Final Report

October 31, 1982

AN ASSESSMENT OF THE BELIZE LIVESTOCK SECTOR

Submitted to AID/RDO/C

By

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GLOSSARY OF ACRONYMS

AIC	Agricultural Investment Credit
APC	Agricultural Production Credit
BBC	Belize Beef Corporation
BELCAST	Belize College of Arts, Science and Technology
BLPA	Belize Livestock Producers Association
BMB	Belize Marketing Board
BML	Belize Meats Limited
BMVA	Butchers and Meat Vendors Association
BSA	Belize School of Agriculture
CAEP	Caribbean Agricultural Extension Project
CARDI	Caribbean Agricultural Research and Development Institute
CARE	Cooperative for American Relief Everywhere
CARICOM	Caribbean Community and Common Market
CDB	Caribbean Development Bank
CIDA	Canadian International Development Agency
CPU	Central Planning Unit
DFC	Development Finance Corporation
FAO	Food and Agriculture Organization
FIC	Farm Improvement Credit
GDP	Gross Domestic Product
GOB	Government of Belize
HPI	Heifer Project International
IDRC	International Development Research Center
MAC	Middle American Countries
MUCIA	Midwestern University Consortium for International Agriculture
MONR	Ministry of Natural Resources
PCA	Production Credit Association
PCTAA	Producers Credit and Technical Assistance Association
REAP	Rural Education and Agriculture Program
UNDF	United Nations Development Fund
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

CONVERSIONS

US$1.00	= B$2.00
1 short ton	= 0.907 metric ton
1 long ton	= 1.016 metric ton
1 square mile	= 259 hectares
1 square km	= 247.1 acres

PREFACE

Winrock International was contracted by AID/RDO/Caribbean to conduct an analysis of the livestock sector in Belize. The scope of work for this analysis was prepared by the three-person team, W. P. Warren of LAC/AID; J. H. Conrad and J. R. Simpson of the University of Florida. The following excerpts are from the scope of work:

> The overall objective of the team will be to evaluate the role of livestock in the overall agricultural sector, to determine the constraints to development of the livestock industry and provide suggestions for alleviating the constraints.
>
> Team members will focus primarily on, but are not limited to, the following primary areas while conducting the livestock sector analysis in Belize: GOB policy and goals, marketing, markets and demand, credit, livestock production, forages/feed, research-education-extension, training needs, general infrastructure and economic analysis.
>
> The assessment team will document areas where AID could possibly assist upon analyzing the livestock sector and identifying areas of constraint to the livestock industry development in Belize. Constraint areas identified for possible AID involvement should be exclusive of, but could be complimentary to, other donor activities. The constraint areas should be prioritized and substantiated.
>
> A PID or PID's are to be developed on the priority constraints areas for AID's further consideration for project development. The PID is to be detailed and provide as much information as possible leading to a PP.

To accomplish these objectives, Winrock International organized a team composed of:

H. A. Fitzhugh (leader), Animal Scientist; Winrock International
R. Bernsten, Agricultural Economist; Winrock International
J. H. Maner, Animal Scientist; International Agricultural Development Service
E. Ospina, Agricultural Economist; Texas A&M University
N. S. Raun, Animal Scientist; Winrock International
D. Schreiner, Agricultural Economist; Oklahoma State University
L. E. Tergas, Pasture Specialist; Centro Internacional de Agricultura Tropical

The team worked in Belize from 28 June to 24 July 1982. During this period, members traveled throughout the country observing all aspects of the livestock sector. Interviews were conducted with producers, processors, vendors, and consumers of livestock products. Meetings were held with government officials and representatives of private and public institutions involved in education, research, extension, and financial activities related to livestock. Reports were reviewed and statistics previously compiled were assembled to form the basis for the quantitative information used in the report.

Sincere appreciation is expressed to the many persons who shared their experience and views with the Winrock team. These persons are recognized in the extensive list of contacts. Strong support from personnel of the Government of Belize, especially the Ministry of Natural Resources, and the U.S. Embassy greatly facilitated the study.

The consensus view of the team is that the livestock sector has great potential for contributing to the economic well-being of Belize. There are, however, serious constraints impeding the realization of this potential. Resolution of these constraints will be neither easy nor quick. However, an integrated program of financial and technical assistance supported by USAID in

collaboration and coordination with those of other individual and institutional efforts can be effective in alleviating these constraints to the development of the livestock industry of Belize.

ACKNOWLEDGMENTS

Sincere appreciation is expressed to Michele Lipner and Beth Henderson who with perseverance and skill edited the contributions of the seven-person team into an integrated document. And as always Shirley Zimmerman, Tammy Chism, and others in the Winrock word processing unit worked hard, long hours under pressure to complete this manuscript. Their skills make the difficult, routine.

INTRODUCTION

Belize attained full internal self government in January, 1964 and independence on September 21, 1981. English is the official language but Spanish and Mayan are widely used.

The population in 1980 was 145,000 with an average annual growth rate of 1.9 percent. This relatively low growth rate is partially attributed to the high numbers of people that emigrate each year. It is estimated that as many as 40,000 Belizeans reside in the U.S.

The 1981 GDP in Belize was estimated at US$135 million. Agriculture accounted for approximately 32 percent of the GDP or US$43.2 million. About 28.4 percent of the population is engaged in agricultural-related activities. Because of its location, climate, and physical characteristics, Belize is well suited for agricultural endeavors.

Belize is situated in the extreme northeastern portion of Central America between latitude 15°53'N and 18°30'N and longitude 87°28'W and 89°16'W. Boundaries are the Caribbean Sea on the east and the Republics of Mexico and Guatemala on the north and west, respectively. The country is 175 miles long from north to south and 68 miles wide from east to west with a total area of approximately 8870 square miles, including numerous small and large islands within 50 miles from the coast.

There are six districts in the country: Belize, Cayo, Corozal, Orange Walk, Stann Creek, and Toledo (Figure 1). Corozal and Orange Walk districts form the northern region, Belize and Cayo districts the central region, and Stann Creek and Toledo form the southern region.

Climate

The climate of Belize is tropical with a mean annual temperature of 79°F, fluctuating from a low of 50°F which occurs during the coolest period of the year (November through January), and a high of 95°F during the warmest period (May to September).

Rainfall distribution fluctuates from 50-55 inches in the northern region to more than 150 inches in the Toledo District in the southern region (Table 1). There is a well-marked dry season from February to May which limits agricultural production in the northern region.

Soils

Soils in Belize are described in Stassen (1981), Bazan (1969), and Jenkin et al. (1976). The general classifications used here include Vertisols, Coastal Pine Ridge Soils, and Alluvial soils.

In the northern region and western portion of the central region, Vertisols are the most common soil type. They are typically shallow, overlying soft limestone marl. Fertility is high, allowing for a variety of crops to be grown during the rainy season. During dry months, however, they tend to become dry and the subsoil fissured. Improved farming methods have been successfully applied to grow crops and soil management measures practiced to reduce erosion.

The Coastal Pine Ridge Soils, also known as Puletan Soils (Ultisol and Oxisols), are found on approximately 700,000 acres, from Deep River in Toledo District to the northwest of Belize District (Figure 2). These soils have a high acid content and are low in plant nutrients (Table 2). In addition, they consist of loam

topsoil overlying dry subsoil which may have poor draining capacity during the wet season. The native vegetation consists of pine forest, palmetto, tree-shrub, and grass savannas. Under traditional management, extensive cattle grazing is the principal economic venture. Under improved management with adequate fertilization and liming, the better drained Oxisols in the Stann Creek District are being used for citrus production.

The Alluvial soils found in the central and southern regions are similar in formation and derived from igneous rock of the central mountains. They are generally deeper, more fertile, less alkaline and contain less clay than soils in the north region. These soils are conducive to producing a wide range of crops because of their natural fertility (Table 2). However, there is always some danger of sudden flooding near riverbanks. The soils of the coastal plain in the southern region are also alluvial, but are derived instead from the organic residues of mangrove forests mixed with coastal alluvium. They are generally not suitable for agriculture due to periodic incursions of seawater and year-round flooding.

Vegetation

As in many other tropical regions of the world, the vegetation of Belize follows a pattern closely related to rainfall distribution. The information presented here is based on studies by Stassen (1971), Bauman (1969), and Jenkin et al. (1976).

The deciduous seasonal forests are found in the northern region and on the western part of the central region on fertile Vertisol and Alluvial soils. Rainfall averages 50-80 inches per year with a marked dry season from February to May. Large land areas have been cleared and cultivated, although forest trees and particularly Cohune (Orbignya) palms are left standing. Land abandoned

after shifting cultivation is soon occupied by quick-growing short-lived trees and shrubs. Areas cleared for permanent cropping are sown to sugarcane, corn, beans, and improved pasture.

The deciduous semi-evergreen seasonal and rain forests are mainly found in regions with more than 80-100 inches of rain per year and on alluvial belts along the rivers. This type of forest is characterized by the prevalence of Cohune palm and dense stands of lofty trees found in heterogeneous associations. Most of these forests have not yet been cleared, except for the exploitation of valuable species used for timber such as Mahogany (Swietenia macrophylla), Cedar (Cedrela mexicana) and Sapodilla (Achras zapota).

The pine and savanna forests are found on the Pine Ridge soils. This area is characterized by low soil fertility and is prone to frequent grass fires. The savanna grasses, mainly Andropogon spp., Eragrostis spp., Sporobolus indicus and sedges such as Cyperus spp. and Scleria ciliate, cover most of the coastal plain. Pine forests (Pinus caribaea), are usually found on well-drained land, and Palmetto palm shrubs (Thrinax spp.) are common on flat land near the coast.

Perspective

Tables 3-7 present a series of statistics that illustrate the position of Belize compared to the other Middle American Countries (MAC) and to selected countries in the Caribbean Basin. These statistics provide a frame of reference for Belize, indicating similarities and differences between the countries considered.

Land Use

Among the fourteen MAC countries considered, Belize is tenth largest in area (Table 3). Compared to an average of 44 percent for the region, Belize has the smallest proportion of area in crops (3.9 percent) and pasture (1.6 percent). It has the third largest share of land in forests (44.4 percent).

Population

Belize has the smallest population of any MAC country, with less than one-tenth of one percent of the region's total (Table 4). During the past decade, population has grown at a rate of 1.9 percent per year. Only five countries registered a slower growth rate. Both a low population and moderately large physical area contribute to the country's low population density of 16 persons per square mile, representing the lowest in the region. By comparison, the second least populated country, Nicaragua, has a density of 60 persons per square mile and the most densely populated country, Barbados, has 1,639 persons per square mile.

While Belize has a significant and undeveloped agricultural potential, it ranks tenth in terms of the proportion of the population in agriculture (28.4 percent), somewhat below the MAC average of 39 percent.

Gross National Product

As shown in Table 4, Belize ranks eighth in terms of GNP (US$1,080). However, only Barbados had a GNP growth rate that exceeded Belize's 4.1 percent per year over the period 1970-79. During this time, the average growth rate for the entire region was only 2 percent.

Livestock

Mexico dominates the region in livestock production, with 60 percent of the cattle, 65 percent of the pigs, 85 percent of the sheep, 78 percent of the goats, and 63 percent of the poultry (Table 5). In sharp contrast, Belize has approximately one-tenth of one percent of the MAC's inventory of cattle, pigs, and poultry and about one-thousandth of the region's stock of sheep and goats.

Compared to neighboring countries similar in size, livestock populations in Belize are relatively small. For example, Trinidad, with one-fifth the area, has 32 percent more cattle. Jamaica, with less than half the area, has over five times as many cattle. El Salvador, with 90 percent the area, has 25 times as many cattle. Haiti, with 21 percent more land, has 19 times as many cattle. Stocks of pigs, sheep, goats, and poultry in Belize are also low, relative to neighboring countries.

In terms of livestock productivity, Belize ranks relatively low (Table 6). Annual cattle slaughter as a percentage of herd numbers is only 12.1 compared to 15.6 for other MAC countries. Carcass meat yield per head in the herd is the lowest of all countries considered. Annual pig slaughter as a percentage of herd number is the lowest in the region (25.9) compared to an average of 58 percent for all MAC countries.

Trade

Belize is one of four MAC countries that is self-sufficient in beef, although six of the nine importing countries also export substantial quantities of beef (Table 7). Among importers of beef, Trinidad imports the largest share (44 percent) of the region's total, followed by Jamaica (20 percent), Barbados (17 percent), and Mexico (11 percent). While Belize exports beef,

its share is only one-tenth of one percent of the region's exported output. By comparison, Costa Rica and Honduras both have 25 percent of the region's export share, followed by Nicaragua (23 percent), Mexico (11 percent), and Guatemala (9 percent).

In contrast, most of the MAC countries including Belize are not self-sufficient in fresh pork, bacon, poultry, and milk products. In terms of total MAC imports, the primary importers of these products are, fresh pork: Dominican Republic (57 percent), Trinidad (14 percent), and Panama (12 percent); bacon: Panama (23 percent), Dominican Republic (21 percent), and Barbados (20 percent); poultry: Cuba (37 percent), Jamaica (30 percent), and El Salvador (10 percent); and milk products: Mexico (55 percent), Cuba (14 percent), and Trinidad (7 percent).

Summary

The preceding paragraphs have provided a general overview of Belize in relation to her neighbors in the Caribbean and Middle America. The following pages discuss conditions relevant to Belize in more detail. Emphasis is placed on the agricultural industry and factors effecting its expansion.

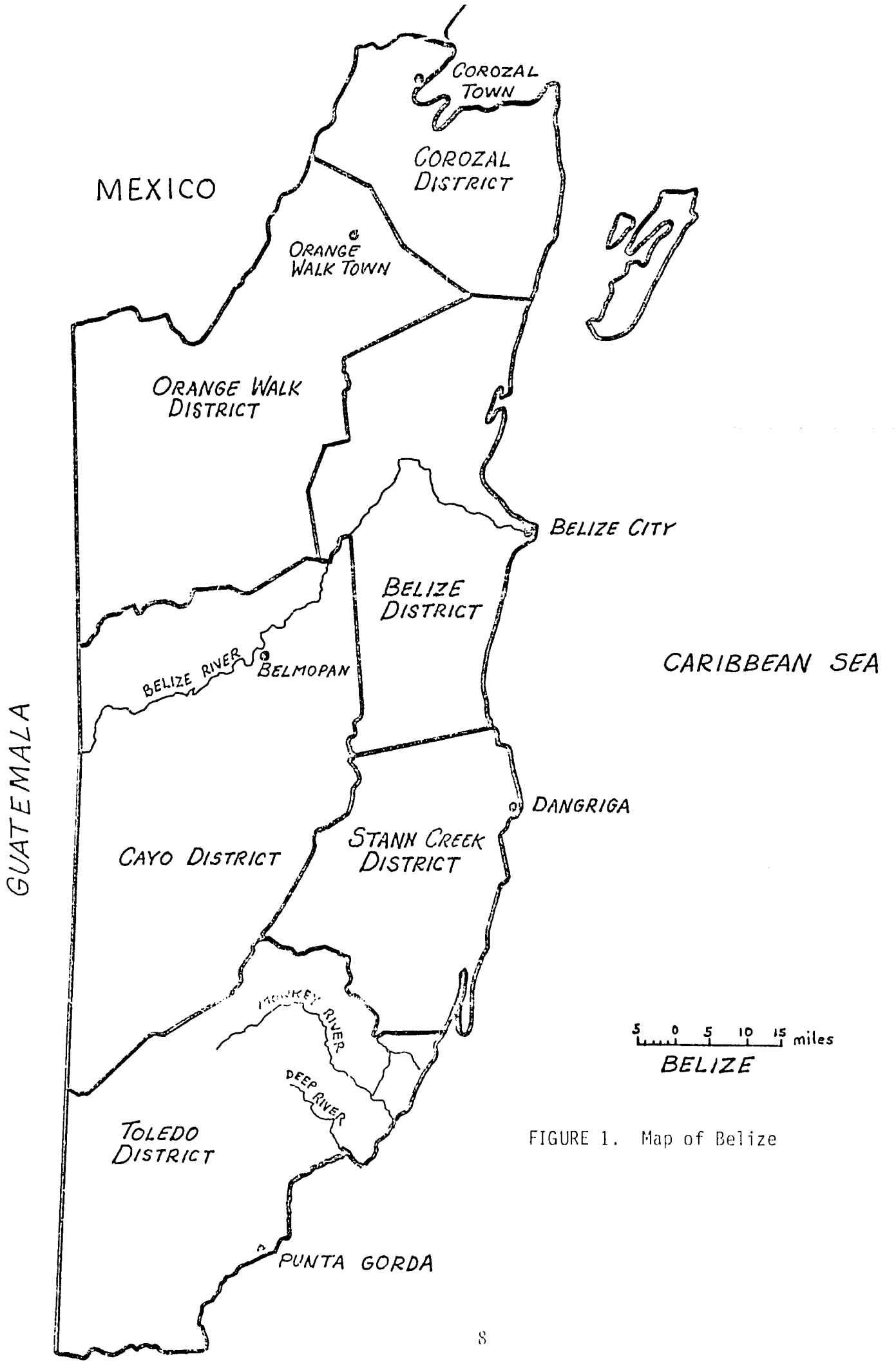

FIGURE 1. Map of Belize

Table 1. Average Monthly Rainfall by Station, by District, Recent Years, Belize[1]

District	Corozal	Orange Walk	Cayo		Belize	Stan Creek	Toledo
Site	Corozal	O. Walk	Central Farm	Belmopan	Belize City	Dangriga	Punta Gorda
	Inches						
January	2.48	2.50	4.18	5.82	4.06	5.51	6.67
February	1.36	2.10	1.93	2.90	2.28	2.92	3.97
March	0.72	0.93	1.53	5.27	2.16	2.38	2.94
April	1.65	1.18	0.79	0.69	2.14	2.79	3.31
May	5.01	2.82	3.25	4.61	2.89	6.31	8.41
June	8.32	8.70	8.86	8.80	9.65	10.42	25.06
July	7.10	7.48	7.24	14.67	10.16	10.73	29.45
August	5.81	5.72	6.33	10.79	6.96	9.31	23.63
September	9.48	9.06	8.88	12.41	10.03	12.49	20.93
October	6.58	6.02	7.11	6.99	9.87	11.48	12.82
November	3.95	3.88	7.18	6.81	6.81	8.10	8.38
December	2.51	3.15	4.96	5.09	5.26	6.38	7.36
Total	54.97	53.54	62.24	84.85	72.27	88.82	152.93

[1] Number of years considered by site is Corozal (35), Orange Walk (13), Central Farm (9), Belize (18), Dangriga (39), Punta Gorda (37).

Source: Ministry of Natural Resources, Dept. of Agriculture.

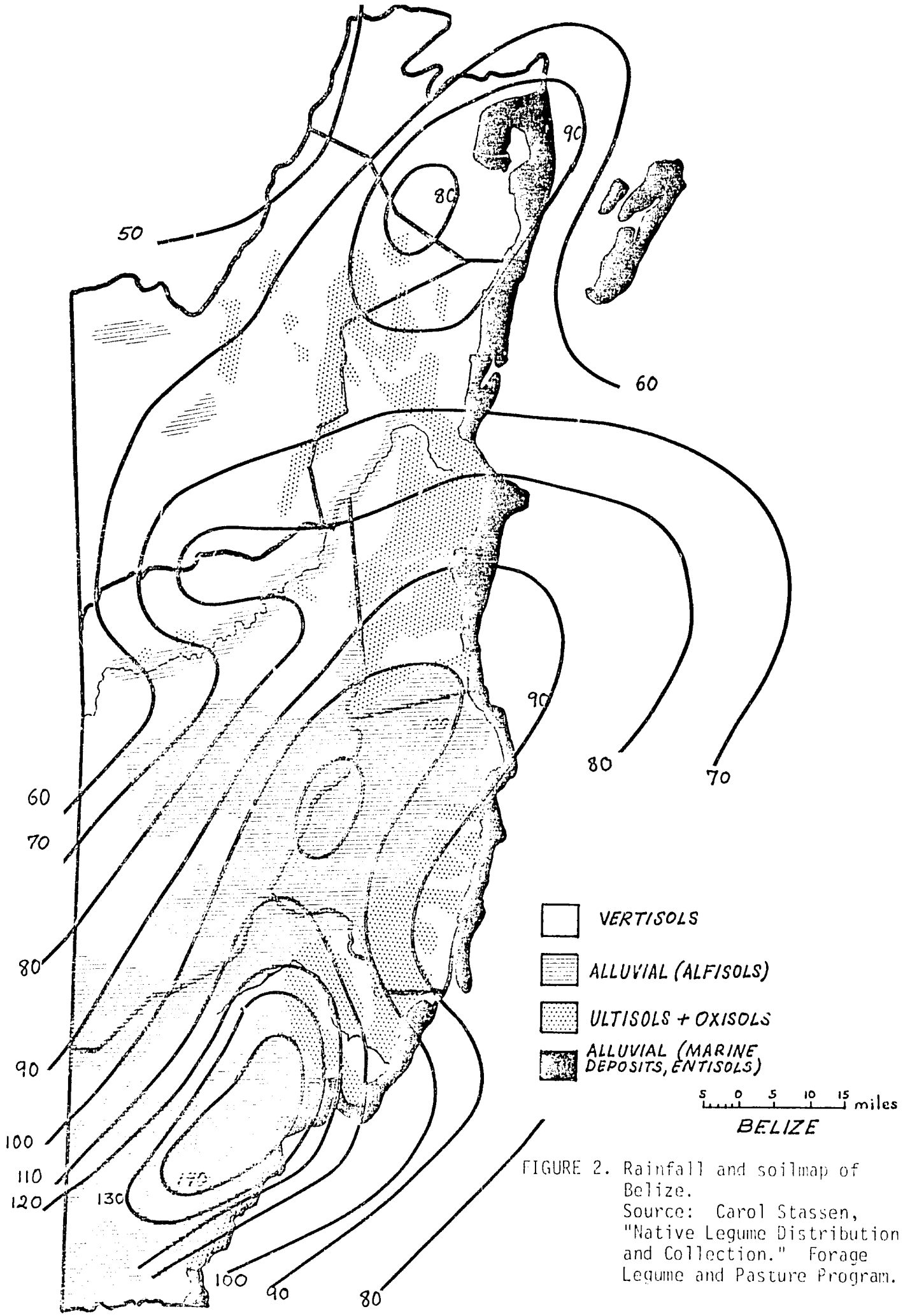

FIGURE 2. Rainfall and soilmap of Belize.
Source: Carol Stassen, "Native Legume Distribution and Collection." Forage Legume and Pasture Program.

