	916
Firebreaks	Miles	40	1,100
Roads <sup>2/</sup>	Miles	200	209
Water <sup>3/</sup>	Ranch Units	15,157	17
Buildings <sup>4/</sup>	Ranch Units	27,073	15
Spray Races	Units	2,000	24
Tractors, Vehicles, Machinery <sup>5/</sup>	Ranch Units	21,155	17
Office Equipment	Ranch Units	2,000	12
Horses and Equipment	Head	180	89
Radio Equipment	Units	1,000	10
Land Clearing	Acres	28	200
Silage Pits	Units	1,800	9
Dairy Equipment <sup>6/</sup>	Dairy Units	17,900	4
Electricity	Dairy Units	2,000	4

b/ Technical services for ZCDL General Management post (internationally qualified in management of livestock operations) 5 man years at Kwacha 18,000 per year which includes salary, housing, medical, and educational allowances, leave and gratuity. Consultant services to assist ZCDL and National Livestock Development Group in planning future ranches, dairy farms, national livestock sector program, artificial insemination program, livestock watering facilities and pasture improvement schemes. Three man-years at inclusive cost (as above) of Kwacha 19,000 per year for consultants internationally qualified in their respective fields.

1/ Includes external and internal fencing 2/ Includes tracks, grids, bridges, etc.  
3/ Includes boreholes, dams, weirs, piping, pumps, windmills, troughs, etc.  
4/ Includes housing, offices and stores 5/ Includes tractors, land rovers, ploughs, agricultural equipment, graders, tankers, etc.  
6/ Includes herringbones, separators, etc.



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

Artificial Insemination Program - Cost Estimates  
(K)

Item	Quantity	K	US\$	Year					Total		
				1	2	3	4	5	K	US\$	
<b>Capital Items</b>											
Land Rover	1	2,500	3,500	2,500	-	-	-	-	-	2,500	3,500
Large Storage Canister	3	500	700	1,000	-	500	-	-	-	1,500	2,100
Ranch Canisters	17	180	252	3,060	-	-	-	-	-	3,060	4,284
Microscopes	11	100	140	1,100	-	-	-	-	-	1,100	1,540
A.I. & Veterinary Equipment	2	1,000	1,400	1,000	-	-	1,000	-	-	2,000	2,800
Electro Ejaculator	1	462	660	462	-	-	-	-	-	462	660
Portable Generator	1	200	280	200	-	-	-	-	-	200	280
<b>Semen</b>											
Boran Charollaise Brahman ex Kenya (Beef Ranches) <sup>1/</sup>	28,000	0.70	0.98	(2,700 doses) 1,890	(3,400 doses) 2,380	(6,000 doses) 4,200	(7,500 doses) 5,250	(8,400 doses) 5,880		19,600	27,440
Bull Equivalents Dairy Farms				65	85	150	182	210		692	
Friesian Progeny Tested <sup>2/</sup>	7,200	3	4.20	(300 doses) 900	(900 doses) 2,700	(1,500 doses) 4,500	(2,100 doses) 6,300	(2,400 doses) 7,200		21,600	30,240
Freight Costs (Estimates only)	35,200	60	84	180	258	450	576	648		2,112	2,956
Liquid Nitrogen <sup>3/</sup> (Liters) 1570/annum	7,850	0.45	0.63	707	707	707	707	707		3,535	4,945
<b>Labor</b>											
Technicians <sup>4/</sup>	10	1	1.40	2,830	2,830	2,830	2,830	2,830		14,150	19,810
Bonus/Cow Settled <sup>5/</sup> (Cows settled)	10,501	0.20	0.28	199	307	425	538	631		2,100	2,941
Subtotal				16,029	9,182	13,612	17,201	17,896		73,919	103,496
Contingencies - about 10%				1,672	918	1,388	1,699	1,704		7,381	10,404
Total				17,700	10,100	15,000	18,900	19,600		81,300	113,900

1/ 20% of beef cow herd bred by A.I. allowing 2 ampules of frozen semen/cow

2/ 100% of dairy cow herd bred by A.I. allowing 1.5 ampules of frozen semen/cow

3/ Assessed on 110 liters/month required for canister for storage and transportation, i.e. for 19 canisters 1,570 liters per annum @ K 0.45/liter of liquid nitrogen

4/ Allowance has been made for 35 ngwee (US\$ 0.49)/per day over the normal daily rate for ranch labor of 65 ngwee (US\$ 0.91)/per day for a total daily wage of K 1 (US\$ 1.40)/day, working 283 days per annum. Also includes total wage benefits