Table 2. Soil Fertility Analysis for Topsoil (Depth, 0-6 inches) Representative of Main Soil Types in Belize[1]

Parameter	Ultisol	Oxisol	Alluvial	Vertisol
pH	3.0-5.0	4.5-5.5	5.0-7.0	7.0-8.0
Organic Matter (%)	0.75-2.25	0.75-3.0	1.5-5.0	4.5-75
P (ppm)	0-3	0-3	3-15	1-4
K (ppm)	25-125	25-200	50-250	300-400
Ca (ppm)	100-2000	200-4000	6000-12000	12000-25000
Mg (ppm)	0-200	0-200	200-800	2000-3000
Cation Exchange Capacity (Milli-equivalents/100 grams)	1-15	10-25	25-50	50-80
Base Saturation (%)	5-40	15-40	50-80	80-90

[1] H. Vernon, Ag. Chemist (Soils), Central Farm. Personal Communication.

Table 3. Land and Land Use for Middle American-Caribbean Countries, 1980

Country	Total (million ha)	Land Use		
		% Arable	% Pasture	% Forest
Belize	2.28	3.9	1.6	44.4
Barbados	.04	76.7	12.1	-
Costa Rica	5.07	9.7	30.8	37.5
Cuba	11.45	27.9	18.8	16.5
Dominican Republic	4.84	25.4	31.0	13.2
El Salvador	2.07	34.3	29.4	7.0
Guatemala	10.84	16.7	8.1	42.7
Haiti	2.76	32.1	18.5	3.7
Honduras	11.19	15.7	30.4	37.0
Jamaica	1.08	24.5	19.4	28.3
Mexico	192.30	12.1	38.7	25.5
Nicaragua	11.88	12.7	28.6	38.7
Panama	7.60	7.5	15.3	55.3
Trinidad	0.51	30.8	2.1	45.0

Source: 1980 FAO Production Yearbook.

Table 4. Total Population, Population in Agriculture, GNP Per Capita, 1980, and 1970-79 Growth Rates, Middle American and Caribbean Countries

Country	Population			GNP per Capita (US$)	Growth Rates 1970-79	
	Total (1000)	Density (per sq. mile)	In agriculture (%)		Population (%)	GNP per capita (%)
Belize	145	16	28.4	1,207	1.9	4.1
Barbados	253	1,639	16.6	3,040	0.5	2.1
Costa Rica	2,213	113	35.1	1,730	2.5	3.2
Cuba	9,978	226	23.3	NA	1.4	NA
Dominican Rep	5,946	318	56.1	1,140	3.0	3.7
El Salvador	4,801	601	51.4	590	2.9	1.4
Guatemala	7,262	174	54.9	1,110	2.9	3.1
Haiti	5,817	546	66.6	270	1.7	1.8
Honduras	3,693	86	62.6	560	3.4	0.5
Jamaica	2,192	526	20.7	1,030	1.6	-3.7
Mexico	69,994	94	36.0	2,130	3.0	1.9
Nicaragua	2,737	60	41.8	720	3.3	-1.6
Panama	1,944	66	34.5	1,730	2.3	1.3
Trinidad	1,139	579	16.0	4,370	1.2	4.5

Sources: Belize data - Ministry of Finance, Central Planning Unit.
Other data - 1980 FAO Production Yearbook.
1981 World Bank Atlas.

Table 5. Numbers of Livestock for Middle American-Caribbean Countries, 1980

Country	Numbers, thousand				
	Cattle	Pigs	Sheep	Goats	Poultry
Belize	58	27	3	1	340
Barbados	19	43	51	28	422
Costa Rica	2,183	232	2	1	5,700
Cuba	5,900	1,950	355	99	25,000
Dominican Republic	2,153	250	54	380	8,200
El Salvador	1,440	421	4	15	5,500
Guatemala	1,653	792	679	76	14,000
Haiti	1,100	2,000	89	995	4,800
Honduras	2,220	534	5	15	4,645
Jamaica	300	255	6	380	4,200
Mexico	31,094	13,222	7,318	7,185	152,000
Nicaragua	2,401	500	2	7	4,700
Panama	1,525	195	-	6	5,000
Trinidad	77	59	11	46	7,400
Total	52,123	20,480	8,579	9,234	241,907

Source: 1980 FAO Production Yearbook.

Table 6. Numbers and Meat Productivity of Cattle and Swine, Middle American-Caribbean Countries, 1980

Country	Cattle			Swine		
	Numbers (1000)	% Slaughtered	Carcass meat kg[a]	Numbers (1000)	% Slaughtered	Carcass meat kg[a]
Belize[b]	58	12.1	17	27	25.9	-
Barbados	19	10.5	-	38	44.7	53
Costa Rica	2,183	17.5	37	232	66.4	43
Cuba	5,900	14.7	25	1,950	60.3	31
Dominian Republic	2,153	10.5	20	250	100.0	48
El Salvador	1,440	12.8	19	421	73.6	38
Guatemala	1,653	29.0	48	792	43.4	20
Haiti	1,100	12.3	22	2,000	41.3	17
Honduras	2,220	17.7	25	534	53.2	17
Jamaica	300	23.7	43	255	62.7	35
Mexico	31,094	11.4	19	13,222	52.9	37
Nicaragua	2,401	15.8	29	500	42.0	22
Panama	1,525	16.7	34	195	58.5	36
Trinidad	77	13.0	26	59	89.8	51

[a] Yield per head in herd.
[b] FAO estimates for cattle and swine population considerably exceed those reported by GOB, which are used elsewhere in this Report.
Source: 1980 FAO Production Yearbook.

Table 7. Import and Export Statistics for Selected Livestock Products, Middle American-Caribbean Countries, 1980

Country	Beef, MT		Fresh Pork, MT		Bacon, Ham, MT		Poultry, MT		Milk Products, US$1000	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
Belize	-	150	100	-	460	-	40	-	4,440	-
Barbados	2,400	-	900	-	1,327	10	3,333	-	1,798	-
Costa Rica	21	26,047	150	-	303	-	400	-	6,343	400
Cuba	-	-	-	-	-	-	22,000	-	55,700	-
Dominican Republic	30	1,122	4,627	-	1,379	-	6,075	-	12,416	-
El Salvador	350	1,434	-	-	75	-	80	260	18,216	-
Guatemala	62	9,425	220	-	300	-	1,000	-	12,730	300
Haiti	643	1,181	-	-	41	-	-	-	11,950	-
Honduras	-	26,160	30	-	39	-	-	-	13,970	-
Jamaica	2,900	-	350	-	606	-	18,000	-	9,200	-
Mexico	1,500	11,801	-	100	-	-	-	-	222,288	-
Nicaragua	-	24,000	-	-	11	-	3,500	-	2,640	-
Panama	-	2,650	1,000	-	1,500	-	500	-	6,700	3,000
Trinidad	6,296	68	1,180	30	578	18	4,252	39	28,512	1,565
Total	14,231	103,468	8,157	130	6,611	28	59,180	299	406,990	5,265

Source: 1980 FAO Trade Yearbook.

CATTLE INDUSTRY

CATTLE INDUSTRY

This section describes the cattle industry and principal production systems and outlines constraints to cattle production. Information gathered from the Cattle Census of 1978, published reports, and interviews with Government of Belize representatives, livestock producers, and agriculture industry authorities provide the basis for the following review.

The total cattle herd in 1978 numbered 48,747 head. Highest numbers of cattle were in Cayo (22,225), Orange Walk (15,501), and Belize (6,922) districts, accounting for 91.6 percent of the total population (Table 8). Agricultural land on 1,386 cattle farms totaled 241,112 acres with an average of 35.2 head/farm and 4.9 acres of land per animal (Table 9). Pastureland totaled 108,441 acres with an overall pasture/cattle ratio of 2.2/1.0 (Table 10). About 76 percent of the total herd was reported on farms having more than 100 acres which accounted for 27.1 percent of total cattle farms. The 375 farms of more than 100 acres had an average of 99 head/farm while farms of less than 100 acres had 11.5 head/farm (Tables 11, 12).

It is generally believed that total cattle numbers have declined since 1978. A new cattle census is scheduled for 1983.

Slaughter

The number of cattle slaughtered in 1981 was almost 92 percent higher than in 1970 (Table 13). Extraction rate in 1981 was 13.1 percent. However, this extraction rate does not include estimates of farm slaughter or of sales of live cattle to Mexico. Average annual dressed weights varied between 311 and 392 pounds. In terms of production of dressed carcass weight, the

largest increases occurred from 1970 to 1973, and 1977 to 1978. There has been a steady decline in total beef production since 1978. Farm slaughter is not included in these figures.

Belize and Cayo district accounted for over 80 percent of all cattle slaughtered in 1979 and 1980 (Table 14). Over 70 percent of the cattle slaughtered in Belize District was performed by the Belize Beef Corporation (now Belize Meats Ltd.) at the Ladyville plant.

Production Systems

Two principal types of cattle production systems are found in Belize: animal based, and mixed crop/livestock systems. The first system encompasses medium size farms and large ranches in which the main agricultural activity is cattle production. The second group includes medium size and small farms (milpas) in which cropping is the main activity with cattle and other livestock production as complementary activities.

Animal Based Production Systems

Medium size farms and large ranches for which the main agricultural activity is cattle production constitute the major animal based production systems in Belize. The size of these operations may vary from 100 to several thousand acres, and from 30 to 7,000 head of cattle. Most cattle production in Belize is from these systems.

The main feed resource is pasture with little supplementation even during the dry season. Approximately 62 percent of the total pastureland has been left in native varieties after the land has been cleared (Table 15). However, considerable efforts have recently been made to establish cultivated pastures: Pan-

gola, Guinea, and Bermuda grasses on well-drained fertile soils; Para and Carib grasses on poorly drained alluvial soils; and Bahia grass on the less fertile acid soils. (See Feed Resource section for more details.)

Operations specializing exclusively in growing purchased feeder cattle to slaughter have not yet been developed in Belize. Most producers have sufficient pasture to grow slaughter stock as well as maintain their cow/calf operations, albeit at high land per animal ratios.

Production coefficients, characteristics, and general animal husbandry practices are presented in Table 16 for four representative cattle operations. These producers are using bulls from improved imported breeds, such as Brahman, Charolais, Charbray, and Santa Gertrudis for crossing with mixed-breed cows. One bull generally services 20-25 cows. The breeding season is limited to 4-6 months. Heifers are first bred between 24-30 months of age at an average liveweight of 660 pounds. Calving rates vary from 65 to 80 percent; calves are generally weaned at 7-8 months of age and 350-500 pounds average liveweight.

Mortality rates are less than 3 percent for young animals and 1-2 percent for adults. These low mortality rates reflect the absence of serious endemic diseases in Belize. The major health problems are caused by parasites such as screwworm (Callitroga hominivorax), beef worm (Dermatobia hominia), intestinal worms (Nematodes and others), coccidia, and ticks. Regular deworming and dipping is practiced. Animals are routinely vaccinated against Blackleg disease. Vampire bats often constitute a problem, particularly for young stock. Although rabies is endemic, there is no indication that it poses a major health problem for cattle.

The main production constraint faced in the animal based system is the limited development and availability of high quality pasture. Consequences include poor nutritional levels, low stocking rates, and long growing periods to slaughter, resulting in increased production costs. Improved pastures are needed to both replace low producing natural grasslands and renovate cultivated pastures that have deteriorated because of poor species adaptation and management.

Mixed Crop/Livestock Systems

Primarily crop production farms, the mixed crop/livestock systems maintain cattle to augment farm income and utilize pasture for noncropped lands and crop residues. Although there are a few large operations e.g., Big Falls Ranch (rice and cattle), this system is more generally represented by medium size family farms and small farms known as milpas.

Medium Size Family Farms. The Mennonite farming communities of Blue Creek and Shipyard in Orange Walk District and Spanish Lookout in Cayo District are representative of medium size farmers engaged in the mixed crop/livestock production system. Although discussion focuses on the Spanish Lookout Mennonite community, the analysis is relevant to other medium size family farms.

In 1980, Spanish Lookout community had a population of 1,276 people in 217 households. Total area in pasture, annual crops, and homestead was approximately 20,000 acres. Average farm size was about 90 acres.

The major field crops grown are corn, red kidney beans, and sorghum. In 1980, about 5,000 acres of corn and over 2,000 acres of beans were harvested. Hybrid corn, first introduced in 1966, is now planted by all producers. Fertilizer and weed control chemi-

cals are applied. There is a substantial degree of mechanization.

Spanish Lookout farmers initially planted Jaragua and Molasses grass on the newly cleared land; in recent years they have changed to Pangola and African Star for establishing permanent pasture. New pastures are plowed before planting but there is little fertilization. Fields are bushhogged when woody growth becomes a problem. While legumes are found naturally in pastures, few efforts have been made to establish grass-legume mixes. Over 5,000 acres are in pasture in the community, 75 percent of which is improved.

In 1978, 151 farms (70 percent of all farms) in Spanish Lookout kept 2,786 cattle, for an average herd size of 18 animals per farm. Most of the cattle are raised for beef production, but there are about 100 dairy cows and some cattle used in a dual-purpose capacity. Major improved breeds used include Brahman, Charolais and Charbray, for beef; Holstein and Brown Swiss for dairy; and Red Polled and crosses of dairy cattle and Brahman for dual purpose. Average stocking rate is about 2 acres per animal. Mortality rates are low and there are no widespread health problems. Production coefficients, general characteristics, and management practices for representative farmers in this group are presented in Tables 17 and 18. Herd performance is generally similar to that described for animal based systems. However, weight gains of growing/finishing animals and calving percentage are probably somewhat lower due to poorer pastures and lower availability of forage during the dry season.

The main constraint to cattle productivity in this group is the limited availability of improved pastures even where crop residues are present.

Milpa. Small farms, known as milpas, are generally mixed crop/livestock operations operated by the family. The milpa includes both shifting and permanent mixed agriculture. Historically, the slash-and-burn system has been used to clear land for annual food crop production although some of the cleared land is now being established in longer term cash crops such as citrus, bananas, and cacao.

The farmer (or milpero) clears the land by hand and burning. When the rains begin, food crops are planted. The crops are harvested towards the end of the wet season, although crops such as cassava and plantains may not mature until several months into the dry season. While some milpas are cropped for two or more consecutive years, most land is usually allowed to return to bush after one crop. However, the milpa does provide a low cost system for bringing the land into permanent crop or pasture production.

Most of the labor is performed by the family. The bulk of crops produced are for home consumption, while surplus is sold in the neighboring markets. Some pigs and chickens are found on most farms; they utilize household wastes and crop residues.

The milperos build their cattle herds over several years, purchasing animals as added cash becomes available. Because of limited financial resources, herds tend to be small and expansion is primarily through natural herd growth. Total cattle, including those for breeding and slaughter, are commonly 10 or less of native (Criollo) and Zebu breeding. With exceptions, herd productivity is low (Table 18). Animals are often marketed at 500-600 pounds. This is primarily due to family needs for cash income, limited availability of pasture, and the low quality of the pasture. Only rarely are slaughter stock carried to market weights of 800-900 pounds.

Heifers are bred at 26-30 months of age; calving percentages range from 65 to nearly 100 percent, often higher than for large producers.

Native pasture grows on the harvested milpa. While legumes grow naturally in these pastures, no special effort is made to maintain these species. Some farmers may seed improved grasses such as Guinea or Jaragua before crops are sown. Cattle are allowed to graze after crops are harvested and on volunteer pasture in following years. Following the cropping year(s), the volunteer pasture can be stocked at about 4 acres/animal.

Constraints faced by milperos wishing to improve their cattle operations are mainly lack of financial resources and limited knowledge concerning management practices such as planting improved grasses, legume bank establishment, parasite control, mineral supplementation, and the use of improved breeding stock.

Economic Analysis of Cattle Production

Results from analyses of beef cattle production from the point of view of the individual producer can be used to draw inferences about the industry as a whole (Simpson and Farris, 1982). Accurate estimates of operational and investment costs are essential to the usefulness of these analyses. Unfortunately, only limited figures are available. Some current costs and prices were obtained from reports and interviews with government officials and producers. Cited costs for land clearing and establishment of improved pasture ranged from B$100 to B$125 for hand clearing and pasture development to B$250 to B$400 when heavy machinery was used to clear, plow, and plant pastures.

Retail price controls or beef restricted price for live cattle. Controls on the higher priced cuts have been removed and pro-

ducers anticipate increased live prices as well. The Belize Livestock Producers Association published a recommended price list for slaughter cattle in February, 1982.

Liveweight, lb	Steers, Bulls, Heifers	Cull Cows
500 to 550	B$ .80	B$.70
551 to 600	.825	.725
601 to 650	.85	.75
651 to 700	.875	.775
701 to 750	.90	.80
751 to 800	.925	.825
801 to 850	.95	.85
851 to 900	.975	.875
901+	1.00	.90

Very poor quality animals: B$.65 per lb.

These prices are intended to serve as an incentive to grow cattle to heavier slaughter weights and improve beef offtake from the national herd. However, the relatively few cattle sold at these prices are primarily purchased by Belize Meat, Ltd. to supply meat for the British Army stationed in Belize. Prices cited by butchers and a few producers who had recently sold slaughter cattle ranged from B$.65 to B$.85 per pound for 600 to 800 pound steers. Most cattle are sold on a per head basis with the price negotiated between seller and buyer based on their respective estimates of liveweight. The more experienced buyer usually has an advantage in these transactions.

Prices for common grade breeding cows (3 to 4 years of age) were quoted at BS450 to BS600. These prices tend to be lower than the potential slaughter value (see above price list), probably because of current regulations against female slaughter and lack of interest among producers in buying cows to expand their cow herds. Grade bulls generally sell at their slaughter value even when intended for breeding purposes; however, bulls from herds based on importations of pedigreed stock sell for BS1000 to BS1500 or higher at 2 to 3 years of age.

The paucity of cost data makes it difficult to develop enterprise budgets. Belisle (1981) and Brabyn (1981) compared small, medium, and large cattle operations. There were major differences between the analyses in production coefficients, cost estimates and herd sizes. For example, Belisle assumed herd sizes of 15, 100, and 800 breeding cows; whereas Brabyn's herd sizes were 7, 60, and 80 breeding cows for the small, medium, and large operations, respectively.

While there were differences in financial and production coefficients between the reports, the values used by both authors were within the normally accepted range. Somewhat surprisingly, therefore, the results from the analyses differed markedly. Brabyn's results indicated that the small herd lost money but both the medium (his terminology was small commercial) and large operations were profitable with annual gross revenues exceeding operational costs. In contrast, Belisle's results indicated that all three operations were profitable (gross revenue-operating expenses) but, more importantly, that the small size herd yielded an internal rate of return twice that of the medium and large size operations (18.6 versus 9.2 and 10.5 percent, respectively). Brabyn did not evaluate return to capital investment in his analysis.

Investment costs considered by Belisle included land purchase (with different costs per acre for pasture in natural and improved states) and costs of breeding cattle. In the Belisle analysis one reason for the higher return on investment for small operators was the assumed difference in costs for clearing and improving pasture land (B$25/acre for small farms versus B$200/acre for larger operations).

Given the differences in results and conclusions from these two reports, an additional analysis was made in order to evaluate if

there were major differences among farm sizes in investment costs per animal or land unit, in operational costs (i.e., breakeven prices per pound of liveweight sold), and in internal rates of return. Prices and costs for these analyses were obtained from those reported by Brabyn, Belisle and from interviews with government officials and livestock producers.

Three farm sizes were considered, small, medium, and large. The estimations are undertaken for a six-year period. All three farms are integrated cow/calf and finishing operations. Weaning rate for all operations was assumed at 60 percent. Death rates were assumed at 2 percent for adult stock and 3 percent for young animals. The value of land in native pasture was assumed to be the same for all three operations, representing approximate current market value.

Investment costs are:

1.	For the small size farm	
	3 cows with calves @ B$700	B$ 2,100
	7 bred heifers @ B$600	4,200
	1 bull	1,000
	Cattle investment	B$ 7,300
	60 acres, native pasture @ B$100/acre	B$ 6,000
	1.12 miles of fence @ B$2,600/mile	2,912
	Miscellaneous	300
	Total investment	B$16,512
2.	For the medium size farm	
	40 cows with calves @ B$700	B$ 28,000
	20 bred heifers @ B$600	12,000
	2 bulls	2,000
	Cattle investment	B$ 42,000
	230 acres of native pasture @ B$100/acre	B$ 23,000
	40 acres of improved pasture @ B$250/acre	10,000
	Pasture investment	B$ 33,000
	Fence 5 miles @ B$2,600/mile	B$ 13,000
	Corral, dipping vat	20,000
	Total investment	B$108,000

3. For the large size farm

120 cows with calves @ B$700	B$ 84,000
60 bred heifers @ B$600	36,000
6 bulls @ B$1000	6,000
Cattle investment	B$126,000
500 acres of native pasture @ B$100/acre	B$ 50,000
110 acres of improved pasture @ B$250/acre	27,500
Pasture investment	B$ 77,500
Fence, 12 miles @ B$2600/mile	B$ 31,200
Corrals, dipping vat	30,000
Buildings, etc.	15,000
Vehicles, equipment, houses, etc.	30,000
Total investment	B$309,700

Annual operating expenses are:

1. For the small size farm

Pasture management B$20/acre	B$ 1,200
Fence maintenance, drenching vat, etc.	B$ 130
Owner labor, 14 hrs/week, B$2/hr	B$ 1,456
Drugs, salt, minerals, etc. $5/head	
Spraying B$.60/head	
Drenching B$1.60/head	

2. For the medium size farm

Management, native pasture, 230 acres @ B$20/acre	B$ 4,600
Management, improved pasture, 40 acres @ B$ 20/acre	800
Fertilizer application (500 lb/acre) @ B$20/acre	800
Fence maintenance and vat	500
Labor: part-time hired, 28 hrs/week @ B$2/hour	2,912
owner labor, 30 hrs/week @ B$2/hour	3,120
Drench @ B$2.60/head	
Spray @ B$1.20/head	
Drugs, salt, minerals, etc. @ B$6.25/head	

3. For the large size farm

Management, native pasture @ B$20/acre	B$10,000
Management, improved pasture @ B$20/acre	2,200
Fertilizer, lime, etc. @ B$20/acre	2,200
Maintenance, fence, corral, dipping vat	850
Labor: full-time and part-time, 4500 hr @ B$2/hr	9,000
owner labor, or hired manager @ B$3/hr	6,240
Maintenance equipment, vehicle, etc.	4,000
Drenching @ B$2.60/head	
Spraying @ B$1.20/head	
Drugs, salt, minerals, etc. @ B$7.00/head	

Bulls are replaced every three years in all operations. Cow culling rates are assumed at 10 percent in the small size farm; 10 percent in the first three years and 15 percent thereafter in the medium size farm; and 10 percent in the first three years and 20 percent thereafter in the large size farm.

The following sale weights and prices were assumed for all three operations:

Culled cows	850 pounds	B$.68/pound
Steers (2-3 years)	850 pounds	B$.73/pound
Surplus breeding heifers	850 pounds	B$.80/pound

The sale value of the bulls was assumed equal to the purchase value minus depreciation for three years.