5/ A bonus incentive has been allowed of K 0.20 for every cow settled (not served) by A.I. This is shared by inseminating technicians and herdsmen responsible for heat detection

6/ For project years 6-20, sufficient bulls will be available from local sources and/or ranch bred for natural service. Continued A.I. costs for dairying are included under dairying operating estimates



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT  
Pasture Development Proving Trials  
(K)

Inputs	Unit Cost	lb/Acre	Year 1		Year 2		Year 3		Year 4		Total	
			Acre	Cost	Acre	Cost	Acre	Cost	Acre	Cost	Acre	Cost
<u>Land Preparation<sup>1/</sup> (1,000 acres)</u>												
Clearing and Windrowing	17.50	-	550	9,625	350	6,125	100	1,750	-	--	1,000	17,500
Grubbing and Root Raking	17.00	-	50	850	-	--	-	-	-	-	-	850
Seed Bed	18.00	-	550	9,900	350	6,300	100	1,800	-	-	-	18,000
<u>Planting</u>												
Fertilizer Cost	45/ton	300	550	3,712.50	350	2,362.50	100	675	-	-	-	6,750
Legume and Inoculant Seed Cost <sup>2/</sup>	2/lb	8	50	800	-	-	-	-	-	-	-	800
Grass Seed Plus Legume <sup>3/</sup>	3/lb	3	500	4,500	350	3,150	100	900	-	-	-	8,550
<u>Harvesting</u>												
Legume Seed	1/lb	100	-	-	50	5,000	50	5,000	50	5,000	-	15,000
Grass Seed	.20	30	-	-	100	600	100	600	100	600	-	1,800
<u>Maintenance</u>												
Regrowth (mechanical)	1/acre	-	-	-	550	550	350	550	100	100	-	1,200
Regrowth (chemical)	1.50/acre	-	550	825	350	525	100	150	-	-	-	1,500
Fertilizer	45/ton	150	-	-	550	1,856.25	350	1,181	100	328	-	3,365
Reseeding	.50/acre	1	-	-	550	225	350	175	100	50	-	450
Subtotal	-	-	-	30,213	-	26,694	-	12,781	-	6,078	-	75,766
Contingencies	5%	-	-	1,510	-	1,335	-	640	-	304	-	3,789
Consultants	2,000/annum	-	-	2,000	-	2,000	-	2,000	-	2,000	-	8,000
Total	--	-	-	33,723	-	30,029	-	15,421	-	8,382	1,000	87,555

<sup>1/</sup> Costs supplied by Ministry of Agriculture, Machinery Section, should not be used as indicative of second stage large-scale project, as modern low cost land clearing techniques unknown to Zambia at present would be used.

<sup>2/</sup> Estimates based on Kenya Source cif costs

<sup>3/</sup> Estimates applicable to Australia plus freight to Zambia.



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

ANNEX 2  
Table 1

Phasing of Project Investment<sup>1/</sup>  
(in KWACHA)