Results from the economic comparisons (Appendix I) are summarized in Table 19. These results are determined by the financial coefficients and other assumptions, many of which were based on little more than best guesses. Nevertheless, the results do suggest certain reasonable conclusions. First, cattle production currently yields very low returns on investments; these returns of 3% to 4% are substantially less than prevailing interest rates. Low productivity (e.g., the assumed 60% calf crop) was a major factor leading to estimated low profitability. Our opinion is that improving productivity to reasonable levels (e.g., 85% calf crop) could improve return on investment to 15% or more even at present cattle prices in Belize.

Second, investment cost per animal decreased as the size of the operation increased, while investment costs per acre were higher for the large operation, primarily because of the higher cost of mechanical vs hand clearing of pasture.

Third, in agreement with Belisle, the small operations yielded the highest rate of return. However, the breakeven price per pound of live weight sold was also highest for the small operation and there was actually no significant difference in returns to different size operations.

These results tend to bridge the gap between the apparent differences in the studies by Brabyn and Belisle. However, there is need for collection of more and better farm budget data and for use of these data in more detailed analyses to develop plans for policy and credit programs.

Constraints

Principal constraints on the cattle industry are discussed in the following paragraphs.

Limited Markets

The most critical constraint facing the cattle industry is the limited capacity of the domestic market and the current stagnation of the export markets to Mexico, Caribbean countries, and the U.S. Although export market options/opportunities exist, operational trade agreements have not been developed. If the export market is not developed, there is little opportunity for substantial expansion of the cattle industry. Furthermore, at present, producers unable to sell cattle ready for slaughter are experiencing financial losses.

Pasture

Although improved pasture management and adapted grass and legume species are available in Belize, systems of pasture improvement have been implemented by only a few producers. There is particu-

lar need for pasture management systems which will supply adequate energy and protein to maintain productive levels of cattle performance during dry seasons. This constraint is more critical for operations that depend entirely on native pasture for year-round feed supply.

Credit

Timely and adequate credit is a principal input needed for further development of the cattle industry. This credit is needed to develop improved pastures and to purchase breeding/fattening animals. This constraint is particularly critical for medium and small producers who, because of insufficient collateral, have limited access to established credit lines.

Production Constraints

Important production inputs are in short supply and/or expensive; e.g., dicalcium phosphate and trace minerals for mineral supplements, vaccines, chemoprophylactic and chemotherapeutic agents, wire, and tools. High prices for these inputs discourages their use, with subsequent effects on productivity.

Cattle theft is an important constraint to some producers, often exceeding losses due to disease. Apprehension of thieves is infrequent and punishment (usually fines) is considered inadequate by many producers.

Transfer/Application of Technology and Trained Personnel

Appropriate technology is already available for pasture management and establishment, animal husbandry, livestock health, and farm management to substantially improve current levels of production and support the development of an efficient cattle indus-

try in Belize. However, research demonstration and extension activities for transferring this technology to producers, particularly medium and small producers, is not well developed.

Numbers of trained personnel are not sufficient to design and implement a national program to increase cattle production. This program should include supervised credit and technical assistance to producers, training of extension specialists and producers, field testing and validation of improved pasture/livestock production systems and development of an export market for beef.

Belize Beef Corporation

BBC, incorporated in 1977, was designed to facilitate the development of a profitable beef industry in Belize. A joint private and public sector venture, the BBC was originally conceptualized as a vertically integrated beef cattle operation that would include a cow-calf unit, a sugarcane feeding facility, and a meat packing plant. The BBC was seen as a vehicle for providing consistent supplies of slaughter cattle necessary to develop a profitable beef export market through the plant. Further, the sugarcane feeding facility would demonstrate the advantages of utilizing this feedstuff as a means of increasing beef offtake by decreasing age at which cattle reached desirable slaughter weights of 900 to 1000 pounds.

To this end, four ranch properties and the abattoir/meat packing plant at Ladyville were purchased in 1977/78. However, the original plans for BBC were never fully realized. The feedlot has not yet been developed; one of the ranch properties has been sold; and the abattoir/packing plant was sold to the Government of Belize in September, 1981.

Failure to realize the original plans was a consequence of many factors, principal among them undercapitalization. The BBC was authorized to issue 600,000 shares at B$10 each to raise B$6 million in capital. It was anticipated that approximately one-third of the shares would be owned by private ranchers and food distributors. In this way, the Caribbean Development Bank (CDB), which provided the loan to finance BBC, would be a substantial but minority stockholder (Table 20).

In actuality, B$2.39 million of equity was realized. CDB became the majority shareholder with GOB (including equity owned by DFC) the other substantial shareholder. Agrodinamica, a Costa Rican based company, originally contracted to manage BBC operations, still holds equity, but the management contract was terminated by mutual consent in 1980. Only one rancher owns equity.

Between 1978 and October 1981, BBC accumulated losses of B$3.5 million, completely eroding equity. These losses primarily affected the abattoir and meat processing activities. The cattle rearing activities have operated at a breakeven level.

The decision has been made to restructure BBC through the following actions:

1. GOB will purchase the abattoir and meat packing facility from BBC for B$1.5 million. CDB will provide an additional loan and grant for technical assistance to restructure plant operations and refurbish facilities (c.i.f. section on Belize Meats Ltd. for details).

2. The Never Delay section (946 ha) of the BBC ranch complex will be sold for an estimated B$938,000.

3. GOB will provide an additional B$2 million in cash equity to BBC to be used to liquidate outstanding debts (Mt. Pleasant Ltd., Barclays Bank, E. Bedran, and Agrodinamica).

4. The outstanding CDB loan of B$1.3 million (not including accrued interest) will be converted to equity.

5. BBC cattle operations will focus on growing and finishing purchased cattle, utilizing pastures and confinement feeding of sugarcane based rations during the dry season. The cow/calf operations will be discontinued.

6. CDB will provide B$292,000 in equity to fund development of the sugarcane feeding component.

7. CDB will loan B$803,000 over a 2-year period at 4 percent interest with a 5-year grace period and a 15-year repayment schedule.

Implications of these financial transactions to equity holdings are shown in the last columns of Table 20.

The restructured cattle production plan will be based on the Mt. Pleasant and Little Orange Walk ranches in the Cayo District, about 3.5 km north of Belmopan on the Western Highway. The ranches comprise 1700 ha including 983 ha of cleared native pasture and 102 ha of Guinea grass (Panicum maximum) with the remainder in light to medium bush. Approximately 635 ha will be established in Guinea and African Star (Cynodon nlemfuensis) grass. Twenty ha will be planted in sugarcane to provide feed for approximately 360 cattle during the dry season. Sugarcane based rations will be fed in a fenced enclosure subdivided into six pens all with feed bunks, water facilities, and shade.

The commercial cow herd will be dispersed. A small herd (30 cows) of pedigreed Brahman cattle originally imported from Costa Rica will be retained to produce breeding stock for sale to other producers. Weaner cattle will be purchased for growing and finishing over a 15 to 20 month period. Assuming a 0.4 kg average daily gain over this period, steers should reach 360 kg and cull heifers, 320 kg, by 20 to 30 months of age when they are slaughtered. The growing/finishing of purchased cattle is expected to increase rate of offtake from the ranch and improve cash flow. Under this plan, BBC is expected to produce a net annual offtake of 225 tons of liveweight and provide up to 20 percent of the cattle slaughtered by Belize Meats Ltd.

The BBC operation offers an opportunity to evaluate and demonstrate technologies, such as improved pasture management and supplemental feeding during dry season. It will also provide a base for developing stocker-feeder cattle management practices. By serving as a center for research and demonstration, the issue of conflict of interest between public and private sector investment in cattle production will become less critical.

Table 8. Cattle Numbers, by Kind, by District, 1978

District	Bulls	Cows/ Heifers	Steers	Calves	Total
Belize	781	4,370	457	1,314	6,922
Corozal	92	643	55	260	1,050
Orange Walk	1,420	9,422	1,304	3,355	15,501
Cayo	1,920	13,283	2,481	4,541	22,225
Stann Creek	124	995	95	312	1,526
Toledo	373	1,110	22	18	1,523
Total	4,710	29,823	4,414	9,800	48,747

Source: Cattle Census, 1978.

Table 9. Number of Farms With Cattle, Cattle Numbers Per Farm, Acres of Agricultural Land, and Acres of Land Per Animal, 1978

District	Number of Farms	Cattle Per Farm	Acres of Farmland	Acres Per Animal
Belize	200	34.6	47,174	6.8
Corozal	79	13.3	7,890	7.5
Orange Walk	439	35.3	73,536	4.7
Cayo	540	41.2	101,246	4.6
Stann Creek	33	46.2	7,262	4.8
Toledo	95	16.0	4,004	2.6
Total	1,386	35.2	241,112	4.9

Source: Cattle Census, 1978.

Table 10. Ratio of Pasture to Animals

District	Total Animals	Pasture (acreage)	Ratio
Belize	6,922	19,472	2.8
Corozal	1,050	2,226	2.1
Orange Walk	15,501	30,885	2.0
Cayo	22,225	50,050	2.3
Stann Creek	1,526	2,847	1.9
Toledo	1,523	2,961	1.9
Total	48,747	108,441	2.2

Source: Cattle Census, 1978.

Table 11. Number of Farms With Cattle, by Size, by District, 1978

Size of Farms (acres)	Belize	Corozal	Orange Walk	Cayo	Stann Creek	Toledo	Total
0 - 20	65	28	68	111	2	42	316
20 - 40	43	16	135	77	8	23	302
40 - 60	29	9	74	73	6	16	207
60 - 80	11	3	45	44	2	5	110
80 -100	6	6	14	47	3	--	76
100 & over	46	17	103	188	12	9	375
Total	200	79	439	540	33	95	1,386

Source: Cattle Census, 1978.

Table 12. Distribution of Cattle by Districts According to Farm Size, 1978

Districts	Farm Size (Acres)						
	<20	20-40	40-60	60-80	80-100	>100	All
Corozal	86	131	98	43	98	594	1,050
Orange Walk	346	880	719	819	346	12,391	15,501
Belize	699	618	570	233	235	4,567	6,922
Cayo	693	730	1,004	922	967	17,909	22,225
Stann Creek	14	97	114	31	101	1,169	1,526
Toledo	373	260	271	140	--	479	1,523
Total	2,211	2,716	2,776	2,188	1,747	37,109	48,747

Source: Cattle Census, 1978.

Table 13. Total Cattle Slaughter Numbers, Total and Average Dressed Weight, 1970-81 [1]

Year	Animal Numbers	Total Dressed Weight	Average Dressed Weight
		- - - - - - lbs - - - - - -	
1970	3,310	1,045,000	316
1971	4,390	1,500,000	342
1972	5,004	1,694,000	339
1973	6,886	2,265,000	329
1974	5,670	1,908,000	337
1975	5,798	1,805,000	311
1976	6,000	2,079,000	347
1977	6,300	2,472,000	392
1978	7,276	2,577,000	354
1979	7,088	2,562,000	361
1980	6,621	2,300,000	347
1981	6,367	2,216,000	348

[1] Farm slaughter not included.
Source: Abstract of Statistics, 1980 for 1970-79; 1980-81 Unpublished Information, Department of Agriculture, Ministry of Natural Resources.

Table 14. Cattle Slaughter Numbers, by Kind, by District, 1979-80

District	Bulls	Steers	Cows	Heifers	Total
1979					
Corozal	124	2	407	--	533
Orange Walk	189	62	230	10	491
Belize[1]	899	1425	1372	122	3818
Cayo	1071	404	421	305	2201
Stann Creek	--	--	--	--	--
Toledo	34	--	11	--	45
Total	2317	1893	2441	437	7088
1980					
Corozal	329	35	212	1	577
Orange Walk[2]	276	108	61	16	724
Belize[1]	628	1079	1168	148	3023
Cayo	885	474	523	298	2180
Stann Creek	27	45	19	--	91
Toledo	18	--	8	--	26
Total	2163	1741	1991	463	6621

1 Slaughter Numbers for Belize Beef Corporation were:

Year	Bulls	Steers	Cows	Heifers	Total
1979	575	1309	987	108	2979
1980	274	895	791	121	2081

2 Total figures for Orange Walk include 263 head slaughtered at Carver Ranch; their distribution by kind is not known.

Source: Unpublished data, Central Planning Unit.

Table 15. Pasture Analyzed by District & Nature, 1978

District	Total Farmland, acres	Pasture, acres		
		Natural	Improved	Total
Belize	47,174	16,100	3,372	19,472
Corozal	7,890	1,488	738	2,226
Orange Walk	73,536	17,703	13,182	30,885
Cayo	101,246	26,694	23,356	50,050
Stann Creek	7,262	2,690	157	2,847
Toledo	4,004	2,904	57	2,961
Total	241,112	67,579	40,862	108,441

Source: Cattle Census, 1978.

Table 16. Coefficients for Principal Production Parameters, Large Scale Production Systems

	BSI John Masson	Banana Bank John Carr	BBC Elias Juan	Carver Ranch Chester Cotter
Herd Type & Nos.				
Type	Life cycle	Life cycle	Life cycle, shift to fattening	Life cycle
Head	2050	800	1600	7000
Cows	770	300 Beef (100 Dairy)	500	
Pasture System				
Type	Seeded Stargrass	Seeded Stargrass, Pangola, Guinea; native legumes;	Seeded Stargrass, native grass; native legumes	Seeded pastures 5000 acres; rest native
Area, acres	3000	Total 4000 acres; 2500 open, 300 developed	7500 acres (6300 pasture)	26,000
Reproduction				
Breeding system	Crisscross: Brahman, Charbray	Beef - crossing of Brahman, Charbray, Brangus Dairy - Holstein	Crossing of Brahman, Charbray	Crossing of Brahman, Santa Gertrudis, other
Calving %	80	85	75	
Females/male	20	25	-	
Breeding season	6 mos (Feb-July)	6 mos	4 mos (Apr-July), 2 mos (Nov-Dec)	
Age/weight 1st breeding	26-30 mos 660#	24-30 mos 660#	24-30 mos 660#	
Culling rate %	13	NA	NA	
Weaning				
Weight, lbs	400-500	350-375	400	
Age, mos	7-8	7-8	8	
Finishing				
Weight, lbs	880-950	800	800-850	
Age, mos	26-30	24-30	24-30	
Mortality, %				
Calves	3.0	No critical	3.0	
Adults	1.5	health problems	1.5	
Other				
AI conception 2 services	Charbray 63% Brahman 40%	NA	NA	
Dairy	NA	Holsteins 25 head, 20# milk/day	NA	

Footnotes for Table 16:
(All cost data in Belize dollars)

o BSI, John Masson

1) Goal to reach 3000 head in 1986.
2) Annual pasture maintenance costs for 3000 acres: $15,000 maintenance, $15,000 fences.
3) Pasture renovation: Complete $200/acre; partial $50/acre.
4) Needs: Pasture seeds and vegetative material, cattle finishing operations.
5) Runs two bulls, two months at a time with 100 cows, i.e., two first two months, another two second two months, first two bulls last two months.

o Banana Ranch, John Carr

1) Plans to feed dairy cows fresh-chopped sugarcane and some concentrate in addition to pasture.
2) Plans to establish milk processing unit in Belmopan with 3000-5000# daily capacity, market fresh milk in Belmopan, Belize, other areas. Plant estimated to cost $200,000-250,000. Plans to produce 50-60% own milk, purchase rest from other producers. Tested fresh milk market in Belize, feels market there for his milk.
3) Retails his own beef through retail outlet in Belmopan, 4 animals/week.
4) Uses short scrotum "castration" method.
5) Dairy cows in Belize/Cayo districts: Mennonites 100, other 250.
6) Beef cow breeding groups of 100 cows, 4 bulls.

o BBC, Elias Juan

1) CIDA funding to test finishing cattle in dry season using fresh-chopped sugarcane, molasses, urea, silage, grain. Now planting 100 acres of sugarcane.
2) Has 250 head of sheep, mostly hair sheep types (Barbados Blackbelly), some Suffolk. Good local demand for lamb/mutton. 1.5-1.75 lambs per lambing, lambing interval 8-9 months.
3) Changing from cow-calf to finishing operation.
4) Estimate 1.5% loss from rustling.
5) Costs:

Fencing - $2500/mile	Unskilled labor -$13/day 48 hr week
Antibiotics - $150/hd/yr	Tractor dr-$1.75-2.00/hr
Minerals - $10/head/yr	Stockmen -$125/week
Pasture establishment - $100/acre	Land:
Clearing - $350-400/acre	Cleared land with pasture - market value $300-$400/acre
Handclearing - $150/acre	
Seed & planting-$50/acre	
Interest - 20%	
Deworming - $1.50/animal/dose	

Table 17. Coefficients for Principal Production Parameters, Medium Farm Production System

Source	Blue Creek Mennonites (Juan Dyck)	Central Farm, MONR (Rene Montero)	Richmond Hill Station, MONR	Silkgrass Village (M. Duncan)	Orange Walk (R. Perera)	Orange Walk (T. Carillo)
Herd Type & Nos.						
Type	Life cycle	Life cycle	Life cycle	Life cycle	Life cycle	Cow-calf
Herd	2500	900	336	326	118	110
Cows	1000	350	210	200	35	40
Pasture System						
Type	Seeded: Stargrass, Aleman, Caribe	Seeded: Pangola, Guinea, Stargrass	Seeded grasses	Natural Pastures Seeded Stargrass -	Seeded pasture, Guinea	Seeded pasture, Carib
Area, acres	3000		1000	75 acres just planted; 350 native	337	120
Reproduction						
Breeding system	Beef - Brahman, Charbray Dairy - Brahman, Holstein	Beef - Brahman, Red Polled, Charbray		Charbray, Brahman, Simental	- - - - Grade Brahman - - -	
Calving %	75	75	70	60-70	New Herd	75
Females/male	25	25		20	- - - - - 20-25 - - - - - - -	
Breeding season	Continuous	3 mos: May-July 2 mos: Nov-Dec		Continuous	- - - continuous breeding -	
Age/weight 1st breeding	24-30 mos 660#	26-30 mos 660#		30-36 mos 650#	- - - - - 26-30 mos - - - -	
Culling rates %	NA	15		NA	- - - - - 12-15% - - - - -	
Weaning						
Weight, lbs	400-500	380-450	350	500	New herd	400-500
Age, mos	6-7	8	7-8	12	New herd	12
Finishing						
Weight, lbs	880-900	750		700	- - - - - 500-600# - - - - -	
Age, mos	24-30	36		24	- - - - - 12-24 mos - - - -	
Mortality %						
Calves	7	5-10		1-2	Similar to larger operations but higher in dry season	
Adults	3	3		1		
Other						
AI conception 2 services	NA	43%		None		
Dairy	Farm herds, Holstein x Brahman	Holstein, Brown Swiss & crosses with Zebu; 20# milk/day, 275 day lactation		None		
Families	100 families	-		-		
Total area	32,000 acres	NA		1000 acres, 300 acres citrus, 75 acres Stargrass	454 Cane, 117	120 NA
Expansion	200 acres pasture/ yr, get up to 3000 head or more	NA		NA		

Additional Notes on Operations Listed in Table 17:

- Blue Creek Mennonites
  1) Only health problems are blackleg (Clostridium chauvoei) -- vaccinate young animals, internal parasites -- use injectable on young animals, ticks-dip.
  2) Continued expansion of cattl (beef) enterprise to over 3000 head.
  3) Producing/marketing 3000 broilers/week for sale in Orange Walk, Corozal, San Pedro. Broilers marketed at 7-8 weeks, weighing 3.5#.
  4) Principal crops -- corn, beans, sorghum, rice.

- Central Farm
  1) Weaning weights were: Charbray males 447#, females 420#; Brahman males 405#, females 388#; Red Polled males 400#, females 384#; Grade Zebu males 410#, females 333#.
  2) Cows culled if they fail to conceive in Nov-Dec breeding period.
  3) Ranking of dairy cattle on production: a) Brown Swiss, b) Brown Swiss x Brahman, c) Holstein, d) Holstein x Brown Swiss x Brahman.
  4) Dairy cattle on Pangola grass and fed grain ad libitum milking time.

- Richmond Hill
  1) 126 calves now from 210 cows (60%), more calves to come. Estimate 70% calving rate.
  2) Objectives: In-service training of young farmers; multiplication/distribution of breeding animals.

- Mr. Duncan, Silkgrass, Stann Creek District
  1) Farm size: 1000 acres; 300 acres citrus.
  2) Sells 20-50 steers/year in Dangriga.
  3) Occasionally salt & mineral supplementation and bananas.
  4) Producing and marketing 1000 broilers/week for sale in Dangriga.
  5) Raise 50 pigs with chicken heads, bananas, and some grain sorghum and corn.
  6) Mixes his own concentrate for chickens: corn, sorghum & Nutrina concentrates.

- Rudy Perera
  1) Wants to have finishing operation besides cow-calf.
  2) Wants to have layer operation.

- Tomas Carillo
  1) Lost 30 cattle last year from undetermined causes; pastures overstocked and overgrazed.

Table 18. Coefficients for Principal Production Parameters, Permanent Small Farmer Production System

Source	Alfonso Tzul	Santiago Torres	Felipe Carillo	Donato Gutierrez	Gilberto Sosa	Calvert Raynolds	Erick Gomez
Herd Type & Nos.							
Type	Cow-calf fattening	Cow-calf	Cow-calf	Cow-calf	Cow-calf	Cow-calf	Cow-calf
Head	18	70	40	30	50	80	15
Cows	8	20	18	14	30	50	8
Pasture System							
Type	Seeded Guinea native	Native pasture	Native pasture	Native pasture	Native pasture	Native pasture	Native pasture
Area, acres	Seeded:46 Native:54	70	25	140	85	90	25
Reproduction							
Breeding system	- - - - - - - - - - - - Grade Brahman - - - - - - - - - - - -					Red Polled	Brahman
Calving, %	90+	75	70-75	80	66	80-85	75
Females/male	-Dependent on herd size; 20-25 females/male in larger herds-					50	8
Breeding season	- - - - - - - - Most are continuous breeding - - - - - - - -					- - Continuous - - -	
Age/weight 1st breeding)	- - - - - - Most bred at 26-30 months - - - - - - - - - -					- - - - 30-36 - - - -	
Culling rate	Probably is some less than the 12-15% culling rate used by larger producers					10% (old cows)	
Weaning							
Weight, lbs	450	400-500	NA	NA	500	450-500	NA
Age, mos	8	12	NA	NA	12	12	12
Finishing							
Weight, lbs	- - - - - - - - Most sell animals weighing 500-600 -						
Age, mos.	- - - - - - - - - - - - - - - - - - -24-36- -						
Mortality, %							
Calves	Mortality rates like larger operations except larger losses in dry season, probably due to deficiency of pasture forage					1-2 during wet season	Nil
Adults							Nil
Other							
Total farm, acres	NA	120	125	150	200	120	
Other crops, acres	NA	Cane-50	Cane-35, Cane outside quota, 65	Cane-10	Rice, Corn-100 Cane-15	Citrus-5, Coconut-25, Pineapple-15	

Additional Notes on Operations Listed in Table 18:

- Alfonso Tzul

  1) Needs: farmer training program, supervised credit, produce own seed stock.
  2) Small producer uses family labor.
  3) Sees needs for guaranteed export market, increased animal productivity, stratify industry--increase demand for feeders, incentive for small producers to sell weaners.