Years	1	2	3	4	5	TOTAL
<b>I. BREEDING/WEANING RANCHES</b>						
A. <u>Chitima</u>						
Physical Inputs	31,500	300	300	700	400	33,400
Livestock	-	8,400	8,400	8,400	8,400	33,600
B. <u>Mogoto/Wolverton</u>						
Physical Inputs	13,100	300	2,200	300	600	16,500
Livestock	-	-	7,200	8,400	8,400	24,000
C. <u>Mushi</u>						
Physical Inputs	35,500	300	300	700	400	37,200
Livestock	1,800	26,500	9,600	10,200	10,200	62,300
D. <u>Kalomo</u>						
Physical Inputs	80,200	35,200	9,700	4,000	700	129,800
Livestock	70,500	31,500	33,600	66,200	12,600	217,400
E. <u>Katwe</u>						
Physical Inputs	41,600	31,700	500	500	1,000	74,800
Livestock	48,300	24,900	19,400	18,000	10,800	121,400
F. <u>Solwezi</u>						
Physical Inputs	52,800	10,300	48,900	29,100	8,000	149,100
Livestock	40,200	36,500	39,300	29,400	17,600	163,000
G. <u>Katete/Chinjara</u>						
Physical Inputs	32,900	35,300	9,300	3,000	1,400	81,900
Livestock	35,400	33,800	29,200	20,800	7,400	126,600
TOTAL PHYSICAL INPUTS	287,600	116,400	71,200	18,300	13,500	527,000
TOTAL LIVESTOCK	196,200	164,600	146,700	161,400	75,400	744,300
Sub-Total	483,800	281,000	217,900	199,700	88,900	1,271,300
<b>II. BREEDING/FATTENING RANCHES</b>						
A. <u>Mbala</u>						
Physical Inputs	26,200	30,500	8,400	3,200	1,000	69,300
Livestock	32,500	37,400	8,400	12,000	11,400	101,700
B. <u>Chishinga</u>						
Physical Inputs	53,400	400	20,400	800	34,800	109,800
Livestock	25,800	36,800	13,200	7,800	6,200	89,800
TOTAL PHYSICAL INPUTS	79,600	30,900	28,800	4,000	35,800	179,100
TOTAL LIVESTOCK	58,300	74,200	21,600	19,800	17,600	191,500
Sub-Total	137,900	105,100	50,400	23,800	53,400	370,600
<b>III. BULL BREEDING RANCH</b>						
Physical Inputs	48,200	700	700	700	1,800	52,400
Livestock	3,000	5,400	3,600	2,400	3,600	18,000
Sub-Total	51,200	6,100	4,300	3,100	5,400	70,400
<b>IV. 2 BREEDING/WEANING RANCHES</b>						
Physical Inputs	-	60,000	36,000	30,000	20,000	146,000
Livestock	-	40,100	115,500	120,000	83,300	358,900
Sub-Total	-	100,100	151,500	150,000	103,300	501,900
<b>V. GRAVETT'S DAIRY FARM</b>						
Physical Inputs	27,900	7,200	700	1,700	400	37,900
Livestock	15,100	16,000	13,900	3,200	2,400	50,600
Sub-Total	43,000	23,200	14,600	4,900	2,800	88,500
<b>VI. MODEL DAIRY FARMS</b>						
Dairy Farm No. 1						
Physical Inputs	82,200	52,200	13,300	1,400	-	149,100
Livestock	50,800	22,300	-	-	-	73,100
Dairy Farm No. 2						
Physical Inputs	-	82,200	52,200	13,300	1,400	149,100
Livestock	-	36,000	37,100	-	-	73,100
Dairy Farm No. 3						
Physical Inputs	-	82,200	52,200	13,300	1,400	149,100
Livestock	-	50,800	22,300	-	-	73,100
Dairy Farm No. 4						
Physical Inputs	-	-	82,200	52,200	14,700	149,100
Livestock	-	-	50,800	22,300	-	73,100
TOTAL PHYSICAL INPUTS	82,200	216,600	199,900	80,200	17,500	596,400
TOTAL LIVESTOCK	50,800	123,900	95,400	22,300	-	292,400
Sub-Total	133,000	340,500	295,300	102,500	17,500	888,800
<b>TOTAL</b>	<b>848,200</b>	<b>856,000</b>	<b>734,000</b>	<b>484,000</b>	<b>271,300</b>	<b>3,194,200</b>
<b>CONTINGENCIES</b>	85,000	86,000	73,000	48,000	27,000	329,000
<b>PASTURE IMPROVEMENT PROGRAM</b>	-	33,700	30,000	15,500	8,400	87,600
<b>ARTIFICIAL INSEMINATION PROGRAM</b>	17,700	10,100	15,700	18,900	19,600	81,300
<b>TECHNICAL SERVICES</b>	43,000	36,000	36,000	16,000	16,000	147,000
<b>WORKING CAPITAL</b>	200,000	100,000	-	-	-	300,000
<b>GRAND TOTAL</b>	<b>1,194,600</b>	<b>1,121,800</b>	<b>888,000</b>	<b>582,400</b>	<b>342,300</b>	<b>4,120,100</b>

<sup>1/</sup> Totals may not add due to rounding.



ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

Corporate Organization of the Agricultural Development Corporation and its Subsidiary, the Zambia Cattle Development Ltd.

Agricultural Development Corporation

1. The Agricultural Development Corporation (ADC) was formed on March 28, 1968, as a company of limited liability under the Companies Ordinance (Chapter 216 of the Laws of Zambia). The principal function of ADC is to develop and manage, on a strictly commercial basis, soundly conceived agricultural and agro-industrial enterprises which would contribute to the development of the agricultural sector. The Company's Memorandum and Articles of Association give it broad powers to achieve this objective by conducting business either alone or in association with any other person or body.
2. As provided for in the Articles of Association, ADC's Board of Directors, appointed by Government, presently consists of 10 members: 6 private farmers and 4 representatives of Government (the Permanent Secretaries of the Ministries of Commerce, Rural Development, Natural Resources and the Director of Agriculture of the Ministry of Rural Development). The Chairman is elected by vote of the Board. A director may hold office until he resigns or is removed.
3. Business operations are being conducted by a staff of six: a general manager, an agricultural development adviser, a director of administration, a financial adviser and two accountants. The General Manager is a former Agricultural Officer of the Ministry of Rural Development.
4. On present activity, this staff is sufficient, as some of the companies which ADC was supposed to have started in 1968 have not yet been organized. Staff for future executive positions will be recruited as necessary both from Zambia and abroad. As yet there is no provision for the post of Deputy General Manager, who would play a major role in financial matters of ADC.
5. Until ADC can become a self-financing corporation, it will need to rely heavily on Government funds to finance the development of its projects and to cover any operating deficits of ADC and its subsidiary companies. ADC has been established with an authorized share capital of K 14 million (US\$19.6 million) and Government transfers of existing assets to ADC is taking the form of equity.