- Santiago Torres

  1) Lost cattle in the dry season from undetermined causes; pastures overstocked and overgrazed.

- Felipe Carillo

  1) Lost cattle in the dry season from undetermined causes; pastures in fair condition.

- Donato Gutierrez

  1) Wants loan for pasture improvement, dissatisfaction with DFC loan conditions.

- Gilberto Sosa

  1) Has 45 hair sheep and 18 goats; sold to Mexicans, good demand.
  2) Their local livestock association would like to develop local coop with:
     -- retail outlet for meat products
     -- credit association, funds for pasture improvement
     -- machinery rental for pasture establishment/renovation
  3) Membership fee of $8.00 in local association, 80 members, representative from each community on executive committee.

- Calvert Raynolds

  1) Runs a store in the village.
  2) Supplies mineral block.
  3) Needs: additional bull, improved pastures (20-25 acres), fencing.
  4) No problem in selling feeders to Mr. Duncan.

- Erick Gomez

  1) Main problems: uncertain market plus low price.
  2) High cost of wire for fencing: B$1,600/600 yards.

Table 19. Summary of Results from Comparative Analysis of Cattle Operations on Small, Medium, and Large Size Farms[1]

	Small	Medium	Large
Land, acres	60	270	610
Cattle herd			
Year 1			
Bulls	1	2	6
Cows	10	60	180
Followers	3	40	120
Year 6			
Bulls	1	2	6
Cows	10	60	180
Followers	6	95	285
Value of capital			
Investment, year 6, B$	25,024	161,150	418,450
Investment cost/animal, B$	1,472	1,026	888
Investment cost/acre, B$	417	597	685
Breakeven farmgate price[2], B$/lb	.88	.65	.54
Internal rate of return, %	3.6	2.8	3.5

[1] See Appendix I for details of calculations.
[2] Annual operating expenses/total pounds of liveweight sold.

Table 20. Anticipated, Existing and Proposed Equity Structure for BBC

Entity	Anticipated in 1977		Existing 1982		Proposed	
	B$1000	%	B$1000	%	B$1000	%
Caribbean Development Bank	1980	33	1280	54	2863	46
Development Finance Corp[a]	900	15	695	29	695	11
Government of Belize	--	--	130	5	2130	34
Agrodinamica	1080	18	185	8	185	3
Private Investors	--	--	--	--	--	--
Ranchers[b]	1500	25	100	4	100	2
Food distributors	540	9	--	--	--	--
Caribbean Food Corp[c]	--	--	--	--	217	4
Total	6000	100	2390	100	6190	100

[a] Including DFC Investment Co. Ltd.
[b] A single rancher, E. Bedran, owns shares in BBC.
[c] To be issued to CFC in return for assistance supported by CDB/UNDF Technical Assistance Funds.

SWINE INDUSTRY

SWINE INDUSTRY

According to the Pig Census, the total swine population of Belize in 1980 was estimated at 16,011 animals (Table 21). Presently, pigs concentrated in the Districts of Toledo and Orange Walk account for about 56 percent of the national herd. The districts of Corozal, Cayo, and Belize have 40 percent of the pig population while Stann Creek contributes only 3 percent to the overall population.

Pigs are found primarily on small farms (Table 22). Average farm size of the 2,893 farmers with pigs surveyed was only 11.88 acres, and swine numbers per farm averaged 5.53 animals (Table 23). At the time of the census, 28.7 percent of the pig owners surveyed had only one pig on their farm, 68 percent had less than 5, and 86.6 percent had less than 10. Only 49 farmers, or 1.7 percent of those surveyed, had more than 25 pigs (Table 24).

The majority of pigs are from local breeds (62 percent). Improved stock such as Duroc (9 percent), Large White (12 percent), Hampshire (7 percent), and crossbreds (10 percent) are becoming more common (Table 25).

Slaughter

Figures for swine slaughter (Table 26) indicate there has been a contraction of the swine industry in Belize since 1970. The highest slaughter volume took place in 1972, followed by a decline. It appears that while a recovery took place between 1976 and 1978, the decline has been steady thereafter. These figures do not include farm slaughter.

Health

Hog cholera and mycoplasma-related diseases have been identified in Belize. A small outbreak of hog cholera occurred in one isolated village in Cayo District during 1981, but rapid quarantine and slaughter prevented its spread. Since this outbreak, no further cases have been diagnosed. Heavy infestations of internal parasites, including Ascarid, Trichuris, and Strongyloides have been found in many pigs at slaughter. Treatment is not commonly practiced and would be of limited value since reinfestation would be almost immediate. In general, the national swine herd is relatively free of health problems.

Extensive Swine Production

Coefficients for the principal production traits for extensive small farm pig production appear in Table 27. The extensive system of pig production as practiced in Belize is similar to that observed in farms throughout Central and South America and the Caribbean. Pigs are allowed to roam freely throughout villages and surrounding fields. Although an enclosed and roofed corral is generally available on each farm, it is used only for night housing or confinement of pigs being fattened for slaughter. Occasionally pregnant sows are confined, but farrowing often occurs in the fields. Five to twelve pigs are born per litter with an average weight of 2 pounds. However, growth rate of piglets to weaning is poor because nutritional deficiencies limit the sow's milk production. As a result of these deficiencies and a general lack of care, only 3 to 5 pigs will reach weaning age. Weaning weights vary widely, but are estimated to average about 15 pounds when the animal is 60 to 70 days of age.

Young females are generally bred at about 18 months of age, weighing an average of 80 to 100 pounds. Breeding is uncon-

trolled and depends on the type of boar roaming the village at the time of estrus. Gilts will weigh about 125 pounds at first parturition and will not increase significantly in weight after that time because of poor feeding and nutrition during lactation. Therefore, mature body weight of sows is closely associated with weight at first parturition.

It is estimated that sows raised under the extensive system produce an average of only 1.6 litters per year, with a farrowing interval of approximately 7 to 8 months. Although the sows are constantly exposed to boars in the village, their extremely thin and emaciated condition following lactation delays estrus. Sows may remain in the breeding herd for two to three years, but the majority are fattened and sold or consumed on the farm after they have raised two to three litters.

As scavengers, pigs consume waste products, e.g., fallen fruit, roots, weeds, grasses, and insects. In addition, they may feed on corn, kitchen garbage (swill), and other farm by-products including cassava, sweet potatoes, bananas, and pumpkins. The 1980 Pig Census indicated that 84.8 percent of the producers surveyed fed corn to their pigs, with 40.5 percent feeding only farm grown corn, 32.3 percent feeding purchased corn, and 24.8 percent feeding a combination of both. Swill was fed by 48 percent of the pig producers and 53.8 percent fed other farm products. Mixed feed or protein concentrates are not generally administered under the extensive system. Only 33.8 percent of all farmers surveyed fed their pigs any mixed feed. In Toledo District, for example, only 2 of the 465 pig producers reported using mixed feeds.

The local breed of swine, which is usually black, is the predominant type under the extensive management system. This pig is very hardy and is known for its ability to scavenge for food.

However, production rate and efficiency are low. During recent years, numbers of improved breeding stock, e.g., Duroc, Hampshire, and Yorkshire, have been introduced into the villages.

Pigs raised under an extensive management system obtain a slaughter weight of about 100 pounds, depending on age and level of supplemental feed. Average slaughter age is 11 months. Average dressing weight for these animals is 69 pounds. Meat yield per pig is low and pork quality is poor. Because of breed characteristics and extreme protein deficiency during growth, ratio of fat to lean is high and hams and loins are lightly muscled.

The profitability of extensive swine production as practiced in Belize is questionable. However, swine operations in this management system provide the following benefits: (1) they are a market for damaged or unsaleable corn as well as other farm crops and by-products that otherwise would be wasted: (2) pigs are a source of ready cash; and (3) the herd is a source of food for home consumption.

Production costs under this system are difficult to calculate. However, estimates can be made using the following assumptions: (1) farrowing interval for each sow is 228 days, (2) 3.5 pigs per litter reach a market weight of 100 pounds at 11 months of age, (3) 2.2 pounds of corn is fed per animal per day, (4) corn has an on-farm value of B$.12 per pound, (5) no veterinary costs are incurred, (6) pigs are sold at the farm, or consumed at home.

The estimated cost of feeding corn is:

1 sow x 228 days x 2.2 lbs corn	501.6 lbs	x B$.12 =	60.19
3.5 pigs x 270 days* x 2.2 lbs corn	2,079.0 lbs	x B$.12 =	249.48
Total cost of corn	2,580.6 lbs		B$309.67

* animals fed for 9 months following weaning

Market value of pigs at alternative prices:

3.5 pigs x 100 lbs x B$.75 = B$262.50
3.5 pigs x 100 lbs x B$.85 = B$297.50
3.5 pigs x 100 lbs x B$.90 = B$315.00
3.5 pigs x 100 lbs x B$.95 = B$332.50

A price of B$.88 per pound would be required for the farmer to break even on the value of his corn at B$.12 per pound. This price is above the current market price of B$.75 per pound.

Intensive Swine Production

Only a small percentage of the pigs produced in Belize are raised under intensive management systems. The typical farming operation contains only two or three sows and their offspring. Larger swine operations (50 or more pigs) have generally not been successful because of financial losses caused by poor management practices, high feed costs, low productivity, inadequate marketing, and government price controls.

In the few intensive management operations which are successful, swine are raised in confinement. Housing and equipment are simple but adequate. Confinement facilities are provided with a cement floor, and corrals are constructed from wood. Roofing materials include galvanized tin, tarpaper sheets, and, most commonly, palm thatch. Many units utilize automatic feeders constructed of wood, or employ open troughs constructed of cement. Water is provided by automatic drinking nipples attached to a pressure water line or, more commonly, to a barrel that is filled each day.

Husbandry and care are good. Generally, the farmer's family is responsible for the cleaning, feeding and caretaking of animals. Feed and water are available at all times.

Well-balanced rations are fed throughout the life cycle. The rations are based on corn, rice bran, sorghum, and a commercial protein supplement in various combinations, either purchased or prepared. Some farmers who have access to a feed grinder purchase protein supplement and mix it with farm grown corn. Others purchase corn, rice bran, and protein supplement and mix the ration on the farm or have it custom mixed at a local feed mill. A growing number are purchasing complete rations from one of the commercial feed mills in Belize.

Animal quality on these farms is good. The origin of most improved swine can be traced to Central Farm and the other government multiplication centers. Although most of the breeding stock on these farms are crossbreds, there are purebred Duroc, Hampshire, and Yorkshire. Reproduction, growth rate, and carcass quality of these animals are generally superior to those observed under the extensive system of production. However, because of the small number of sows on each farm, it is not economical to maintain purebred boars, since a low ratio of sows to boars increases final production costs.

Level of sanitation and health on these farms is satisfactory. However, where gestating sows and boars are kept in dirt lots, a potential problem of heavy internal parasite infestation exists. In addition, since no vaccination program for hog cholera is practiced in Belize, outbreaks of this disease could cause major losses.

The coefficients for the principal production traits for pigs raised under intensive management are tabulated in Table 28. From the data presented, it can be seen that levels of productivity are high and compare favorably with commercial swine farms in the U.S. and other developed countries. Based on these observed production coefficients, a sow could be expected to pro-

duce an average of 14 weanling pigs per year. These pigs would reach an average market weight of 200 pounds in 7 months with an average feed efficiency of approximately 3.5.

Constraints to the Swine Industry

The swine industry in Belize is hampered by numerous problems. Although the technology necessary to expand production is available, transfer to the farmer has been limited. The major constraints are: lack of trained personnel, low quality breeding stock/productivity, inadequate nutritional levels, and high cost of feed.

Lack of Trained Personnel

Belize lacks adequately trained people to organize, direct, promote, and carry out an expansion of the swine industry. To date, the direction and execution of research and development has been the responsibility of one animal scientist. His responsibilities include management of the entire livestock section at Central Farm, classroom and practical teaching in the School of Agriculture, and implementation of the feed research and feeder pig projects. Agricultural Extension Service personnel have not received specific training in swine production, breeding, or nutrition. As a consequence, the services provided have not met the needs of the farmer to overcome the problems associated with insufficient knowledge of management practices.

Low Quality Breeding Stock/Productivity

Although Heifer Project International (HPI), in collaboration with government programs, has for years provided stock of Duroc, Hampshire, and Yorkshire breeds, local breeds comprise over 62 percent of the present pig population. A higher percentage of

pigs of the local breed are concentrated in Toledo, Orange Walk, and Corozal Districts, while the majority of the improved breeds are concentrated in Cayo, Belize, and Stann Creek Districts. The Pig Census indicated that 242 farms produce breeding stock. However, the majority of the improved stock has its origin on government farms.

The first breeding herd established by the government was developed at Central Farm in Cayo District. Imported animals were used to establish the present herd of 35 to 42 sows and 8 to 10 boars. The breeds include Duroc, Hampshire, and Yorkshire. Quality of breeding animals at the station is adequate. The facilities are very good. An average of 8 pigs are born per litter, and an average of 6 per litter are weaned at 8 weeks. Average weaning weight is less than 30 pounds. Culling of both males and females is high. Less than 80 pigs per year are sold for breeding purposes. Breeding animals are priced at B$2.00 per pound. All other animals are sold as feeder pigs at a price per pound equal to current market value for slaughter pigs.

A second swine breeding and multiplication unit has been established at the Yo Creek Station, in Orange Walk District. Facilities are adequate for the planned 30 sow unit. All original breeding animals for the station were transferred from Central Farm. The present herd consists of 19 sows and 4 boars. An average of 8 pigs per litter were reported. Management appears superior to that observed at Central Farm. Level of feeding was adequate for gestation, but lactation feeding level of 8 pounds per sow per day was too limited to permit satisfactory milk production and piglet growth during the suckling period. Piglet growth was further limited by the absence of a creep ration. Weaned sows, because of low feeding level during lactation, are thin and the interval from weaning to re-breeding exceeds 28 days, thus reducing number of litters per sow per year.

A third multiplication unit has been developed in Stann Creek district. This 10-sow unit is completely operational to supply both breeding animals and feeder pigs for the district. All original breeding stock was transferred from Central Farm. Two additional 10-sow multiplication units are planned for the districts of Corozal and Toledo.

While these government stations are providing some superior breeding stock to Belize farmers, the numbers available each year are far short of national needs.

Inadequate Nutritional Levels

Nutritionally inadequate diets that support only minimal growth and efficiency are characteristic of the industry. The cost of commercial concentrates has been high, preventing their economic use in swine production. For example, swine rations from Reimer's Feed Shop, the Ben Wolf Feed Mill, Belize Farm Center, and the Marketing Board Feed Mill have been selling for an average of B$29.00 to B$30.00 per 100 pounds. To produce 2,800 pounds (liveweight) of pork, one sow producing 1.8 litters of 8 pigs per litter and fed to a market weight of 200 pounds will require an average of 10,590 pounds of feed. One boar serving 10 sows will require 1,460 pounds of feed per year or an average of 146 pounds per sow. Total feed required would amount to 10,736 pounds. As can be seen from Table 29, the breakeven price of pork will be between B$1.10 and B$1.20 per pound, substantially above the current market price of B$.75 per pound. Equivalently, at the current market price of pork, the breakeven point is reached when feed cost is B$.21 per pound.

High Cost of Feed

In an attemp' to reduce the high cost of commercial feeds, the Belize Feed Project was initiated in 1976 at Central Farm in collaboration and with the support of Michigan State University, University of Wisconsin, MUCIA, Heifer Project International, The Partners of America, CARE, the Kelley Foundation, and the Ministries of Natural Resources and Fisheries. To date, 78 swine rations (grower/finisher) have been formulated and tested. A number of new rations have been developed and tested under field conditions. Their commercial use, however, is economically questionable because the protein supplements, e.g., soybean meal and meat and bone meal are not available on the local market and must be imported at relatively high prices. For this reason, high feed costs will continue to constrain expansion of the swine industry.

Table 21. Swine Numbers, by Kind, by District, 1980

District	Boars		Sows	Gilts	Barrows	Piglets		Total
	Mature	Young				Male	Female	
Corozal	70	128	333	475	524	270	389	2,189
Orange Walk	60	200	545	693	921	854	1,015	4,288
Belize	108	114	274	394	305	414	361	1,970
Cayo	61	242	343	554	491	297	317	2,305
Stann Creek	47	56	89	98	64	73	123	550
Toledo	104	538	778	319	982	973	1,015	4,709
Total	450	1,278	2,362	2,533	3,287	2,881	3,220	16,011

Source: Pig Census, 1980.

Table 22. Average Farm Size Where Pigs Are Grown

District	Number of Farms	Total Acreage[1]	Average Acreage Per Farm
Stann Creek	58	1,574	27.14
Belize	212	5,414	25.54
Cayo	539	11,133	20.65
Orange Walk	1,152	14,384	12.49
Corozal	467	1,034	2.21
Toledo	465	829	1.78
Total	2,893	34,368	11.88

Source: Pig Census, 1980.

Table 23. Distribution of Pigs by District and Farms

District	Number of Pigs	Percentage of Population	Number of Farms	Average Number of Pigs per Farm
Toledo	4,709	29.4	465	10.13
Orange Walk	4,288	26.8	1,152	3.72
Cayo	2,305	14.4	539	4.28
Corozal	2,189	13.7	467	4.69
Belize	1,970	12.3	212	9.29
Stann Creek	550	3.4	58	9.48
Total	16,011	100.0	2,893	5.53

Source: Pig Census, 1980.

Table 24. Number of Pigs Per Farm, by District

Number of Animals Per Farm	Districts						Number of Farms	Percent
	Corozal	Orange Walk	Belize	Cayo	Stann Creek	Toledo		
1	117	420	35	226	7	26	831	28.7
2 - 3	159	364	55	166	14	79	837	28.9
4 - 5	53	121	20	52	8	46	300	10.4
6 - 7	47	101	24	39	8	70	289	10.0
8 - 10	38	87	23	18	6	78	250	8.6
11 - 15	24	38	24	26	5	85	202	7.0
16 - 25	23	18	22	8	6	58	135	4.7
25 - 50	6	2	6	3	3	21	41	1.4
Over 50	nil	1	3	1	1	2	8	0.3
Total Farms	467	1,152	212	539	58	465	2,893	100.0

Source: Pig Census, 1980.

Table 25: Breed Numbers and Distribution, by District

District	Purebreds			Crossbreds	Local	Total Animals
	Duroc	Large White	Hampshire			
Corozal	38(1.7)	93(4.2)	240(11.0)	177(8.1)	1,641(75.0)	2,189
Orange Walk	423(9.9)	351(8.2)	153(3.6)	427(9.9)	2,934(68.4)	4,288
Belize	38(1.9)	533(27.1)	193(9.8)	384(19.5)	822(41.7)	1,970
Cayo	160(6.9)	401(17.4)	362(15.7)	425(18.4)	957(41.5)	2,305
Stann Creek	4(0.7)	281(51.1)	31(5.6)	91(16.5)	143(26.0)	550
Toledo	793(16.8)	207(4.4)	156(3.3)	100(2.1)	3,453(73.3)	4,709
Total	1,456(9.1)	1,866(11.7)	1,135(7.1)	1,604(10.0)	9,950(62.1)	16,011

Source: Pig Census, 1980

Table 26. Total Swine Slaughter Numbers, Total and Average Dressed Weight, 1970-81 [a]

Year	Animal Numbers	Total Dressed Weight	Average Dressed Weight
		lbs	
1970	6,542	448,413	68.5
1971	8,526	729,125	85.5
1972	9,902	891,123	90.0
1973	9,439	652,090	69.0
1974	5,795	426,370	73.5
1975	5,925	451,000	76.1
1976	4,163	371,000	89.1
1977	5,693	546,000	95.9
1978	7,100	764,000	107.6
1979	6,864	659,000	96.0
1980	6,492	518,710	79.9
1981	5,242	365,000	69.6

[a] Home slaughter not included.

Sources: 1970-79, Abstract of Statistics, 1980, Statistical Office, Central Planning Unit. 1980-81, Unpublished Information, Ministry of Agriculture.

Table 27. Coefficients for Principal Production Traits, Extensive Small Farm Pig Production System

Trait	Average	Low	High	Information Source
Reproduction				
Litters per year, no	1.6	1.0	2.0	Pig Census, 1980
Farrowing interval, days	228.0	182.0	365.0	Pig Census, 1980
Yrs sow in breeding herd	2.0	1.0	3.0	Farm visit
Conception rate	NA	NA	NA	--
Ratio females/males	5.0	1.0	7.0	Farm visit
Survivability				
Pigs born alive, no	6.3	5.0	12.0	Pig Census, 1980
Birth-weaning, %	55.0	15.0	100.0	Pig Census, 1980
Weaning-slaughter, %	95.0	80.0	100.0	Pig Census, 1980
Mature females, %	95.0	80.0	100.0	Pig Census, 1980
Average Ages				
Weaning, days	60.0	50.0	70.0	Farm visit
First parturition, mos	18.0	12.0	36.0	Farm visit
Slaughter, mos	11.0	9.0	24.0	Pig Census, 1980 and farm visit
Culling (females), mos	36.0	15.0	48.0	Estimated
Production, lbs				
Weaning wt	15.0	10.0	18.0	Farm visit
Slaughter wt	100.0	50.0	150.0	Farm visit
Avg dressed wt	69.0	20.0	140.0	Dept. of Agri, 1981
Wt at 1st parturition	125.0	100.0	175.0	Farm visit
Mature wt	140.0	100.0	200.0	Farm visit
Miscellaneous				
Avg herd size, no	5.5	1.0	10.0	Pig Census, 1980
Major health problems				
Hog cholera				Dr. B. Silva
Mortality, %	100.0	100.0	100.0	Chief Liv. Off.
Mycoplasma				
Mortality, %	10.0	5.0	30.0	Dr. B. Silva
Morbidity, %	80.0	20.0	100.0	Chief Liv. Off.
Internal parasites				
Mortality, %	2.0	0.0	10.0	Dr. B. Silva
Morbidity, %	80.0	50.0	100.0	Chief Liv. Off.

Table 28. Coefficients for Principal Production Traits, Intensive Pig Production System

Trait	Average	Low	High
Reproduction			
Litters per year, no	1.8	1.0	2.0
Farrowing interval, days	205.0	182.0	365.0
Years in breeding herd	3.0	1.3	4.0
Conception rate, %	95.0	85.0	100.0
Ratio females/males	2.0	-	5.0
Survivability			
Pigs born alive, no	8.8	2.0	14.0
Birth-weaning, %	92.5	66.6	100.0
Weaning-slaughter, %	99.0	95.0	100.0
Mature females, %	99.0	97.0	100.0
Avg. Ages			
Weaning, days	60.0	49.0	70.0
First parturition, mos	14.0	13.0	15.0
Slaughter, mos	7.0	6.0	9.0
Culling (females), mos	30.0	15.0	48.0
Production Traits, lbs			
Weaning wt	30.0	25.0	40.0
Slaughter wt	200.0	170.0	240.0
Avg. dressed wt	150.0	125.0	180.0
Wt at 1st parturition	210.0	180.0	250.0
Mature wt	300.0	250.0	400.0
Miscellaneous			
Avg herd size	19.0	15.0	50.0
Major health problems			
Internal parasites			
Mortality, %	0.0	-	-
Morbidity, %	10.0	2.0	20.0

Source: Information obtained from discussions with producers

Table 29. Feed Requirements and Estimated Feed Cost of One Sow and Litter of Pigs Per Year

Animals	Total Feed (lbs)
1 sow (100 days lactation x 12 lbs per day)	1,200
(265 days gestation + open x 4 lbs per day)	1,060
1/10 boar (365 days x 4 lbs ÷ 10)	146
14 pigs (170 lbs x 3.5 conversion x 14)	8,330
Total feed for 1 sow and 14 pigs to 200 lbs	10,736

Sale Value of 2,800 lbs of Pork at:		Feed Cost to Produce 2,800 lbs of Pork at:	
Sale Price	2,800 lbs Liveweight	Feed Cost Per lb	2,800 lbs Liveweight
B$0.75	B$2,100.00	B$0.20	B$2,147.20
0.80	2,240.00	0.21	2,254.56
0.90	2,520.00	0.22	2,361.92
1.00	2,800.00	0.23	2,469.28
1.10	3,080.00	0.24	2,576.64
1.20	3,360.00	0.25	2,684.00
1.30	3,640.00	0.26	2,791.36
1.40	3,920.00	0.27	2,898.72
1.50	4,200.00	0.28	3,006.08
		0.29	3,113.44
		0.30	3,220.80
		0.31	3,328.16
		0.32	3,435.52
		0.33	3,542.88
		0.34	3,650.24
		0.35	3,757.60

DAIRY INDUSTRY

DAIRY INDUSTRY

The dairy industry in Belize operates on a small scale. A single commercial plant, Western Dairies at the Mennonite community of Spanish Lookout, processes about 1,250 gallons of milk per week (Silva, 1981). Approximately 85 percent of this milk is pasteurized, homogenized, and sold as plain or flavored fluid milk, primarily in Belize City and to the British Army; the remaining 15 percent is used to make cheese.

Production

The 1978 Cattle Census indicated that cows were being milked on 427 farms, representing 31 percent of the farms with cattle (Table 30). Numbers of farms on which cows are milked were appreciable only in Orange Walk and Cayo Districts, primarily because of the Mennonite communities of Shipyard and Spanish Lookout, respectively. With the exception of those at Spanish Lookout, most cows are milked for home consumption or local sales of raw milk and cheese.

A survey undertaken in June, 1982 in the Cayo District milkshed indicated that Brown Swiss, Holstein, and crosses with Brahman are the main dairy types (Betancourt, 1982). The Mennonite farms at Spanish Lookout were not included in the survey. Betancourt identified 225 cows presently being milked with an additional 25 expected to freshen in the next 6 to 8 months. Estimated daily production per cow is 12 pounds, over a 180-day lactation interval. Farmers interviewed in the survey indicated that an additional 210 cows would be milked if a profitable market existed.

Proposed Expansion Studies

Two studies have been made to assess the feasibility of expanding the Belize dairy industry. The CARICOM Dairy Feasibility Study in 1977, estimated a cost of B$11 million to cover: the establishment of 4 nucleus farms, each with 120-140 dairy cows; settlement farms each with 50-60 dairy cows; clearing and development of 13,500 acres of land; importation of improved dairy breeding stock; and processing plants for feed and milk, the latter with an annual capacity of 1.5 million gallons of milk. This project was not funded, primarily because of concern over adequate investment returns.

A second study, Belize Dairy Industry Expansion, was prepared in 1981 by the Berl-Cawthron Consortium for the UNDP. Project components included:

(a) Marketing equipment and promotion: a refrigerated vehicle, consumer cheese vacuum-packaging unit;

(b) Investigation of UHT processing and marketing;

(c) Establishment of a demonstration farm, to have two herds each of 30 cows. One a research herd and one under "moderately acceptable" commercial management;

(d) Establishment of a dairy farm services division of the Cooperative to promote dairy development by a range of farmers.

First preference was to expand the existing processing facility at Western Dairies, although the option of constructing a new plant south of the Belize River was considered. Projected costs were:

	BS
Marketing equipment & promotion	85,000
Demonstration farm	365,000
Dairy farm services manager	125,000
Total Initial Cost	$575,000

Benefits anticipated from the project included (quoted from the report, pp. 5-6):

(1) Direct beneficiaries, i.e., dairy farmers, can expect an initial lift in cash surplus from B$5-8,000 p.a. to B$10-15,000 p.a. Capital growth of dairy herds will also accrue.

(2) Net benefits to the Belize Balance of Payments position could reach B$10 million per annum from the dairy industry within a very few years.

(3) Other national benefits include nutritional advantages of fresh milk, increased economic productivity and increased resource use.

(4) This project exploratory study does not encompass all resources which will be used in dairy industry development. At the basic production unit level, the conservative farm budgets imply an economic internal rate of return of 9 percent for establishing new farms, and of 17 percent for upgrading an existing family farm unit for dairying.

(5) The minor risk with the project is in achieving expansion of fresh milk consumption at a high enough rate. The contingency investigation of a shift to long-life products will reduce this risk.

However, it was recognized that major constraints limit consumption and, hence, demand for fresh milk; namely (quoted from the report, pp. 14-15):

(1) Refrigeration: The existing main product form is fresh milk which requires refrigeration at all times. Thus, the main market is limited firstly to retail outlets that have refrigeration and then to those that have sufficient space in existing refrigeration cabinets. Secondly, fresh milk sales are limited to those consumers who have refrigeration in their homes or to those who intend to consume the milk immediately after purchase. (Refrigerator ownership is however high and is growing).

Electricity cuts in Belize City have caused storage problems in shops and homes by preventing adequate refrigeration.

(2) Price: Reconstituted evaporated, condensed, or powdered milk costs consumers less per unit of whole equivalent than fresh milk offered by the largest supplier in Belize at the present time as follows:

Evaporated milk	$4.61/gal fresh milk equiv.
Condensed milk	$4.72/gal fresh milk equiv.
Powdered milk	$3.44/gal fresh milk equiv.
Fresh milk ex Western Dairies	$6.00/gal fresh milk equiv.

(3) Tastes: Consumer taste for the existing milk product forms is well established (especially for sweetened condensed milk which has an attractive flavor) although there is some switch towards powdered milk.

The approach recommended in this latter study appears technically feasible; it will build on existing processing and marketing infrastructure and provide a market for milk output from the small herds identified by Betancourt. However, while the economic advantage of supplanting all or part of the B$10 million cost of imported dairy products cannot be denied, the constraints of refrigeration, price and taste preference to dairy development seem likely to prevail in the near future. Perhaps technology like UHT processing can resolve the refrigeration problem, but the additional costs of such a processing facility must be analyzed in more detail.

Table 30. Number of Farms Where Cows Are Being Milked, Percent of Cattle Farms, and Frequency of Milking, by District

District	Total farms with cattle	Percent of Cattle Farms	No. Farms Milking	
			once/day	twice/day
Belize	5	3	4	1
Corozal	2	3	1	1
Orange Walk	256	58	19	237
Cayo	162	30	48	114
Stann Creek	--	--	-	-
Toledo	2	2	1	1
Total	427	31	73	354

Source: Cattle Census, 1978.

OTHER LIVESTOCK INDUSTRIES

OTHER LIVESTOCK INDUSTRIES

Poultry

Poultry production is successful in Belize as both a commercial enterprise and a low-cost backyard system for home consumption. Commercially, 29,500 chickens were slaughtered per week in 1981; of those, 28,000 were produced by the Mennonite communities in Orange Walk and Cayo Districts and 1,500 by commercial producers in Belize District. This weekly slaughter rate was 21 percent higher than in 1980. It is estimated that an additional 10,000 chickens per week were slaughtered which were not officially recorded because they were primarily for home consumption and local sales.

Total poultry meat production, including commercial production and estimated home consumption, exceeded 6.5 million pounds in 1981. Price per pound liveweight at Spanish Lookout was B$1.21. Wholesale price in Belize City was B$1.80.

Data on egg production is not systematically collected. Therefore, information is sparse. However, it is estimated that 580,000 dozen eggs were produced in 1980 for home consumption and local sales.

The general consensus is that poultry production is expanding rapidly. This expansion may in part be attributed to the transfer of technology and market prices for poultry products which are sufficiently high to cover costs of production. Freedom from government price controls on poultry products has likely also been an incentive to the industry.

Sheep and Goats

FAO statistics indicate that in 1980, total populations for sheep and goats numbered 3,000 and 1,000, respectively. While neither species has significant economic importance, each provides meat for home consumption and local sales. Sheep or goats are often the preferred species for meals on festive occasions.

Sheep types include hair sheep imported from the Caribbean islands, especially Barbados. Quite probably, "Pelibuey" sheep from the Yucatan Peninsula have also been brought into Belize. Other sheep types include wool sheep, primarily of British origin, and crosses between hair and wool types.

Observations suggest that performance of both hair and wool sheep is similar to that observed in other tropical regions. Hair sheep appear better adapted to the humid tropical conditions than wool types. Among the flocks developed from imported Barbados Blackbelly sheep, twins and triplets are common. Lambing intervals of 8 to 10 months were reported in one flock of approximately 200 head. Ewe weights in hair sheep flocks with some outcrossing to British breeds were estimated to be 90 to 100 pounds.

Small numbers of goats are seen scavenging around urban areas. Their appearance suggests a base genotype of Spanish "criollo" with some introduction of European dairy breeding. HPI, in conjunction with 4-H Club and CARDI, has introduced dairy goats to nine farms in Bullet Tree Falls and Lucky Strike villages. Does produced approximately 1 liter of milk per day for a 5- to 6-month lactation period. Response of farmers to these goats has been mixed, especially with regard to consumption of goat milk.

Small ruminants may be combined with cattle in mixed species grazing systems to improve the efficiency of pasture utilization. However, only a few producers are currently following this practice and its acceptance in Belize will probably depend on expanding market demand for sheep and goat meat.

FEED RESOURCES

FEED RESOURCES

This section presents an evaluation of available feed resources in Belize. The first part analyzes the pasture situation which is the basis for the cattle industry. The second part is dedicated to an analysis of grains, concentrates, and by-products which are basic to swine and poultry production and have potential for growing and finishing beef cattle.

Pasture Situation

The cattle industry in Belize is based on grass-fed animals. Approximately 3.2 million acres of land are classified as agricultural; however, only about 3 percent is presently utilized to support the current cattle population.

Natural Grasslands

Natural pastures represent 60 percent of total acreage used for cattle production, although carrying capacity is between 4 and 6 acres per animal. About 90 percent of the total 68,000 acres of natural pasture land may be found in the Belize, Cayo, and Orange Walk Districts, where most cattle are concentrated (Table 31).

Two different types of natural pastures must be considered and evaluated in relation to their role in the cattle industry: grass savanna and natural pastures. Grass savannah is generally low in nutritive value and soil fertility. Dominant grass species are Andropogon bicornis, Eragrostis spp. and Sporobolus indicus and sedges Cyperus spp. and Scleria spp. Natural pastures found on fertile soils include Paspalum spp. and Axonopus spp. In addition, several species of native forage legumes, Macroptilium spp., Centrosema spp., Desmodium spp., Calopogonium

spp., contribute to better quality grasslands, especially during the dry season. In the Pine Ridge area, natural pastures and Stylosanthes spp. make a significant contribution to improved forage quality.

The low nutritive value of natural grasses affects forage intake and animal performance. Stocking rates have been estimated by Jenkin et al. (1976) at 1 animal per 5 to 10 acres depending on soil fertility. Natural pastures do not economically respond to fertilizers, except for legumes which respond to phosphorus and potash.

Cultivated Pastures

The total area of cultivated pastures is approximately 45,000 acres, or 40 percent of total grasslands in the country. These pastures are found primarily in Cayo, Orange Walk, and Belize Districts (Table 31). The two most popular grasses (Table 32) are Jaragua (Hyparrhenia rufa) and Guinea (Panicum maximum). These species are easily propagated by seeds, mainly following crop harvest. Other grasses propagated by vegetative material are also important, such as the high quality Pangola (Digitaria decumbens), the drought tolerant Bermuda (Cynodon dactylon) and African Star (Cynodon nlemfuensis), plus Para (Brachiaria mutica) and Carib (Eriochloa procera) which are tolerant to flooding on alluvial soils.

According to Neal and Patten (1981), the nutritive value of cultivated grasses is usually higher than natural grasses, with crude protein levels at 6-10 percent compared to less than 5 percent and digestibility 55-65 percent compared to 53 percent. However, the phosphorus levels in plant tissue is almost always low, suggesting the need for animal supplementation throughout the year. During the dry season, protein levels of cultivated

grasses decline to 4-5 percent and digestibility to less than 55 percent. This decline will have a negative effect on forage intake and animal productivity. The carrying capacity has been estimated by Jenkin et al. (1976) to be approximately 0.8 animal/acre for Jaragua grass and 1.9 animals/acre for nitrogen fertilized Pangola grass.

Forage legumes have not been cultivated on improved pastures, although research results have shown that they can significantly increase animal productivity on both native and cultivated grass pastures (Table 33). Lack of available seeds and technology for pasture establishment and management to assure legume persistence are principal reasons for their nonuse.

Grain, Concentrates, and By-products

Grain, concentrates, and by-products play an essential role in the livestock industry. Domestic supplies of corn and rice are adequate to meet the needs of the human population as well as provide surplus grain and by-products for animal feeds. Products such as wheat and flour must be imported to meet the needs of the country (Table 34). In addition, there is a shortage of protein feeds, making it necessary to import large quantities of protein concentrate. A discussion of domestic production and imports of grains is presented, followed by an evaluation of current and potential use of by-products.

Corn

Corn acreage and production estimates are presented in Table 35. Cayo District alone produced more than 50 percent of the national total. The Mennonite Community at Spanish Lookout produces and utilizes a significant proportion of corn raised in the Cayo District; in 1981, they accounted for about 19 percent of

the total estimated national production (8.7 million pounds), planting 4570 acres of land (B. Thiesson, personal communication).

While the Belize Marketing Board (BMB) set a support price of B$.24 per pound of 14 percent moisture, it only purchased about 4 million pounds of the total 1981 crop. Failure to purchase the corn and delayed payments to farmers after purchase may have an unfavorable effect on the 1982 crop. Corn support prices for 1982 have been set at B$.19, B$.20, and B$.24 for corn of 15.9, 14.9, and 13.9 percent moisture, respectively. The BMB intends to purchase a specified quantity at these support prices and the remaining at B$.12 per pound. To date, however, the specific amounts that farmers may sell at the support price have not been determined.

Although large quantities of corn are available for animal feed, the artificially high support price has resulted in feed prices for pork and poultry producers which are well above imported prices (e.g., f.o.b. Gulf Port U.S. corn price was US$.048 per pound, July 1982). These high prices have reduced demand for corn to the point that the BMB has reduced prices to B$.09 and B$.11 per pound. Some of the stored grain has begun to deteriorate because of ineffective drying and storage facilities.

Rice

Due in part to price supports, annual rice production has increased in recent years (Table 36). Big Falls Ranch in Belize District produced about 55 percent of the 1981 crop. The 1981 support price for clean paddy at 14.5 percent moisture was B$.26 per pound. The BMB purchased 6.5 million pounds of rice from the districts, with about 90 percent bought from Toledo.

In 1981, the quantity of rice bran resulting from milling totaled 1.9 million pounds. Rice bran is B$.13 per pound. Local rice bran contains 13 percent crude protein, 3.0 percent crude fiber, 6.5 percent ash, 11 percent ether extract, and 56.5 percent nitrogen-free extract.

Research done under the Belize Feed Project has demonstrated that rice bran can supply up to 30 percent of the ration for swine. Other results indicate that swine rations can be formulated to contain 45 to 50 percent rice bran without biologically affecting production, but higher levels tend to reduce growth rate. With current prices of corn at B$.11, rice bran at B$.13, and protein supplement at B$.47 per pound, increasing the percentage of rice bran in the diet from 0 to 10, 20, 30 and 40 percent would reduce ration cost from B$19.00 to B$18.70, B$18.40, B$18.10, and B$17.80 per 100 pounds, respectively.

Although not presently used in commercially available poultry rations, rice bran can be utilized to supply a maximum of 5 to 10 percent of the ration for both broilers and laying hens.

Wheat By-Products

Belize imports all wheat used for flour production. There is one flour mill in the country (Belize Flour Mill, Ltd.). At full capacity it can mill 13,200 short tons of wheat per year. Presently, however, the milling rate is only 8,800 short tons per year, producing 6,160 tons of flour and 2,640 tons of wheat by-products. These by-products are 1,716 tons of bran and 924 tons of middlings and shorts. Price for mixed millfeed is B$16.36 per 100 pounds.

Mixed millfeed contains 16 percent crude protein, 10 percent crude fiber, 3.5 percent ether extract, 4.5 percent ash, and 56

percent nitrogen-free extract. While an excellent source of protein for ruminants, wheat millfeed in excess of 30 percent in gestating sow rations, 15 percent in growing pig rations, and 10 percent in broiler rations will lower performance. Currently, export demand for millfeed from Belize to Guatemala and Honduras is so strong that its price is not competitive with corn, sorghum, or rice bran for livestock rations.

Sorghum

Sorghum can be grown during the dry season when most other crops are adversely affected by drought. In 1981, 1,700 acres of sorghum were planted. The BMB purchased a total of 606,135 pounds of sorghum in 1981. While national production figures are not available, preliminary information indicates that significant quantities above those purchased by the Marketing Board were produced.

Analysis from Central Farm indicates that sorghum grain contains 10 percent crude protein, 2.5 percent crude fiber, 1.5 percent ash, 2.8 percent ether extract, and 74.7 percent nitrogen-free extract. Although most varieties have brown kernels and appear to be relatively high in tannin, studies conducted by the Belize Feed Project have demonstrated that sorghum grain can be a substitute on a pound-for-pound basis for corn.

Bananas

The banana industry contributed B$7 million to the export market in 1980. Commercial banana plantations are located on 1,560 acres in Cowpen in Stann Creek District. Although 1981 production was approximately 30 percent below that of previous years, both yields and acreage are expected to increase in 1982 as a result of extensive irrigation projects and improved management

practices. Rejects at the packing sheds are estimated to be over 10 percent of total production. Therefore, a total of 2.5 to 4.0 million pounds of reject bananas may be available as a potential feed source (Table 37).

The Government of Belize and the Banana Control Board are interested in utilizing banana waste as feed for pigs. Because of their high moisture control, bananas cannot be economically transported large distances; therefore, pig feeding programs must be established near the banana plantations. Bananas contain only 20 percent dry matter and are very low in crude protein (less than 1 percent in the fresh state).

Bananas are most efficiently utilized when fed ripe in conjunction with protein supplement. One sow and 14 pigs produced in one year (1.8 litters x 8 pigs per litter) will consume approximately 66,127 pounds of ripe bananas. Four million pounds of bananas could nutritionally support 840 slaughter pigs. Using the average dressed weight of 80 pounds, this would represent a total of 67,200 pounds of pork, or nearly 20 percent of reported slaughter in 1980.

Alternatively, bananas could be used as supplemental feed for cattle. However, cattle numbers are limited near the major banana growing areas and cost of transporting bananas to other areas limits their economical use.

Molasses

The sugar industry accounts for about 20 percent of the GDP and 60 percent of the export market revenue. Two sugar factories, both located in northern Belize, process about one million tons of cane per year. Sugar production in 1981 from 61,000 acres planted was estimated at 97,724 tons. Production of molasses

reached 31,980 tons, of which 86 percent was exported (Table 38). Rum is produced locally from molasses, thus leaving only a small percentage available for animal feed. The current f.o.b. price for molasses to livestock producers is B$90 per ton. Including transportation and handling, it is available in Belize and Cayo Districts for B$100 per ton.

Local analyses indicate that molasses contains 75 percent dry matter, 3.0 percent crude protein, 0.9 percent calcium, and 0.02 percent phosphorus. Present commercial ration formulations do not include molasses in either poultry or swine rations. A 16 percent protein ration containing 77.7 percent corn and 22.3 percent protein supplement would cost B$.19 per pound. Substitution of 20 percent corn with molasses would increase the total cost of the ration to B$.21 per pound because it would be necessary to increase the quantity of protein supplement (48.75 percent corn, 20 percent molasses, and 31.25 percent protein supplement) in order to maintain the 16 percent protein in the ration. Only when the price of corn reaches B$.18 per pound does it become economical to substitute molasses. Therefore, under present prices, it is not economically feasible to use molasses for swine feeding. The difficulty of handling and mixing would be an added disadvantage related to its use for poultry and swine.

Molasses has been used in several countries as a source of energy for both beef and dairy cattle. Although molasses as an energy source is biologically feasible, and the sugar industry is making it available to producers at prices below those paid by rum manufacturers, its current use in Belize is limited by economic reasons.

Cassava and Sweet Potatoes

Neither cassava nor sweet potatoes constitute an important source of energy feed for the livestock industry. Both are produced by "milpa" farmers as part of their subsistence food supply. Peelings and small or damaged roots are generally fed to livestock, particularly swine and poultry. Accurate data on acreage and yields are not available. The role of cassava and sweet potatoes in the livestock industry is not expected to change in the near future.

Citrus Pulp

Deliveries of oranges and grapefruit for the 1980/1981 season reached 1.6 million boxes, an increase of approximately 16 percent over the 1979/1980 season (Table 39). In order to increase production and overall competitiveness of the industry, the Citrus Groves Association is encouraging improved management practices to achieve higher yields. Research is in progress to determine improved methods of grove management, disease control, and optimal application and timing of fertilizer.

Although some fresh fruit is distributed to the domestic market, the bulk of annual orange and grapefruit production is exported as frozen concentrate. Over 142 million pounds of orange and grapefruit residue resulting from juice extraction is presently wasted, even though the equipment necessary for producing dried citrus pulp from citrus residue is available and operational. Dried citrus pulp was previously produced for the export market, but drying costs and unprofitable market prices made this practice uneconomical. Analyses from the Belize Feed Project indicate that citrus pulp contains 87.7 percent dry matter, 4.8 percent crude protein, 21.5 percent crude fiber, 5.4 percent ash, 2.0 percent ether extract, 2.0 percent calcium, and 0.03 percent available phosphorus.

It is estimated that 12 to 13 million pounds of dried citrus pulp is potentially available as a source of feed for livestock. To a great extent its utilization depends on economic considerations as well as technical knowledge.