Zambia Cattle Development Ltd.

7. In July 1968, ADC established its first subsidiary, the Zambia Cattle Development Ltd. (ZCDL) as a livestock company limited by shares under the Companies Ordinance of Zambia. See Chart I for details of ZCDL's organizational aspects. Currently all its shares are owned by ADC. Under the Memorandum and Articles of Association of ZCDL, the number of members of the company cannot exceed 50. The Company by ordinary resolution can issue regular shares and shares with special rights to private investors. Thus, ZCDL could issue preferred shares to qualified investors if ZCDL's Board approves the terms of such additional equity investment.

Financial Operations

8. ZCDL has not been operative long enough to issue any trading accounts. Estimates of ZCDL's opening and projected balance sheets are given in Annex 11 Table 2. ZCDL's estimated cash flow for the life of the Project are included in Annex 11 Table 1 for Project activities. With the 1968 price increase for beef and under proper management, the return on ADC's equity capital should vary annually between 11 and 14%.

9. As the accounts of most of the beef ranches and Gravetts dairy farm were part of the Ministry of Rural Development's recurrent expenditure and capital accounts and the Ministry of Finance's General Revenue accounts, an accurate assessment of the operating costs and revenues prior to their transfer to ZCDL has been difficult to ascertain for each ranch. On the basis of the data on cattle inventories, capital costs, as well as trading and profit and loss accounts provided by the Ministry of Rural Development's accountant for six of the project ranches plus Gravetts dairy farm for 1967 and 1968, it has been possible to make an estimate for the ranches and dairy farm as a group.

10. As a group, the seven ranch and dairy operations had an estimated gross trading profit of about US\$126,000 for 1968, due mainly to the 38% price increase for slaughter stock in effect from January 1968. If comparable standard valuations to 1967 are used, the ranching and dairy operations would have incurred a trading loss of about US\$196,000 for 1968. For 1967, the ranches and dairy showed a trading loss of about US\$177,800 when livestock was valued at the same standard values at the beginning and at the end of the year. Annex 11 Table 1 gives the projected improvements in Project financial operations of the ranches and dairy farms with the Project now under the control of ZCDL's management.

Capital Structure

11. ADC had previously established ZCDL with a nominal share capital of US\$11,200 equivalent with the remainder of its required capital to be in the form of loans from ADC. Such a capital structure had a number of disadvantages. If the loan from ADC were to cover the existing assets and new development capital and were to bear interest, a heavy burden would have been placed on the company in its early years. Also, the new company would not have a

capital structure on which a realistic return on capital could be measured. And, finally, ZCDL would find it difficult to enter into partnership with other interests, local and foreign, for the promotion of joint ventures. Accordingly, Government and ADC have agreed to re-capitalize ZCDL in order to reflect the value of its existing assets, counterpart equity contributions to possible external loan finance and a portion of its permanent working capital requirements. ZCDL's authorized share capital now stands at US\$5.6 million, which is adequate. While this required a registration fee of approximately US\$7,000, the benefits of a properly capitalized ZCDL should be considerable.

12. ADC had originally set up the Board of ZCDL, appointed by the Minister of Rural Development in consultation with ADC, as a purely nominal board. However, in view of the likely size of ZCDL's operations and the importance of ZCDL's production contribution to future development of the livestock industry, agreement was reached with the ADC and the Permanent Secretary of the Ministry of Rural Development that ZCDL's Board has been reconstituted and strengthened to include two representatives of the Zambia cattle industry, one representative of the financial community, one representative of the Ministry of Rural Development and one representative of ADC (Chairman).

13. In May of 1968, ADC requested PMEA to second an ADS staff member to fill the position of General Manager of its proposed livestock subsidiary company. He reported to ADC in July 1968 and is at present assisted at headquarters by an accountant, a secretary and by an administrative assistant. The General Manager would be directly responsible for implementing the financial, marketing, livestock and development policy for the beef ranches and dairy farms.