Imported Concentrates

The livestock feed complex in Belize is based on imported protein concentrates. Statistics for protein concentrates imported each year are confounded with total livestock feed imports. During 1980, 9,154,656 pounds of poultry feed, 91,800 pounds of pig feed, and 325,435 pounds of cattle feed were imported, mostly from the United States (Table 40). Although final trade figures are not yet available, preliminary reports indicate that total imports continued to increase during 1981 and 1982.

However, there has been a major shift in the type of feed imported. During the 1970s, complete mixed feed was imported. As domestic production of corn, rice, and sorghum grain increased to meet national needs, large quantities of by-products became available for use in livestock feeds. Current imports are mainly protein supplements.

The two major importers of protein concentrates are Reimer Feed Supplies and the Ben Wolf Feed Company of Spanish Lookout. Reimer Feed Supplies milled more than 2,986 tons of feed during 1981 and imported a total of 1,737 tons of protein concentrates from Purina (J. Dueck, personal communication). Ben Wolf Feed Company imported 1,650 tons of Pillsbury protein concentrates during 1981, and milled over 2,700 tons of mixed feed (B. Wolf, personal communication). Although data are not available, Master-Mix and Nutrina are importing small quantities of concentrates.

Protein concentrate for swine and poultry feed is available at Spanish Lookout for B$.47 per pound and B$.49 per pound in Orange Walk and Corozal. Until domestic production of quality protein sources is developed, protein concentrate will be imported to complement the domestically available energy sources.

Meat and Bone Meal

Meat and bone meal have been used experimentally to supply all or part of the protein supplement for both swine and poultry rations. In the past, small quantities of meat and bone meal were produced by Belize Beef Corporation at the slaughter plant in Ladyville, and sold for B$.33 per pound. Currently, the plant is slaughtering only a few cattle per week and is not producing these by-products.

Meat and bone meal produced by the plant is considered to be of low quality, due to the raw material being processed. Most of the offal is sold for human consumption, thus only bones recovered from deboning primal cuts, mostly from the forequarter, enter the cooker. Protein associated with bone contains a significant quantity of collagen which is of low biological value. However, protein quality could improve if other carcass by-products such as meat scraps, lungs, and other offal are increased in the mixture.

Currently, meat and bone meal is imported from Honduras and Guatemala. It contains 45 percent crude protein, 2.0 percent crude fiber, 23 percent ash, 17 percent either extract, 7 percent calcium, and 2.7 percent phosphorus. Market price is B$.55 per pound.

Fishmeal

Fisheries contribute more than 3 percent to the GDP and 4 percent to the export market. The industry is primarily controlled by five cooperatives although there are some independent fishermen. Most fishing occurs relatively close to shore; the main products are lobster, conch, shrimp, and fish.

The potential for further expansion of fisheries lies outside the barrier reef and indications are that the continental shelf is small and the sea floor drops off sharply. Although Belizean fishermen are highly experienced at inshore fishing, fishing outside of the barrier reef will require the introduction of new technology, larger equipment, and large investments of capital.

According to reports (D. Hall, personal communication), significant quantities of trash fish and fish waste are discarded each day. This includes an estimated 10,000 pounds of wet fish in nets while trawling for shrimp, 1,000 pounds from individual hand-line fishermen (up to 20 percent of the catch from nets and trap fishermen based close to shore) and substantial quantities of heads, guts, and gills available at fish cleaning plants.

The Belize Trash Fishmeal Project, sponsored by the Department of Agriculture and the Caribena Producers Cooperative Society Limited of San Pedro, Ambergis Caye, with financial support from HPI and CARE, was initiated in October, 1978. Its intent was to develop and operate a small scale fishmeal operation requiring low capital investment and producing high quality protein feed. A pilot processing plant has been developed. Fish waste and trash fish are cooked in an open drum and pressed with a screw-press to remove much of the water and fat. The pressed-fish is placed in a rotating drum dryer to allow the particles to separate while being dried with warm air. After a short drying and

separation period, the fish particles are removed from the drum and placed on a porous tray. Air, heated by a solar collector, is blown through the tray, drying the fish in about 9 to 11 hours. If solar light intensity is reduced by clouds, a heat exchanger fueled by kerosene is used to complete the drying.

The pilot plant can process 2,500 pounds of wet fish per day to produce 500 pounds of fishmeal. Production of fishmeal could be increased to 2,500 pounds per week if sufficient fish waste and trash fish were available. However, only small quantities are available per day and they must be stored (frozen) to accumulate sufficient quantities for a one-day operation.

Fishmeal is presently sold at B$.75 per pound. It must compete with complete protein concentrates based on imported soybean meal that sells at B$.47 per pound. Therefore, one pound of fishmeal protein costs B$1.09, while one pound of concentrate protein from the imported concentrate costs B$1.07. In addition, the protein concentrate contains all the required vitamins and minerals while the quality of fishmeal is poor due to some putrifaction during processing.

Future expansion of fishmeal production is doubtful. Shrimpers are presently not willing to hold trash fish until they return to shore. Increasing fishing output to promote fishmeal production is presently not feasible.

Soybeans

Soybeans are produced only in small quantities. Several farmers in the Mennonite communities of Spanish Lookout and Shipyard have raised soybeans in the past. However, the absence of a processing plant resulted in discontinuation of production.

Research trials at Central Farm have shown that under experimental conditions, 1,500 to 2,000 pounds of soybeans per acre can be produced (H. Vernon, personal communication). Under field conditions at Spanish Lookout, the Mennonites have produced 1,200 to 1,500 pounds per acre.

Stimulation of soybean production will require a simultaneous effort to establish a market by means of an extraction plant. Such an enterprise will not only benefit domestic production of protein concentrates, but also help develop a domestic supply of cooking oil.

Peanuts

Peanut production is gaining much attention in Belize, largely due to the efforts of CARDI to promote the crop in Cayo District. Profits can be earned from well-managed fields. Domestic markets for the roasted kernels have absorbed all peanuts produced to date at a price of B$1 per pound. Some 300 acres will be harvested in 1982 compared to 155 acres in 1981. Total production in 1981 reached 60,000 pounds and is expected to exceed 300,000 pounds in 1982.

Concern about increased peanut production is growing because the domestic market may become saturated. However, the crop could be exported or processed into peanut oil and meal. Currently, it does not appear economically feasible to use peanuts for animal feed. The conclusions here are parallel to those of soybean production.

Coconut Meal

The coconut industry is suffering from years of neglect and the lasting effects of hurricanes, pests, and disease. A Coconut

Rehabilitation Project, funded by the British Overseas Development Administration through the Ministry of Natural Resources and administered by the BMB, aims at encouraging farmers to improve the management of coconut groves to increase production to a level which would permit processing. This project is linked with an Edible Oils and Fats Project administered by the BMB. The Board will purchase coconuts and undertake oil extraction, processing, and the manufacture of margarine, soap, and animal feed. The success of this project will determine the future availability of coconut meal for the livestock industry.

Blood Meal

Blood meal is a by-product of animal slaughter. An animal contains 7 to 9 percent blood on a liveweight basis. After processing and drying, 0.6 to 0.7 pounds of blood meal are produced per hundred liveweight of cattle, and 0.5 to 0.6 pounds per hundred liveweight of calves, pigs, sheep, and goats.

Processing the blood of 1,000 head of cattle weighing an average of 600 pounds would result in the production of between 3,600 to 4,200 pounds of blood meal containing 80 to 82 percent crude protein. Processing 1,000 pigs weighing an average of 200 pounds liveweight would result in the production of 1,000 to 1,200 pounds of blood meal.

The highest quality blood meal is produced by using a rotary-steam dryer or a ring-dryer. However, with low slaughter numbers, it may not be economically feasible to develop a separate blood meal processing unit. Although a lower quality product results, blood can be combined with meat and bone scrap for processing. The combined product is higher in protein than meat and bone meal.

Cohune Meal

Cohune meal is produced as a by-product of the extraction of oil from the kernel of the cohune palm nut. The nut is commonly collected by many farmers and, after being allowed to dry in the sun, is cracked and the large kernel removed. The kernel is ground and boiled in water to remove the oil. The oil is used for cooking

Attempts to extract the oil commercially have not been successful. In 1978, one operation processed 35,000 pounds of kernels through an expeller press, and 65,000 pounds in 1979 (F. Gegg, personal communication). Following these two tests, the project was abandoned as uneconomical. The cohune nut is large and very hard. It is difficult to crack the nut and remove the kernel. Extraction by hand is laborious and mechanized extraction methods have not been developed. If a mechanical procedure for cracking and kernel extraction was developed, cohune meal could supply a large quantity of protein for livestock feed, while supplying oil for domestic consumption.

Cohune meal contains 15 percent crude protein, 31.3 percent crude fiber, 5.6 percent ash, 15 percent ether extract, 0.91 percent lysine, and 0.12 percent tryptophan.

Table 31. Pasture Distribution by Type, Number of Grazing Animals and Ratio of Animals to Pasture, by District, 1978

Location	Pastures Areas				Total Pastures Acres	Total Animals No.	Animals /Acre
	Natural		Cultivated				
	Acres	(%)	Acres	(%)			
Northern Region							
Corozal	1,488	66.6	746	33.4	2,234	1,050	0.47
Orange Walk	17,703	58.2	12,697	41.8	30,400	15,501	0.51
Central Region							
Belize	16,100	82.8	3,335	17.2	19,435	6,922	0.35
Cayo	26,694	48.9	27,890	51.1	54,584	22,225	0.41
Southern Region							
Stann Creek	2,690	94.5	157	5.5	2,847	1,526	0.54
Toledo	2,904	98.1	57	1.9	2,961	1,523	0.51
Total	67,579	60.1	44,882	39.9	112,461	48,747	0.43

Source: Adapted from Neal and Patten, 1981.

Table 32. Distribution of Main Species of Improved Grasses, by Districts, in Acres

Location	Hyparrhenia[1] rufa	Panicum maximum	Digitaria decumbens	Cynodon dactylon + Cynodon nlemfuensis	Brachiaria mutica + Eriochloa procera	Others[2]	Total
Northern Region							
Corozal	150	126	-	120	325	25	746
Orange Walk	135	1,709	18	5,148	5,219	468	12,697
Central Region							
Belize	1,027	43	565	367	1,016	317	3,335
Cayo	18,202	7,551	536	83	328	1,190	27,890
Southern Region							
Stann Creek	-	53	2	100	2	-	157
Toledo	-	-	18	-	-	39	57
Total	19,514	9,482	1,139	5,818	6,890	2,039	44,882

[1] H. rufa, Jaragua Grass; P. maximum, Guinea Grass; D. decumbens, Pangola Grass; B. mutica, Para Grass; E. procera, Carib Grass; C. dactylon, Bermuda Grass; C. nlemfuensis, Star Grass.

[2] Cenchrus ciliaris, Buffel Grass; Echinocloa polystachya, Aleman Grass; Paspalum notatum, Bahia Grass; Panicum maximum var tricholume, Green Panic; Melinis minutiflora, Molasses Grass.

Source: Neal and Patten, 1981.

Table 33. Animal Productivity on Different Types of Pasture, from Research Results at Central Farm

Type of Pasture	Stocking rate An/acre	Animal productivity lb/an	lb/acre	Remarks
Natural:[1]				
Unfertilized, no legumes	0.12	18.2	2.2	2 yrs, Pine Ridge Soils; 60 in. rainfall; legumes fertilized with P, and Potash
+ *Macroptilium* spp.	0.33	116.8	38.9	
+ *Stylosanthes* spp.	0.33	153.3	50.6	
+ Legume mixture + UDZU	0.33	244.5	80.7	
Pangola Grass:				
N Fertilized[2]	2.00	387.6	775.0	2 yrs, alluvial, 27 day-rotation
+ Legumes (*Macroptilium*, *Centrosema*, *Stylosanthes*)[3]	2.00	405.0	810.0	2 yrs, alluvial, put & take, continuous grazing

[1] W. Parham, Agronomist Forage Legume and Pasture Program.
[2] R. H. Neal, Principal Agricultural Officer, Ministry of Natural Resources.
[3] Lazier (1978).

Table 34. Grain and Flour Imports, Volume and Value, 1973-81

Year	Wheat		Flour		Corn		Rice	
	1000 lbs	B$1000	1000 lbs	B$1000	1000 lbs	B$1000	1000 lbs	B$1000
1973	--	--	12,499.9	2,169.4	--	--	--	--
1974	--	--	15,560.9	3,723.1	1,138.3	182.4	--	--
1975	NA	NA	NA	NA	NA	NA	NA	NA
1976	2,832.6	310.1	2,613.8	763.0	25.8	9.1	2,920.3	956.2
1977	19,928.6	2,560.9	12.4	44.7	--	--	--	--
1978	16,461.2	2,851.7	1,509.1	422.7	841.7	184.8	2,048.0	736.6
1979	16,811.7	3,040.3	4,626.3	1,030.1	1,255.5	225.7	Nil	Nil
1980	15,661.0	3,895.1	4,286.0	1,439.5	2,631.7	557.2	Nil	Nil
1981[1]	NA	2,984.4	NA	1,505.7	NA	22.4	NA	Nil

[1] January-September only.

Source: Trade Report, Several issues, 1973-78; 1979-80 Annual Report and Summary Statistics, 1980. 1981 unpublished information, Central Planning Unit, Ministry of Finance.

Table 35. Annual Production of Corn, 1977-81

Year	Estimated Acreage	Estimated Production (1,000 lbs)
1977	31,300	37,600
1978	28,500	43,000
1979	26,500	34,000
1980	27,600	41,500
1981	28,210	46,600

Source: Ministry of Natural Resources, Department of Agriculture.

Table 36. Annual Production of Paddy Rice[a]

	District Production[b]		Big Falls Ranch		Total Production	Rice Bran[c] Production
Year	Acres	(1000 lbs)	Acres	(1000 lbs)	(1000 lbs)	(1000 lbs)
1978	4,100	7,400	2,398	6,596	13,996	1,120
1979	4,300	7,700	3,577	7,053	14,753	1,180
1980	4,900	8,800	3,173	10,222	19,022	1,522
1981	5,300	10,900	4,466	13,105	23,915	1,913

[a] Source: Ministry of Natural Resources, Department of Agriculture.

[b] Based on adjusted data supplied by Ministry of Natural Resources.

[c] Based on estimate of 8% rice bran and polishings recovered during milling.

Table 37. Annual Production of Bananas, 1977-81

Year	Acreage	Boxes Exported	Expected (1000 lbs)	Estimated[a] Rejects (1000 lbs)
1977	N/A	547,812	23,008	2,556
1978	1,475	519,668	21,826	2,425
1979	1,475	842,419	35,382	3,931
1980	1,475	784,885	32,965	3,663
1981	1,560	549,275	23,070	2,563

Source: Ministry of Natural Resources.

[a] Guy Harris. 1981. The Banana Industry. Proceedings of the Third National Agricultural Research and Development Symposium, April 4-5, 1981. Based on estimate of 10% rejects.

Table 38. Total Acreage, Cane, Sugar and Molasses Production and Exports, 1978-81

Production	1977/1978	1978/1979	1979/1980	1980/198
Acreage harvested	59,000	61,000	61,000	61,00
Cane delivered, tons	1,123,100	989,300	1,013,500	970,10
Sugar produced, tons	113,500	98,600	103,300	97,72
Sugar exported, tons	107,600	91,400	97,100	90,26
Molasses produced, tons	36,900	32,300	32,350	31,98
Molasses exported, tons	35,100	30,800	30,200	27,45
Molasses for domestic use, tons[a]	1,800	1,500	2,050	4,52

[a] Rum production mainly.
Source: Ministry of Natural Resources, Department of Agriculture

Table 39. Annual Production of Citrus Fruit, 1976/77-1980/81

Year	Number of Boxes			Total Weight (1000 lbs)	Estimated Dry Citrus Pulp (1000 lbs)
	Oranges (90 lbs)	Grapefruit (80 lbs)	Total		
1976/77	633,450	237,900	871,350	76,042	6,906
1977/78	685,850	302,850	988,700	85,954	7,849
1978/79	567,700	187,600	755,300	66,101	5,979
1979/80	1,109,050	408,400	1,517,450	132,486	12,025
1980/81	1,063,000	586,050	1,649,050	142,554	13,122

Source: Department of Agriculture, Ministry of Natural Resources. Kestersen and Braddock, 1976.

Table 40. Feed Imports, Volume and Value, 1976-81

Year	Cattle Feed		Pig Feed		Poultry Feed	
	lbs	B$	lbs	B$	lbs	B$
1976	186,165	38,806	91,550	24,025	9,053,196	2,517,322
1977	284,800	67,364	205,700	53,655	4,925,200	1,724,759
1978	241,325	62,580	139,110	37,078	5,594,426	2,035,764
1979	206,909	51,495	107,724	33,123	8,205,690	2,885,000
1980	325,435	74,352	91,800	31,527	9,154,656	3,487,936
1981[1]	NA	102,770	NA	19,511	NA	3,003,983

[1] January-September only.

Source: Trade Report, several issues, 1976-78. 1979-81 unpublished information, Central Planning Unit, Ministry of Finance.

DEMAND

DEMAND

The principal livestock products consumed in Belize are meat (beef, pork, poultry), eggs, and dairy products (milk, butter, cheese). While beef, poultry meat, and egg consumption is satisfied primarily by domestic production, consumption of pork and dairy products depend on imports. This section analyzes the characteristics of current domestic and export demands for livestock products. Projections for future consumption, based on alternative population and expenditure growth levels, are also presented and implications explored.

The base year used for the following analysis is 1980, since this is the most recent year for which information was available.

Meat Demand

Per capita meat consumption in 1980 was estimated at 69 pounds. This figure ranks above the 59 pounds per capita world average meat consumption reported for 1977 by Wheeler et al. (1981). Total expenditures on meat amounted to B$22.4 million in 1980 (Table 41), approximately B$156 per capita. Beef consumption accounted for 23 percent (16 pounds), pork for 33 percent (23 pounds), and poultry for 44 percent (30 pounds) of per capita meat consumption. Farm slaughter for home consumption is not included in these figures. According to 1980 estimates by the Central Planning Unit, Ministry of Finance, slaughter for home consumption yielded 13,000 pounds of beef, 799,000 pounds of pork, and 769,000 pounds of poultry. This adds 10.5 pounds per capita consumption of meat in addition to that processed commercially.

Beef

From 1976 to 1980, per capita beef consumption fluctuated between 16 and 19 pounds (Table 42). For comparison, per capita consumption figures for Mexico and selected countries of Central America and the Caribbean are presented in Table 43. Per capita beef consumption in Belize ranks in the lower half. This low consumption is somewhat surprising in light of the cattle production resources available in Belize. Furthermore, only about 80 percent of the beef consumed is domestically produced; imported beef is mainly in the form of canned corn beef (Tables 44 and 45). A conversion of the 1980 imports of corn beef to carcass weight equivalent amounts to 439,000 pounds, which, given an average dressed weight of 350 pounds, would be produced by 1,250 head of slaughter cattle. This represents about 20 percent of the number of animals slaughtered in that year.

On the other hand, beef exports of carcass and boneless beef have fluctuated from year to year (Table 46). The three main markets for Belizean beef have been the U.S., Mexico, and Martinique. However, since mid 1981, Belize has not exported any beef.

There are indications that Belize has the potential to increase both domestic and export markets for beef. In reference to the domestic market, two alternative sets of projections were made based on two rates of population growth (low, 1.76 percent and high, 2.76 percent, Table 47), and expenditure levels. Annual projections were developed for 1982-90. The projections presented in Table 48 assume that level of per capita consumption will remain constant at 1980 levels, and any increase will depend on population increases. Assuming a 1980 average dressed weight of 347 pounds, projected 1985 consumption would require about 7,460 and 7,835 animals slaughtered under scenarios I and II, respectively. This represents an increase of 13 to 18 percent

over 1980 slaughter numbers. Table 49 presents four sets of annual projections based on the low and high population growth rates combined with 2.5 and 4.0 percent increases in per capita consumption (due to increased expenditures, lower prices, or a combination of both). Taking the year 1985, and using a dressed weight of 347 pounds, the projected levels of consumption would require 8,235, 8,649, 8,728, and 9,166 animals slaughtered under scenarios III, IV, V, and VI, respectively. These increases range from 24 to 38 percent above the 1980 slaughter level.

The potential for growth in the export market is more difficult to project. First, export volumes have varied widely and thus a trend does not emerge clearly from past performance. Second, it appears that Belize has never met its import quota to the United States. Although there is a formula to estimate the total quota for U.S. beef imports from all sources (Simpson and Farris, 1982, p. 243), the allocation per country is based on historical data. However, as indicated in Table 50, with the exception of Costa Rica and Honduras, beef exports to the U.S. from countries in Central America and the Caribbean have been declining. Third, in the case of the Mexican and Caribbean markets, the lack of historical trends is even more acute. Such markets are virtually unexplored.

Prices are conspicuously absent in the foregoing discussion because price data series do not exist. Furthermore, government price controls, only recently lifted for preferred beef cuts, prevents the functioning of a true competitive price system to which demand and supply can adjust. For example, the notion of fixing prices for live cattle (i.e., formula pricing) is still prevalent among producers and government officials, as is evident from the proposed liveweight cattle prices for 1982 (Table 51). Price controls are contrary to the competitive nature of the international beef market. The proposed liveweight prices for

1982 would result in beef prices that substantially exceed prices for imported boneless Australian beef in the U.S. (quoted by the Australian Meat Corporation; July 31, 1982; c.i.f., New York):

Type of Boneless Beef	B$/lb
Manufacturing beef	1.88
Chucks	1.86
Clods	1.89
Insides	2.40
Knuckles	2.32

Given the quota in the U.S. market and continued compliance with U.S. regulations for imported beef, Belize has an outlet for beef in the magnitude of 300 to 500 thousand pounds of boneless beef. If this potential is to be achieved, prices for Belize beef (c.i.f., U.S. port) must be competitive with prices for beef from other countries exporting to the U.S. market. For example, based on the simplified assumptions of 50 percent dressed carcass yield and 75 percent yield of boneless beef from carcass, the price of B$1.86 per pound of boneless beef implies a liveweight price of B$.70 per pound (i.e., .5 x .75 x 1.86), and no charge for slaughter, fabrication, or shipping. Taking these processing and marketing charges into account would further reduce the price per live cattle and allow Belize beef to be competitive in the U.S. market.

Higher prices for preferred loin and round cuts may be available in Mexico and beef deficit countries of the eastern Caribbean. However, market channels have not been established and other beef exporting countries of Central America and the Caribbean may be expected to compete for these lucrative markets. The extent to which Belize can open market outlets for its beef in these countries requires careful assessement and vigorous market penetration activities.