14. The General Manager of Zambia Cattle Development Ltd. who would be directly responsible to the Board of Zambia Cattle Development Ltd., would have the responsibility for implementing and executing the livestock development project.

I. The General Manager will have the following specific duties and powers:

- (a) to propose policy and other matters, as necessary, to the Board;
- (b) to execute the Project in accordance with the policies and procedures set forth in the loan documents;
- (c) to hire, subject to such conditions as the Board may impose, the staff including accountant staff considered necessary to carry out the Project;
- (d) to establish the duties and responsibilities of each ranch and dairy farm manager, and of each assistant manager and of the staff;

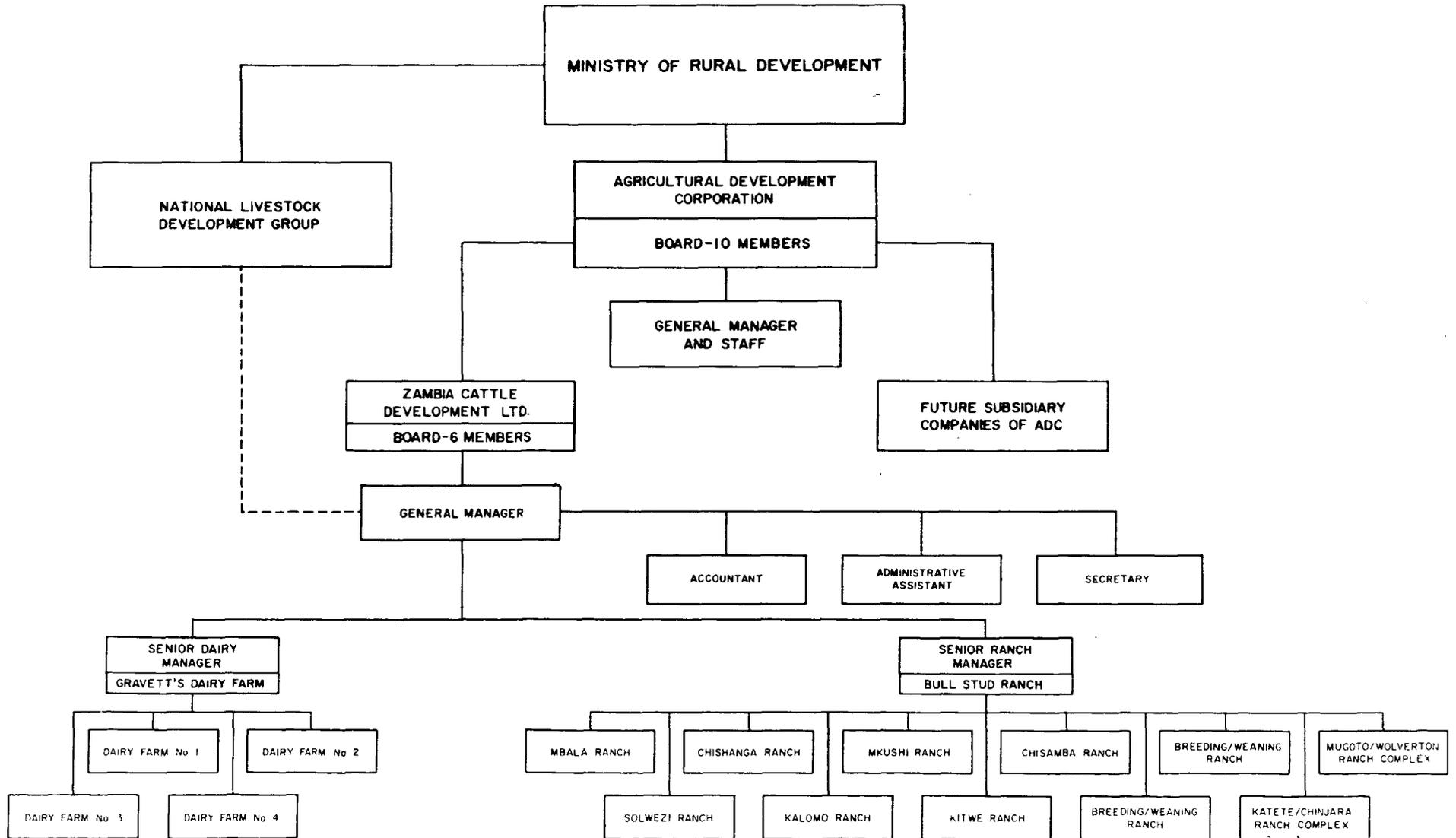
- (e) to train ranch and dairy farm managers and assistant managers in the practical aspects of livestock development and management;
  - (f) to review development plans and to suggest to the Board such modifications as are necessary to the existing ranches and dairy farms and to prepare development plans for the additional ranches and farms included in the Project;
  - (g) to insure the successful completion of each development plan in accordance with the terms of the loan documents;
  - (h) to establish and maintain records for the Project ranches and farms, as needed for project evaluation;
  - (i) to propose policy, for consideration of the Board, with respect to:
    - (i) the selection, promotion, demotion, location, suspension, or removal of project staff; and
    - (ii) the preparation of annual budgets and five-year budgets for the needs of the Project ranches and dairy farms.
  - (j) to prepare quarterly and annual progress reports for transmission to the Bank after approval by the Board; and
  - (k) to establish the terms of reference for the consultants with the approval by the Board and (i) to organize the implementation of their studies for the efficient development of pasture improvement programs (including land clearance and bush control measures) and for the preparation of the development plans for future ranches and dairy farms, and (ii) to evaluate the effectiveness of livestock watering facilities for the Project ranches and dairy farms, as well as the problems involved in instituting an artificial insemination program for the Project ranches.
2. The General Manager will have the following qualifications:
- (a) a good training in agriculture or allied science such as animal husbandry;
  - (b) broad experience in pasture and livestock development, including several years' experience in pertinent fields such as land development, soil cultivation, pasture