Pork

Table 52 indicates that per capita pork consumption in 1980 amounted to 22.8 pounds, substantially above the levels of neighboring countries (Table 53). From 1976 to 1980, per capita consumption figures fluctuated between 19 and 26 pounds. Approximately 80 to 85 percent of the pork consumed is imported. Most pork is imported in processed form (Table 54). In carcass weight equivalents, the 1980 pork imports amount to over 2.6 million pounds. Assuming a dressed weight of 80 pounds, import volumes amount to 32,500 animals, nearly twice the 1980 Belize swine population.

The foregoing discussion underscores the fact that the potential for expansion of pork production in Belize relies on import substitution. Table 55 presents annual consumption projections for pork under low and high population growth scenarios for 1982-90, assuming that per capita consumption remains at the 1980 level of 20.42 pounds (i.e., domestic consumption plus imports in carcass weight equivalents). At the 80 pound average dressed weight, the projected consumption for 1985 would require 40,489 slaughter animals under scenario I, and 42,523 slaughter animals under scenario II. Annual consumption projections, assuming low and high population growth rates and increases of 2.5 and 4.0 percent in per capita consumption, are presented in Table 56. To satisfy the 1985 projected consumption, assuming average dressed weight of 80 pounds, 44,692, 46,939, 47,369, and 49,750 animals need to be slaughtered under scenarios III, IV, V, and VI, respectively.

An alternative strategy involving genetic improvement as well as better nutrition and management would increase average dressed weight. For example, dressed weights of 150 to 160 pounds are possible under improved technology. At these average dressed weights, the number of pigs slaughtered to meet national demand

would be approximately half those listed in the previous paragraph. In fact, an intermediate strategy of increasing both numbers and dressed weights would most likely be achieved.

Meeting domestic pork consumption needs in Belize will require substantial expansion in the pork industry. Until recently, the price system at the retail level was under government controls. Price controls tend to discourage production, particularly when production costs are high relative to the controlled product price. This may explain the high proportion of imports in relation to domestic production. The recent removal of price controls may act as an incentive to expand production. The pronounced consumer preference for processed pork indicates, however, that the expansion of pork production also requires an increase in the capacity for processing pork products.

Poultry

Table 57 presents total and per capita consumption for 1980 and 1981. Per capita consumption of poultry meat appears higher than for any other type of meat, and seems to be increasing. Belize is virtually self sufficient in poultry and eggs. Only small quantities of hatching eggs are being imported (CPU, unpublished information). Poultry and egg prices have not been controlled by the government. Wholesale poultry meat prices in 1981 were reported at $1.80 per pound.

Dairy Products

Except for the fresh milk provided by Western Dairies in Cayo District and some local suppliers in the main towns, Belize imports nearly all the dairy products consumed. Table 58 indicates that in 1980, 14 million pounds of dried and condensed milk, 826 thousand pounds of butter, and 4 million pounds of cheese were imported at a cost of B$24.2 million.

Summary

Per capita meat consumption levels in Belize are above the world average, and at about the same level of neighboring countries. While on the average, less beef per capita is consumed in Belize than in most Central American and Caribbean countries, pork consumed per capita is higher, and poultry consumption is high and rapidly increasing. While Belize is self-sufficient in beef and poultry, it imports most of the pork and nearly all the dairy products it consumes. The potential exists for expanding domestic beef consumption as well as exports. Pork consumption can also be expanded with the immediate target being import substitution. The near term situation on milk consumption depends on imports. The price system under government imposed controls has not encouraged efficient allocation of resources. Any major development in the livestock industry needs to be based on the free competitive forces of the market system.

Table 41. Household Meat Expenditures by Type of Meat and District, 1980

District	Number of Households	Beef	Pork	Poultry	Other Meats	Total	Per Household
		B$1,000					B$
Belize City[1]	8,440	2,675	1,175	4,156	413	8,419	998
Belize	10,660	3,065	1,347	4,908	478	9,798	919
Corozal	4,055	805	806	2,395	84	4,090	1,009
Orange Walk	4,000	498	573	1,790	46	2,907	727
Cayo	4,200	724	442	1,624	114	2,904	691
Stann Creek	2,940	307	368	1,018	61	1,754	597
Toledo	2,290	159	296	402	62	919	401
Total	28,145	5,558	3,832	12,137	845	22,372	795

Source: Unpublished information, Central Planning Unit, Ministry of Finance

[1] Included in Belize District

Table 42. Estimated Total and Per Capita Beef Consumption, 1976-80

Year	Total[1]	Per Capita
	- - - - - - lbs - - - - - -	
1976	2,305,908	18.10
1977	2,062,000	15.59
1978	2,570,132	18.94
1979	2,626,078	18.76
1980	2,371,850	16.32

[1] Commercial slaughter plus imports minus exports.

Table 43. Per Capita Beef Consumption, Mexico and Selected Countries, Central America, and the Caribbean, 1979-80

Country	1979	1980
	- - - - lbs - - - -	
C Rica	36.16	36.60
. nican Republic	15.43	16.31
E. .lvador	16.10	14.77
Guatemala	24.03	24.26
Honduras	12.79	12.79
Mexico	32.41	32.41
Nicaragua	29.76	35.06
Panama	46.30	57.77

Source: USDA, "Foreign Agriculture Circular", FLM 5-81, July 1981.

Table 44. Beef and Beef Product Imports, Volume and Value, 1973-81

Year	Fresh[1]		Corn Beef		Other[2]	
	1000 lbs	B$	1000 lbs	B$	1000 lbs	B$
1973	--	--	--	--	--	--
1974	--	--	--	--	--	--
1975	NA	NA	NA	NA	NA	NA
1976	97,267	107,946	202,791	361,791	31,850	33,953
1977	270,500	312,307	315,600	415,325	75,500	88,008
1978	28,666	27,295	464,386	865,914	51,090	60,705
1979	8,445	31,422	319,552	821,208	--	--
1980	--	--	391,802	1,264,240	--	--
1981[3]	--	--	NA	436,319	--	--

1 Fresh, chilled, and frozen.
2 Includes salted beef, etc.
3 January-September only.

Sources: Trade Report, several issues, 1973-78. 1979-81 unpublished information, Central Planning Unit, Ministry of Finance.

Table 45. Total Beef and Pork Imports and Percent of Total Consumption, 1976-80

Year	Beef		Pork	
	lbs	%	lbs	%
1976	331,980	14.39	2,056,555	84.71
1977	661,600	32.08	2,310,900	80.32
1978	544,142	21.17	2,460,933	76.30
1979	327,997	12.49	2,891,362	81.43
1980	391,802	16.51	2,798,125	84.36

Table 46. Beef Exports, Volume and Value, 1973-81

Year	Quantity lbs	Value B$
1973	503,600	572,050
1974	159,600	157,160
1975	NA	NA
1976	100,000	84,123
1977	1,071,600	2,064,003
1978	551,010	1,648,879
1979	263,919	1,665,638
1980	319,952	1,525,658
1981	147,730	317,000

Sources: Trade Report, several issues, 1973-78. 1979-81, unpublished information, Central Planning Unit, Ministry of Finance.

Table 47. Estimated Population Under Alternative Rates of Growth, 1981-90[1]

Year	Low	High
1981	147,916	149,373
1982	150,523	153,505
1983	153,176	157,750
1984	155,877	162,113
1985	158,624	166,597
1986	161,421	171,204
1987	164,266	175,940
1988	167,162	180,806
1989	170,109	185,796
1990	173,108	190,924

[1] Low: 1.76% rate of growth
High: 2.76% rate of growth

Table 48: Project Domestic Beef Demand Under Alternative Population Growth Rates, 1982-90[1]

Year	I	II
	- - - - - - - - - - lbs - - - - - - - - - -	
1982	2,456,535	2,505,202
1983	2,499,832	2,574,480
1984	2,543,913	2,645,684
1985	2,588,744	2,718,863
1986	2,634,391	2,794,049
1987	2,680,821	2,871,341
1988	2,728,084	2,950,754
1989	2,776,179	3,032,191
1990	2,825,123	3,115,880

[1] I: based on low population growth; II: based on high population growth. Per capita consumption held constant at 1980 level of 16.32 pounds.

Table 49. Projected Domestic Per Capita and Total Beef Demand Under Alternative Scenarios, 1982-90[1]

Year	Per Capita	III	IV	Per Capita	V	VI
			lbs			
1982	16.73	2,517,949	2,567,834	16.97	2,554,797	2,605,410
1983	17.15	2,626,386	2,704,813	17.65	2,703,819	2,784,558
1984	17.57	2,739,516	2,849,112	18.36	2,861,556	2,976,035
1985	18.01	2,857,489	3,001,116	19.09	3,028,464	3,130,685
1986	18.46	2,980,571	3,161,210	19.85	3,205,139	3,399,388
1987	18.92	3,108,931	3,329,875	20.65	3,392,094	3,633,162
1988	19.40	3,242,834	3,507,519	21.48	3,589,972	3,882,991
1989	19.88	3,382,504	3,693,624	22.33	3,799,392	4,148,825
1990	20.38	3,528,191	3,891,031	23.23	4,021,030	4,435,165

[1] III: low population growth
IV: high population growth — 2.5% annual increase in per capita consumption

V: low population growth
VI: high population growth — 4.0% annual increase in per capita consumption

Table 50. U.S. Meat Imports, Subject to Meat Import Law, From Central America, by Country, 1976-81

Country	1976	1977	1978	1979	1980	1981
			1,000 lbs			
Belize	--	38	60	232	297	112
Costa Rica	53,700	58,050	68,206	66,962	45,256	64,089
Dominican Republic	14,086	2,089	2,212	3,101	2,358	10,097
El Salvador	10,427	3,545	8,005	9,965	4,404	370
Guatemala	34,300	32,347	32,218	32,184	18,005	10,632
Haiti	1,900	1,262	2,484	1,660	1,522	2,733
Honduras	35,800	41,138	46,546	50,074	63,870	48,792
Mexico	52,000	59,649	62,568	5,297	242	1,586
Nicaragua	48,900	50,386	64,691	67,952	46,660	17,968
Panama	2,642	2,766	534	901	2,700	4,511
Subtotal	253,755	251,270	287,524	238,308	185,314	160,890
Total U.S. Imports	1,231,713	1,249,768	1,485,679	1,533,835	1,422,033	1,216,840

Source: USDA. "Foreign Agriculture Circular", several issues.

Table 51. Liveweight Beef Prices Proposed for 1982[1]

	Pounds	B$/lb
Steers, Bulls, Heifers	500 - 550	.80
	551 - 600	.825
	601 - 650	.85
	651 - 700	.875
	701 - 750	.90
	751 - 800	.925
	801 - 850	.95
	851 - 900	.975
	901 - ---	1.00
Cows	500 - 550	.70
	551 - 600	.725
	601 - 650	.75
	651 - 700	.775
	701 - 750	.80
	751 - 800	.825
	801 - 850	.85
	851 - 900	.875
	901 - ---	.90
Very poor quality animals		.65

[1] Proposed by the Belize Livestock Producers Association to the Government of Belize

Table 52. Estimated Total and Per Capita Pork Consumption, 1976-80

Year	Total[1]	Per Capita
	- - - - - - - - - lbs - - - - - - - - -	
1976	2,427,555	19.05
1977	2,876,900	21.75
1978	3,224,933	23.77
1979	3,550,362	26.36
1980	3,316,835	22.82

[1] Slaughter plus imports.

Table 53. Per Capita Pork Consumption, Mexico and Selected Countries, Central America and the Caribbean, 1979-80

Country	1979	1980
	----------lbs----------	
Costa Rica	7.28	7.06
Dominican Republic	10.36	6.17
El Salvador	6.61	6.39
Guatemala	5.29	5.29
Honduras	5.95	6.39
Mexico	14.11	14.77
Nicaragua	15.21	9.70
Panama	5.95	6.83

Source: USDA, "Foreign Agriculture Circular", FL75-81, July, 1981.

Table 54. Pork and Pork Product Imports, Volume and Value, 1973-81

Year	Fresh[1]		Dried/Salted		Ham[2]		Bacon		Sausage[2]		Other[3]	
	lbs	B$	lbs	B$	lbs	B$	lbs	B$	lbs	B$	lbs	B$
1973	--	--	513,600	401,860	--	--	379,900	546,191	--	--	460,336	744,721
1974	--	--	754,700	501,745	--	--	395,700	667,830	206,900	279,149	515,800	834,450
1975	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1976	10	35	709,164	743,921	232,055	1,178,981	83,014	211,851	249,619	435,751	782,693	1,178,981
1977	14,700	23,758	918,600	765,266	313,800	725,008	22,400	47,783	261,400	473,257	780,000	1,294,060
1978	44,570	105,990	1,061,940	858,370	367,840	935,720	30,640	77,820	296,777	566,974	659,166	1,260,033
1979	16,042	35,517	980,538	1,012,586	429,886	1,104,390	51,259	196,073	429,764	944,414	983,873	1,948,435
1980	--	--	947,115	896,055	408,544	1,124,570	35,009	125,998	438,102	835,405	969,355	1,911,939
1981[4]	--	--	NA	814,492	--	808,744	NA	85,184	NA	952,507	NA	1,309,663

1 Fresh, chilled, and frozen.
2 Packed and canned.
3 May include some meats other than pork.
4 January-September; only value available.

Source: Trade Report, several issues, 1973-78; 1979-81. Unpublished information, Central Planning Unit, Ministry of Finance.

Table 55. Domestic Pork Consumption Projections Under Alternative Population Growth Rates, 1982-90[1]

Year	I	II
	- - - - - - - lbs - - - - - - - -	
1982	3,073,680	3,134,572
1983	3,127,854	3,221,255
1984	3,183,008	3,310,347
1985	3,239,102	3,401,911
1986	3,296,217	3,495,986
1987	3,354,312	3,592,695
1988	3,413,448	3,692,059
1989	3,473,626	3,793,954
1990	3,534,865	3,898,668

[1] I: based on low population growth; II: based on high population growth. Per capita consumption held constant at 20.42 pounds.

Table 56. Projected Domestic Per Capita and Total Pork Demand Under Alternative Scenarios, 1982-90[1]

Year	Per Capita	III	IV	Per Capita	V	VI
				lbs		
1982	20.93	3,150,446	3,213,860	21.24	3,197,109	3,260,446
1983	21.45	3,285,625	3,383,737	22.09	3,383,658	3,484,697
1984	21.99	3,427,735	3,564,865	22.97	3,580,495	3,723,736
1985	22.54	3,575,385	3,755,096	23.89	3,789,527	3,980,002
1986	23.10	3,728,825	3,954,812	24.84	4,009,698	4,252,707
1987	23.69	3,891,461	4,168,019	25.84	4,244,633	4,546,290
1988	24.27	4,057,022	4,388,162	26.87	4,491,643	4,858,257
1989	24.88	4,232,312	4,622,604	27.95	4,754,547	5,192,998
1990	25.50	4,414,254	4,868,562	29.06	5,031,216	5,549,020

[1] III: low population growth
IV: high population growth 2.5% annual increase in per capita consumption

V: low populatien growth
VI: high population growth 4.0% annual increase inper capita consumption

Table 57. Poultry Total and Per Capita Consumption, 1980-81

Year	Total Consumption	Per Capita Consumption
	- - - - - - - - - lbs - - - - - - - - - -	
1980	4,305,080	29.61
1981[1]	5,216,000	35.26

[1] Per capita figure based on estimated population for 1981.
Source: Unpublished information, Department of Agriculture, Ministry of Natural Resources.

Table 58. Volume and Value of Imports of Dairy Products, 1973-81

Year	Milk[1]		Butter		Cheese	
	1000 lbs	B$1000	1000 lbs	B$1000	1000 lbs	B$1000
1973	5,818.8	2,854.0	703.5	852.1	1,124.6	1,116.8
1974	8,652.3	5,685.1	736.3	1,165.2	1,399.6	1,766.3
1975	NA	NA	NA	NA	NA	NA
1976	4,536.0	4,827.0	561.3	1,037.5	2,755.5	4,580.8
1977	8,612.5	6,712.5	679.3	1,386.0	3,310.8	5,112.5
1978	10,968.5	9,849.8	925.1	1,955.3	2,953.1	5,688.4
1979	15,263.0	12,020.4	234.1	340.6	5,367.8	8,336.0
1980	13,893.6	13,162.3	825.9	1,861.5	3,970.2	9,110.8
1981[2]	NA	14,378.9	NA	204.0	NA	10,399.3

[1] Condensed and evaporated, sweetened and unsweetened at different percents.
[2] January-September only.
Source: Trade Report, several issues, 1973-78; 1979-81 unpublished information, Central Planning Unit, Ministry of Finance.

MARKETING STRUCTURE OVERVIEW

MARKETING STRUCTURE OVERVIEW

Two important factors characterize the market system for livestock and related products. One is the absence of an integrated market structure. The second is the active participation of the government either as a member of the market mechanism, (i.e., buying-selling), or as a regulatory body, (i.e., price controls).

There are no specialized cattle fattening operations in the country, and the extent of pork operations is limited. The major meat processing operation facility, Belize Meats, Ltd. (BML) is owned by the government. The poultry industry, on the other hand, is rapidly developing specialized broiler and egg operations, and successfully taking a higher share of consumer demand. There are currently five commercial broiler slaughter plants which supply the bulk of the market. Only one commercial processing milk operation exists.

At first glance, the livestock marketing system, with the exception of poultry, has been dominated by formula pricing. Livestock auction markets do not exist. Instead, individual contact is established between buyer and seller. Visual inspection is the principal means determining product quality, potential yield, and weight. Bargaining takes place only to a limited extent because an understanding of market strategy is lacking.

Retail price controls on beef and pork products, in existence since the early 1970's, were only recently lifted for higher value beef cuts and pork. However, only minimal information is available with regard to wholesale prices, fluctuations, margins, outlook, etc. Therefore, the buyer as well as the seller operate with little knowledge of existing market conditions, mainly

guided by past experience and "hearsay" information. As a consequence, there is general concern about the middleman (the butcher) on the part of the producer and an added sense that the middleman is receiving an unduly high share of the final price.

The extent to which marketing margins are high in relation to services rendered by intermediaries is difficult to assess. It is widely recognized that existing rudimentary municipal slaughter facilities do not impose high costs on the slaughter process, although a license fee (cess) must be paid at the District Agricultural Office. Transportation costs to the main market center in Belize City, although important, do not appear to take a high share of the market margin. Freight rates in 1981 varied from B$1.25 per 100 pounds from Orange Walk and San Ignacio to Belize City to B$3.50 per 100 pounds from Punta Gorda to Belize City (Belize Marketing Board). Belize is not a large country and the distances products are moved are not great. The main highways to the north and to the west of Belize City are near completion. Unfortunately, the South remains isolated because the highway conditions are very poor. The southern highway presently has a greater impact on transportation of pork than on beef since the South is traditionally a pork production area. While refrigeration facilities in the Central Market in Belize City are satisfactory, they are generally absent in other parts of the country. As a result, most carcasses are rapidly moved to market and meat sold the same day.

Meat processing, with the exception of cutting and packing, is virtually nonexistent, in spite of the relatively high demand for beef and pork processed products which is satisfied through imports. There are a few butchers in Belize City who are processing limited amounts of pork. Processing facilities are available at the BML plant, but currently not in use.

Supermarkets in Belize City are developing rapidly. Although these businesses have meat freezers, the greater bulk of food offered consists of imported products. As a result, the meat market is based at the Central Market, where carcasses are fabricated into retail cuts. In general, hot meat sells at prices lower than refrigerated cuts.

The only commercial milk operation in Belize is owned and operated by Western Dairies in the Spanish Lookout Community. The milk is pasteurized at the Spanish Lookout plant and sold packaged in cardboard containers through the Mennonite Center and the supermarkets in Belize City. Only a small percentage of the milk is processed into cheese. In rural areas and small towns, some raw milk is delivered to consumers or sold daily in local markets.

Slaughter and Meat Processing

Statistics for 1981 indicate that 6,367 cattle and 5,242 swine were slaughtered in inspected facilities in Belize (Table 59). These include slaughterhouses in the major municipality of each district and the plants operated by Carver Tropical Products and Belize Meats Ltd. An unknown, but probably substantial, number of livestock are slaughtered on farms or other uninspected sites. For instance, an estimated 11,580 pigs were slaughtered on farms in 1980 (Table 60). While comparable statistics are not available, it is known that the relatively small number of sheep and goats in Belize are slaughtered on farms. Information on home poultry consumption indicates that a large number of chickens are slaughtered on farms each year.

Sanitary conditions in local slaughterhouses are poor, but generally no worse than those for most local slaughter sites in developing countries. Most Belize slaughterhouses lack any

refrigerated facilities for holding carcasses after slaughter; instead, animals are primarily slaughtered at night and then transported to retail shops and restaurants, many of which have chilling or freezing facilities.

District Health inspectors are responsible for recording slaughter, collecting fees and cess, and inspecting the carcass. However, situations arise when the Health Inspector cannot be present to perform these functions. Generally, carcasses and offal are separated during slaughter, leaving little opportunity to identify disease and parasite problems which could adversely affect meat consumers. Moreover, potentially useful information on animal health problems is lost.

No meat grading service is available in Belize. In some cases demand for meat of higher quality is met by selecting age, sex, and condition of animals to be slaughtered and/or evaluating carcasses after slaughter.

Lack of consistently enforced inspection of all animals slaughtered encourages trafficking in stolen animals and/or their carcasses. Since stolen animals are probably slaughtered clandestinely rather than in public slaughterhouses, once the hide has been removed, there is nothing to distinguish the source of carcass or cut. Retail shop and restaurant buyers have little more than, perhaps, their personal knowledge of the vendor to aid them in avoiding purchasing meat from stolen animals. Stamping the carcass and cuts would be a helpful, but not foolproof, means of identifying meat from animals of known ownership at time of slaughter.

Legislation has been passed to prohibit transportation of meat between districts. In part, its intent is to discourage traffic of meat from stolen animals. Enforcement is slated to begin in

August 1982. This legislation, combined with forced closure of the Belize City municipal slaughterhouse, will mean that meat destined for Belize City market must come from animals slaughtered in the Belize Meats Ltd. plant at Ladyville. The resulting increased slaughter volume is important to the financial success of the BML plant. A major benefit to consumers will be the improved hygienic conditions under which animals are slaughtered and meat processed.

Economic factors, on the other hand, may work against enforcement of the legislation. At present, substantial amounts of meat are transported from outlying districts to Belize City. For example, it is estimated that carcasses from at least two-thirds of the 2,823 cattle slaughtered in San Ignacio in 1981 were destined for Belize City. The reasons for transporting carcasses rather than live animals are clear. Transporting live animals is expensive and the number of trucks capable of carrying these animals in volume is sharply limited. In contrast, several carcasses can be easily, if not always hygenically, transported in a small truck, van, or car. Even though unrefrigerated, traveling in the cooler night hours minimizes risk of spoilage.

Given the concentration of cattle in Cayo and Orange Walk Districts and the relative difficulty and expense of shipping live animals as opposed to carcasses, there will likely be continued opposition to the legislation. Improvement of the western and northern roads further works to the advantage of rapid transportation of carcasses and cuts.