maintenance and use, as well as in the more practical and economic aspects of livestock production, preferably obtained in regions of the world ecologically similar to the Project areas; and

- (c) successful experience in the management of large-scale livestock development projects.



**ZAMBIA: LIVESTOCK DEVELOPMENT PROJECT**  
**AGRICULTURAL DEVELOPMENT CORPORATION (ADC) AND ZAMBIA CATTLE DEVELOPMENT LTD. (ZCDL)**  
**ORGANIZATION CHART**





## ZAMBIA

ANNEX 11  
Table 1

## LIVESTOCK DEVELOPMENT PROJECT

Cash Flow Projection for Zambia Cattle Development Limited  
(K'000)

	Before Development	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<b>Cash Inflow</b>																					
Beef Revenues	161.6	173.6	381.7	475.5	581.7	733.5	1294.0	1417.0	1500.9	1515.0	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9	1521.9
Dairy Revenues	19.1	82.0	247.8	429.4	548.2	620.9	681.8	712.8	722.7	725.6	725.6	725.6	725.6	725.6	725.6	725.6	725.6	725.6	725.6	725.6	725.6
IBRD Loan	-	462.0	466.0	411.0	270.0	167.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barclays Bank DDO Loan	-	151.0	146.0	125.0	82.0	46.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Government (ordinary & preference shares)	-	450.0	510.0	400.0	200.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barclays Bank DDO Working Capital	-	200.0	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>180.2</b>	<b>1518.6</b>	<b>1851.5</b>	<b>1840.9</b>	<b>1681.9</b>	<b>1567.4</b>	<b>1975.8</b>	<b>2129.8</b>	<b>2223.6</b>	<b>2240.6</b>	<b>2247.5</b>										
<b>Cash Outflow</b>																					
Beef Operating Costs	258.0	417.8	528.6	603.4	684.4	748.1	911.0	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6	893.6
Dairy Operating Costs	20.0	65.4	188.1	271.2	310.4	345.5	397.2	428.7	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6	437.6
Ranch and Dairy Development	-	952.0	985.0	851.0	565.0	326.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Technical Services	-	43.0	37.0	37.0	17.0	16.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Subtotal</b>	<b>278.0</b>	<b>1478.2</b>	<b>1730.7</b>	<b>1762.6</b>	<b>1576.8</b>	<b>1435.6</b>	<b>1308.2</b>	<b>1332.3</b>	<b>1331.2</b>												
Surplus (Deficit)	97.8	40.4	118.8	78.3	105.1	131.8	667.6	797.5	892.4	909.4	916.3	916.3	916.3	916.3	916.3	916.3	916.3	916.3	916.3	916.3	916.3
<b>Total</b>	<b>180.2</b>	<b>1518.6</b>	<b>1851.5</b>	<b>1840.9</b>	<b>1681.9</b>	<b>1567.4</b>	<b>1975.8</b>	<b>2129.8</b>	<b>2223.6</b>	<b>2240.6</b>	<b>2247.5</b>										
<b>Interest and Amortisation</b>																					
<b>IBRD</b>																					
Commitment Fee (0.75%)	-	10.0	6.0	3.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest (6.5%) and Amortisation	-	-	30.0	60.0	87.0	104.0	244.0	244.0	244.0	244.0	244.0	244.0	244.0	244.0	244.0	244.0	-	-	-	-	-
<b>Barclays Bank (Loan)</b>																					
Commitment Fee (0.5%)	-	2.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest (7.25%) and Amortisation	-	-	10.0	21.0	31.0	37.0	76.0	76.0	76.0	76.0	76.0	76.0	76.0	76.0	76.0	76.0	-	-	-	-	-
<b>Barclays Bank (Working Capital)</b>																					
Interest (6.5%)	-	-	13.0	19.0	19.0	19.0	15.0	10.0	6.0	-	-	-	-	-	-	-	-	-	-	-	-
Reduction of Working Capital Loan	-	-	-	-	-	-	100.0	100.0	100.0	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total Interest and Amortisation</b>	<b>-</b>	<b>12.0</b>	<b>60.0</b>	<b>104.0</b>	<b>138.0</b>	<b>160.0</b>	<b>435.0</b>	<b>430.0</b>	<b>426.0</b>	<b>320.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>						
<b>Provision for Reserves</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Provision for Permanent Working Capital</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>-</b>											
<b>Corporate Taxes</b>																					
Surplus (Deficit)	-	28.4	52.8	(25.7)	(32.9)	(28.2)	132.6	267.5	216.4	339.4	346.3	346.3	346.3	346.3	346.3	346.3	516.3	516.3	516.3	516.3	516.3
<b>Cumulative Cash Balance</b>	<b>-</b>	<b>28.4</b>	<b>81.2</b>	<b>55.5</b>	<b>22.6</b>	<b>(5.6)</b>	<b>127.0</b>	<b>394.5</b>	<b>610.9</b>	<b>950.3</b>	<b>1296.6</b>	<b>1642.9</b>	<b>1989.2</b>	<b>2355.5</b>	<b>2681.8</b>	<b>3028.1</b>	<b>3544.4</b>	<b>4060.7</b>	<b>4577.0</b>	<b>5093.3</b>	<b>5609.6</b>



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

ZDDL - Actual Balance Sheet January 1969 and  
Pro Forma Estimates December 31, 1969-December 31, 1975  
(K '000)

<u>ASSETS</u>	January 22, 1969	----- 1969	----- 1970	----- 1971	----- December 31, 1972	----- 1973	----- 1974	----- 1975
<u>Fixed (Less Depreciation)</u>								
Buildings and Capital Works	300	460	540	680	690	660	680	690
Machinery, Equipment and Vehicles	328	480	600	680	665	603	680	665
<u>Livestock</u>								
Beef Cattle	1,280	2,035	3,017	3,484	3,906	4,210	4,082	4,190
Dairy Stock	25	124	248	496	620	620	620	620
Sheep, Pigs and Horses	20	21	22	23	24	25	26	27
<u>Other Current Assets</u>								
Permanent Working Capital	-	-	-	-	-	-	100	200
Cash and Bank Balances	30	45	50	50	50	50	50	50
Stocks and Stores	50	60	70	70	80	80	80	80
Total	2,033	3,225	4,547	5,483	6,035	6,248	6,318	6,522
<u>LIABILITIES</u>								
<u>Long Term Loans</u>								
IBRD	-	462	928	1,339	1,609	1,776	1,676	1,576
Barclays Bank DCO	-	140	286	411	493	539	469	400
<u>Current</u>								
Overdraft and Short Term Loans	-	200	300	300	300	300	200	100
Creditors and Accrued Charges	100	100	100	100	100	100	100	100
Provision for Taxes	-	-	-	-	-	-	-	400
<u>Capital</u>								
Ordinary Shares	1,933	2,323	2,833	3,233	3,433	3,433	3,433	3,433
Reserves	-	-	100	100	100	100	100	100
Profit (Loss)	-	-	-	-	-	-	340	413
Total	2,033	3,225	4,547	5,483	6,035	6,248	6,318	6,522
Return on Ordinary Shares	-	-	-	-	-	-	10%	14%
Debt: Equity Ratio (%)	-	26:74	35:65	40:60	41:59	43:57	41:59	38:62



ZAMBIA  
LIVESTOCK DEVELOPMENT PROJECT

Economic and Financial Rates of Return  
(K '000)

	Project Years																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Incremental Net Operating Income after Taxes	(250)	(115)	27	157	354	778	907	712	695	716	708	708	708	708	708	560	560	560	560	560
Total Investment	(848)	(910)	(1,139)	(696)	(359)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital	(100)	(125)	( 60)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Increase in Herd Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,500
Physical Input Salvage Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200
Net Cash Flow	(1,198)	(1,150)	(1,172)	(539)	( 5)	778	907	712	695	716	708	708	708	708	708	560	560	560	560	5,260
	<u>Financial Rate of Return 12%</u>																			
Incremental Net Operating Income <sup>1/</sup>	(230)	(100)	28	185	390	820	960	1,058	1,077	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103	1,103
Ranch Investment	(848)	(910)	(1,139)	(696)	(359)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital	(100)	(125)	( 60)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Less Development Subsidy <sup>2/</sup>	( 64)	( 19)	( 18)	( 10)	( 9)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Increase in Herd Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,500
Physical Input Salvage Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200
Less Extra Cost of Government Services <sup>3/</sup>	( 15)	( 15)	( 15)	( 20)	( 25)	( 25)	( 30)	( 30)	( 30)	( 30)	( 30)	( 30)	( 30)	(-30)	( 30)	( 30)	( 30)	( 30)	( 30)	( 30)
Net Cash Flow	(1,257)	(1,169)	(1,204)	(541)	( 3)	795	930	1,028	1,047	1,073	1,073	1,073	1,073	1,073	1,073	1,073	1,073	1,073	1,073	5,802
	<u>Economic Rate of Return 16%</u>																			

<sup>1/</sup> The value of the extra beef produced as a result of the Project was adjusted upwards by 11% to reflect the equivalent value of the landed cost of the imported beef it would replace

<sup>2/</sup> The input subsidies paid by Government to ZODL developing its ranches and dairy farms has been deducted as an internal transfer

<sup>3/</sup> An estimate was made of the extra costs of Government services required (such as veterinary costs) as a result of investment in the Project



ZAMBIA

LIVESTOCK DEVELOPMENT PROJECT

Project Production Benefits At Maturity

PRODUCTION CLASSIFICATION	BEEF RANCHES			DAIRY FARMS		Total Production at Maturity	Production before Development	Increased Production due to Project	Total Slaughter Production
	Breeding/Weaner Ranches	Breeding/Fattening Ranches	Bull Breeding Ranches	Gravetts	Dairy Farms				
.....(Head).....						.....(Metric Tons)			
<b>A. LIVESTOCK PRODUCTION (Nos)</b>									
<b>1. Slaughter Stock</b>									
Cull Bulls	111	36	11	-	-	158	35	123	66
Cull Cows (beef and dairy)	2,029	726	125	78	448	3,406	536	2,870	724
Fat Steers (beef herds)	-	1,597	-	-	-	1,597	644	953	395
Fat Steers (dairy calves)	-	-	-	155	888	1,043	28	1,015	247
<b>Total</b>	<b>2,140</b>	<b>2,359</b>	<b>136</b>	<b>233</b>	<b>1,336</b>	<b>6,204</b>	<b>1,243</b>	<b>4,961</b>	<b>1,412</b>
<b>2. Breeding and Fattening Stock</b>									
Weaner Steers	8,584	-	-	-	-	8,584	286	8,298	-
Weaner Heifers (beef)	3,767	649	363	-	-	4,779	-	4,779	-
Surplus Heifers (dairy)	-	-	-	53	308	360	-	361	-
Herd Bulls (upgraded)	-	-	531	-	-	531	-	531	-
Cull Bull Calves	-	-	27	-	-	27	5	22	-
Cull Heifers	494	170	27	-	-	691	134	557	-
<b>Total</b>	<b>12,845</b>	<b>819</b>	<b>918</b>	<b>53</b>	<b>308</b>	<b>14,973</b>	<b>425</b>	<b>14,548</b>	<b>-</b>
<b>TOTAL LIVESTOCK TURNOFF</b>	<b>14,985</b>	<b>3,178</b>	<b>1,084</b>	<b>286</b>	<b>1,644</b>	<b>21,177</b>	<b>1,668</b>	<b>19,509</b>	<b>-</b>
<b>B. MILK PRODUCTION (Gals)</b>									
	-	-	-	196,000	1,120,000	1,316,000	35,000	1,281,000	-



ZAMBIA  
**LIVESTOCK DEVELOPMENT PROJECT**  
 PROJECT RANCHES AND DAIRY FARM

- Project ranches and dairy farm
- Areas from which cattle movements are restricted by veterinary regulation
- Main roads
- - - Secondary roads
- Railways