Slaughter costs in the BML plant are at least five time higher than costs incurred at district slaughterhouses. These higher costs act as an additional disincentive to using the BML facility rather than district slaughterhouses.

In order to centralize slaughter at the BML facility, the interests of producers, butchers, and consumers must be served.

Belize Meats Ltd. (BML)

The abattoir and meat packing plant operated by BML is located near the Belize International Airport at Ladyville, about 21 km from Belize City. The plant opened in 1972 under the ownership and management of Belize Meat Packers Ltd. In 1976 it was sold to Belize Livestock Ltd. and leased to a subsidiary of Agro-dinamica Holding Company S.A. Ltd. of Costa Rica. Belize Beef Corporation purchased the plant in 1978 for B$1.5 million. In October 1981 it was resold to GOB for B$1.5 million.

The BML plant was built to meet requirements under the Federal Meat Inspection Act for meat exports to the U.S. Since opening, the plant has regularly passed inspection by USDA Meat Inspectors. In 1981, it exported 102,774 pounds of frozen boneless manufactured beef and 8,693 pounds of beef cuts to the U.S. However, in late 1981 the USDA license was voluntarily surrendered by BML management pending implementation of recommended improvements in equipment and facilities. No difficulties in reinstatement of license are envisioned once these improvements are completed.

Among the requirements for USDA export certification are antemortem inspection of all animals and inspection of carcasses and offal by qualified veterinarians. At present, the BML plant is the only slaughter site in Belize where these inspections as well as a review of hygienic standards in slaughter and fabrication areas are regularly undertaken.

The plant is equipped for cattle and swine slaughter, although sheep and goats can also be handled. It has a rated capacity of

50 head of cattle per 8-hour day, but has never operated at capacity. Due to limited chilling capacity, an estimated 150 to 200 swine could be slaughtered and processed per week but only at the expense of reducing cattle slaughter numbers. Probable substitution rate would be 2-3 pigs per head of cattle.

Plant facilities include corrals and pens for handling animals prior to slaughter, slaughter floor with scalding and dehairing equipment for swine carcasses, refrigerated rooms for chilling and fabricating operations, walk-in room for freezing and storing boxed meat, rooms with some equipment for processing offal, and water and waste treatment equipment. Rooms and equipment for curing and sausage making are present but not operational. Hides are salted and stacked in a building near the abattoir.

Although this is the only facility in Belize currently capable of processing and freezing meat for the export market, the plant design is outmoded and many aspects of plant operation are inefficient. Most operations tend to be labor intensive (e.g., cattle are skinned in floor cradles). Some of the original equipment is now obsolete; in many instances, replacement parts are no longer available. Extensive replacement and renovation of equipment and facilities are needed.

A plan for this refurbishment has been developed by BML management and CDB consultants. The estimated total cost of B$1,344,000 will be covered by a loan of B$1,060,000 from CDB, B$107,000 from the Trinidad-Tobago Counterpart Contribution Fund and B$177,000 from GOB. Project costs and time schedule for phasing the expenditures are:

Item	Cost	Expenditures 1982/83	1983/84
		B$1,000	
Equipment			
Refrigeration	117	117	--
Slaughtering	36	36	--
Rendering	153	153	--
Water treatment	98	92	6
Office	11	11	--
Vehicles	108	108	--
Boiler repairs	5	5	--
Facilities			
Corrals, chutes	70	35	35
Buildings	124	62	62
Technical Services	20	20	--
Contingencies	150	115	35
Interest during construction	59	24	35
Initial operating expenses	393	299	94
Total	1,344	1,077	267

As a result of the plans to refurbish the plant and the enforcement of legislation directing all animals slaughtered in Belize City to BML, the number of animals slaughtered by the plant on a custom basis should sharply increase. However, a principal point of contention by the Butchers and Meat Vendors Association (BMVA) is that the custom slaughter charges proposed by the plant are not in line with the actual product value.

Custom slaughter charges currently quoted by BML management are:

	Per head
Cattle, regardless of weight	B $100
Swine, less 100 lb	$ 12
101 to 150 lb	$ 15
151 and heavier	$ 20
Sheep and goats	$ 12

These charges are substantially higher than those in municipal slaughter houses, B$15 to B$20 per head for cattle.

Charges for cattle slaughter evolved from financial projections which indicated the need for a B$47 per hundredweight of cattle carcass in order for BML to breakeven at a 4,800 head annual kill. These projections incorporated total plant operations, including projected financial consequences of livestock purchase and sale of meat and by-products. Depreciation and debt service added approximately B$15 per cwt to these projected costs. Subsequently, the decision was made not to consider depreciation and debt service, thereby reducing the "breakeven" charge to B$32 per cwt, or B$96 per 300 pound carcass. The decision was made to assign a flat rate charge of B$100 per head with BML keeping the hide.

For comparison, small (20-50 head per day) meat packing plants in the U.S. charge US$8-10 per head for cattle; US$6 per head for swine; and US$8 per head for sheep and goats. The plants also keep the hide and inedible offal.

Thus, the BML custom slaughter charge for cattle is approximately B$80 more per head than that charged in the U.S. In relation to the value of the carcass, BML charges seem especially high compared to those in the U.S. Based on a carcass value of US$614 (the U.S. average for 1981), a custom charge of US$10 represents less than 2 percent of carcass value.

In contrast, using the average dressed weight of 398 pounds for cattle slaughtered at BML and a wholesale price of B$2 per pound, average carcass value would be B$796. The B$100 custom slaughter charge would therefore represent over 12 percent of wholesale carcass value. This added cost would likely be transferred to consumers in the form of increased retail prices.

Table 59. Numbers, Average Dressed Weights and Total Meat Production for Cattle and Swine Slaughtered in 1981[a]

District	Beef Cattle			Swine		
	No.	Dressed wt/lb	Product 1000 lb	No.	Dressed wt/lb	Product 1000 lb
Corozal	576	305	176	745	70	52
Orange Walk	707	342	242	825	75	62
Belize						
Municipal	1,060	286	303	2,297	58	133
BBC[b]	921	398	367	142	115	16
Cayo						
(San Ignacio)	2,823	365	1,030	859	89	76
Stann Creek	222	350	78	100	70	7
Toledo	58	350	20	274	70	19
Overall	6,367	348	2,216	5,242	69	365

[a] Includes only animals slaughtered in inspected facilities.
[b] Belize Beef Corporation, now Belize Meats Ltd.
Source: Dept. of Agriculture, Ministry of Natural Resources.

Table 60. Volume of Home Produced Pork and Estimated Number of Pigs Slaughtered by District, 1980

District	Volume 1000 lb	Number slaughtered[a]
Corozal	42	609
Orange Walk	163	2,363
Belize	4	58
Cayo	3	43
Stann Creek	13	188
Toledo	574	8,319
Total	799	11,580

[a] Estimated using average dressed weight of 69 lb.
Source: Home Production and Consumption Survey (1980).

EDUCATION AND TRAINING

EDUCATION AND TRAINING

Education

Primary and Secondary Education

Belize has a literacy rate of above 80 percent. Primary school attendance for children 6 to 14 is compulsory. Of 209 primary schools, 187 are denominational although the government pays teacher salaries; an additional 15 schools are private. Total primary school enrollment in 1981 was estimated at 36,000 children.

Opportunities for secondary education (forms 1 to 4) are concentrated in Belize City where approximately two-thirds of secondary school enrollment is located. Emphasis tends to be on academic topics in preparation for Ordinary Level exams (O-levels) with 4 to 5 O-level passes necessary for entrance to Sixth Form.

The Sixth Form programs in Belize include St. Johns College and Belize Technical College. Emphasis is on academic studies preparing students for Advanced Level exams (A-levels) necessary for entrance to universities under the British system of education. In 1981, enrollment at these two colleges reached 161 and 141 students, respectively.

Plans have been made to establish junior secondary schools in all districts (except Stann Creek) which will function as vocational high schools with an emphasis on agriculture. These schools are associated with the development of 23 primary schools under the Rural Education and Agriculture Program (REAP) which will develop agriculture related skills.

Post-Secondary Education in Belize

Beyond secondary education, options in Belize include the Belize College of Arts, Science, and Technology (BELCAST), the Belize Teachers College, and the Belize School of Agriculture (BSA). Post secondary education is being reorganized so that BELCAST will function as the coordinating institution for a number of faculties. Within this scheme, BSA would become the Faculty of Agriculture. This organizational plan remains under review. Certain administrative responsibilities have yet to be determined. For example, BELCAST is administered by the Ministry of Education whereas BSA is administered by the Ministry of Natural Resources.

BELCAST

Advance Diploma Courses to be offered at BELCAST beginning August 1982 include:

<u>One-year courses:</u>

1. Accounting
2. Teacher Education (for Secondary and Junior Secondary School)
   Special emphasis on the teaching of one of the following subjects.
   a. English
   b. Spanish
   c. Natural Sciences
   d. Mathematics
   e. Vocational Subjects (including Agriculture)
3. Architectural Technology

Three-year courses:

1. Fisheries Technology
2. Medical Technology
3. Pharmacy Technology
4. Veterinary Technology
5. Science Education (for Secondary and Junior Secondary Teachers).

Entry requirements for admittance to the one-year Advance Diploma Courses include an Associate Degree and/or two "A" level passes. These requirements may be waived for mature students who have working experience in the intended field of study.

Entry requirements for admittance to the three-year Science Education Course or any of the three-year Technology Courses include a High School Diploma plus "O" level studies in Biology, Math, and any of the Physical Sciences.

The course in Veterinary Technology trains laboratory technicians primarily for employment by the Central Veterinary Laboratory.

BSA

The BSA was established in 1977 at Central Farm. Graduation from secondary school (high school) is required. Most students come from rural areas.

From 1977 to 1981, a one-year certificate course was offered in general agriculture. Table 61 indicates the present activities of the 71 graduates of BSA through 1981. Starting in Fall 1981, a two-year option was initiated. The most able students (those with the equivalent of at least a B average), who have completed the one-year certificate course may continue the second year program to qualify for a diploma in Agriculture.

Classroom, library, and dormitory facilities for BSA are located on Central Farm. Lodging is available for approximately 20 first-year and 10 second-year students. There are four full-time faculty members. The resident staff from Central Farm and some MONR staff stationed at Belmopan serve as part-time instructors.

The facilities, equipment, fields, and animals at Central Farm are used to provide actual work experience for students. Since 1981, support for BSA has been made the primary purpose of Central Farm, taking precedence over research and livestock multiplication.

The BSA program is oriented to developing practical agricultural skills. Topics covered the first year include botany, animal science, crop science, pasture science, pest management, farm management, veterinary science, and extension education (Table 62). Students work on supervised activities in each of the ten sections at Central Farm: beef cattle, dairy cattle, swine, calf care, sheep, poultry, farm machinery, agronomy, vegetable production, and horticulture.

Students continuing the second year may emphasize either livestock or crops. Depending on their choice, they work two terms (26 weeks) with livestock and one term with crops or vice versa. During each term of the second year, students complete a project for which they develop a project plan, present progress reports, and complete a final report including economic assessment. Grades earned on these projects constitute one-half of their term grade.

Training Outside Belize

Training opportunities for individuals with areas of interest related to the livestock industry are few. The following

examples indicate advanced training activities that have been provided abroad. CIDA is presently financing four students working on Doctor of Veterinary Medicine degrees. Australia has provided one scholarship for veterinary medicine. One student is in Mexico (financed by the Government of Mexico and the GOB) working in a three-year program on milk technology. Two students are in Guyana studying animal health. Fifteen students are working on a three-year diploma in general agriculture in Honduras. In addition to this support, Belize recently signed an agreement with the Mexican Government to train one student in agricultural engineering, two in veterinary medicine, four in first degree agriculture (diploma level) and four in technician level activities. One student, not yet receiving financial support from the GOB, is working in the U.S. on a dairy science program.

Scholarships

The procedure followed by the Ministry of Education in awarding scholarships to students follows:

1. A scholarship or training program is offered or solicited by the Belizean government.
2. The Ministry writes up the description of the program and advertises the openings.
3. Applications are evaluated and scholarships awarded.

Training participants must sign a bond to work for the GOB upon returning from abroad if a civil service job is available. If GOB employment is not available, they are allowed to work for private firms or for themselves.

Students receive 50 percent of their government pay if single and 80 percent if married when they are in training for more than one year. If the training is less than one year, they receive 100 percent of their pay. This is in addition to their scholarship

proceeds. The Ministry will assist with one-half of the passage for families if it is long-term training.

A partial list of personnel with some involvement in animal agriculture (primarily in the MONR) indicates that with the exception of veterinary science, training to the Diploma level is more common than university degrees (Table 63).

A consequence of the limited numbers of trained personnel is that many individuals with a B.S. degree or higher serve primarily as administrators with little time or opportunity to apply their technical knowledge. Provision of additional traineeships for Belizeans will solve only part of the problem. Suitable positions in the public or private sector must be made available or Belizeans once trained will not return from overseas. Thus, many individuals with the native intelligence and personal drive to seek advanced training are lost to the country.

The need for training agriculturists is great if Belize agriculture is to improve in productivity. These trained people are needed in both private and public sectors, in production and support (e.g., financial) institutions.

Table 61. Current Status of Graduates from Belize School of Agriculture Certificate Course

	1977-1978	1978-1979	1979-1980	1980-1981
Employed in agriculture related fields	16	8	8	7
Employed in other fields	2	6	3	2
Pursuing further studies	1	3	4	11

[a] Of 52 graduates employed: 25 work for GOB (11 in Ministry of Natural Resources), 11 are self-employed, and 16 work in private enterprise.

Source: Report by Opportunities Committee (E. A. Awe, Chairman), Belize School of Agriculture.

Table 62. Belize School of Agriculture Curriculum

Year I Subject	Lecture Hours Per Week	Year II Subject	Lecture Hours Per Week
Botany	2 (1 lab)	Citrus Production	3
Intro to Animal Science	3	Sugarcane Production	3
Agronomy I	3	Banana Production	3
Pest Control	3	Coffee Production	3
Animal Science (2 terms)	3	Farm Mechanization	3
Crop Science	3	Peanut Production	3
Soils	3	Grain Storage	2
Farm Business Management	3	Cacao Production	3
Farm Machinery	3	Agriculture Extension	3
Pasture Science	3	Genetics	3
Agriculture	2	Corn Production	3
Agric. Extension Educ.	2	Rice Production	3
Veterinary Science	3	Sorghum Production	3
Vegetable Production	2	Irrigation, Drainage	3
Soil, Water Conservation	2	Plant Pathology	3
Agricultural Survey, Leveling	2	Entomology	3
Tree Crops	3	Small Stock Production	3
		Poultry Production	3
		Swine Production	3
		Beef Cattle Production	3
		Dairy Cattle Production	3
		Anatomy and Physiology	3
		Animal Nutrition	3
		Dairy Products	3
		Plant Propagation	2

Table 63. Partial List of Persons (Primarily Employees of Ministry of Natural Resource) Whose Training or Position is Livestock Related with Their Educational Background

District	Name	Degree	Institute	Position
Corozal	Bautista A.	Diploma	ECIAF	A.O.
	Ramirez N.	Diploma	SSA (El Salvador)	E.O. II
	Escalante S.	Diploma	U. P. Rico	E.O. I
Orange Walk	Novelo Jose	B.Sc.	U. Florida	A.O. Orange Walk
	Flowers R.	Diploma	ECIAF	E.O. I
	Cooper R.	B.Vs.	U. Bristol	Veterinary Officer
	Clare D.	Diploma	REPAHA	Animal Health Asst.
	Valencia E.	Diploma	Zamorano	E.O. II
	Pech M.	Diploma	Zamorano	E.O. II
Belize	Garcia E.	Diploma	ECIAF	A.O.
	Simmons A.	BVMS	U. Glasgow	Veterinary Officer
	George P.I.	B.Vs.	Ferala State	Veterinary Officer
	Vernon M.	Higher Nat. Cert.	Bristol Polytech	Sr. Lab Technician
	Baldwin A.	Ord. Nat. Cert.	Brooklands Tech Col.	Lab. Technician
	Henriquez T.	Ord. Nat. Cert.	Brooklands Tech Col.	Lab. Technician
Cayo	Vernon H.	B.Sc.		Director, Central Farm
	Cal M.	B.Sc.	U. Florida	Principal, BSA
	Patten A.G.	Diploma	ECIAF	E.O. I
	Tzul A	Diploma	U. Puerto Rico	A.O.
	Betancourt L.	Diploma	GSA	Livestock Officer
	Montero R.	B.Sc.	Michigan State U.	Livestock Officer
	Stafford K.	MVB	U. Dublin, Ireland	Veterinary Officer
	August J.	Diploma	REPAHA	AHA
	Tzul F.	Diploma	SSA	AHA Farm Mgr, Central Farm
	Juan T.	Diploma	SSA	Asst Farm Mgr, Central Farm
	August P.P.	Certificate	Winrock Int'l.	Caricom Farms Ltd.
	Silva B.M.	D.V.M.	U. Guelph	P.V.O.
	Cal J.P.	Ph.D. (Agron)	Cornell Univ.	Mgr. Caricom Farms Ltd.

Table 63. (cont.)

District	Name	Degree	Institute	Position
Cayo (cont.)	Juan E.E.	M.Sc.	U. Arizona	Mgr. Belize Beef Corp.
	Gonzalez L.	B.Sc.	McGill College	CAO
	Pearson W.E.	B.V.Sc.	U. Pretoria	Veterinary Officer
	Neal R.H.	MS	Reading U. (UK)	Prin. Agric. Officer
	Tzul M.R.	Diploma	ECIAF	E.O. II
	Juan R.	Nat. Cer. Agric.	Cumbria Col. (UK)	Lecturer BSA
	Bautista A.	Nat. Cer. Agric.	BSA	Mgr. Agric. Div. DFC
	Parham W.	B.Sc.	UWI	Mgr. Forage Legume Project
Stann Creek	Serrano S.	B.Sc.	UWI	A.O.
	Marin A.	Diploma	REPAHA	AHA
Toledo	Aldana E.	M.Sc.	Reading U. (UK)	A.O.
	Canto G.C.	Diploma	REPAHA	AHA

ABBREVIATIONS:

Institutes:

ECIAF	Eastern Caribbean Institute of Agriculture and Forestry
REPAHA	Regional Educational Program for Animal Health Assistants
BSA	Belize School of Agriculture
Zamorano	Pan American School of Agriculture, Honduras
SSA	Salvador School of Agriculture
UWI	University of West Indies

Positions:

CAO	Chief Agricultural Officer
PAO	Principal Agricultural Officer
A.O.	Agricultural Officer
P.V.O.	Principal Veterinary Officer
VO	Veterinary Officer
E.O.	Extension Officer
AHA	Animal Health Assistant

AGRICULTURAL CREDIT

AGRICULTURAL CREDIT

Agriculture accounts for about 35 percent of total credit administered in Belize. Agricultural credit is used for financing land clearing and development, machinery and equipment, livestock, and agro-industry projects. Formal sources of credit are primarily commercial banks, the Development Finance Corporation (DFC), credit unions, cooperatives, and producer and marketing associations. International sources such as corporations, investment companies, and private individuals represent significant financing for development of Belizean agriculture.

Despite these sources, Belize suffers from an acute shortage of agricultural financing. High interest rates, uncertainty concerning government policies, high costs of administering credit, restrictive credit policies, limited technical expertise in agricultural loan evaluation, and delays in loan approvals discourage the demand for agricultural credit. Investment financing is particularly limiting. Start-up costs for clearing land, fencing and improving pastures, obtaining breeding stock, and constructing buildings and watering ponds are not only high but also require long pay-back periods. Funds to provide long-term investment credit have not been readily available to most livestock producers.

Agricultural Lending

Credit to agriculture has increased from B$22 million in 1977 to B$33.6 million in 1981 (Table 64). However, the increase from 1979 to 1980 was only about B$2 million and from 1980 to 1981, B$1 million.

The two main credit sources in Belize are commercial banks and the DFC. The credit distributed by these institutions to the

agricultural sector is presented in Table 65. The export crops of sugar, citrus, and bananas account for a little less than three-fourths of all credit; sugar alone about one-half of all credit. Credit to the livestock sector amounted to 8 and 9 percent of total credit in 1980 and 1981, respectively.

Credit Institutions

Commercial Banks

Belize has four major banks, all foreign; Royal Bank of Canada, Barclay's, Atlantic, and Nova Scotia. No U.S. bank has offices in the country. The commercial banks carry significant portfolios of agricultural loans (20-25 percent of total portfolio) but almost exclusively in the export sector (sugar, citrus, bananas) and with large scale producers. Interest rates are one to three points over prime, which is currently 18 percent.

Commercial banks have limited experience providing loans to the livestock sector. Loans awarded have, virtually without exception, been made to the large and intermediate size producers who have a record of financial security. Unlike crops, livestock production is considered an economically volatile venture; its success contingent on numerous factors that are not easily anticipated or controlled. In addition, associations involved in the crop sector use producer proceeds as the major source of loan repayment and are viewed as reliable by the banks. However, proceeds from the sale of livestock are not easily controlled by producer associations. As a result, loans made to the livestock industry are seen as a higher financial risk. In fact, at this point, no bank accepts livestock as collateral for loans.

Barclay's Bank has established the "Farm Plan Loans Scheme," a credit plan to assist the small farmer (Appendix II). The objec-

tives are: (1) to provide finances for small farmers (five to fifty acres) who have growth potential, and (2) to help stimulate economic development in rural areas. In addition to being a small enterprise (i.e., assets no more than B$100,000), the farmer should: (1) have a ready market for the produce, preferably with sales made to an established marketing association, the BMB, or a private buyer under contract, and proceeds mandated to the bank; (2) have experience and/or knowledge of farming; and (3) have a good record of credit. Loans reach a maximum of B$30,000 of which B$15,000 may be unsecured; repayment may be up to ten years; and interest is at commercial rates but limited to one and one-half percent over base rate. Loans may be used for (1) land clearing and preparation; (2) purchase of seed, insecticides and stockfeed; (3) harvesting; (4) purchase of land, equipment and livestock, and (5) construction of farm buildings, roads, etc. At present, lack of funding has prevented extensive use of this credit system.

Development Finance Corporation

The Development Finance Corporation (DFC) was created in 1961 as a fully owned government statutory corporation (see Appendix III for "What is the DFC? What Does It Do? How Does It Function?"). The organization scheme of the DFC includes about 54 people. The General Manager, a political appointee, reports to the Prime Minister and oversees the day-to-day management. A Board of Directors has been instituted to supervise, administer, and control overall policy.

The Corporation carries out the following specific activities:

(1) Offers medium to long-term development credit for the agricultural, forestry, fishing, tourism, industrial, housing, and service sectors;

(2) Provides technical assistance to potential borrowers and prospective investors;
(3) Undertakes equity investment in selected projects;
(4) Develops and operates industrial parks;
(5) Administers loan funds of other agencies, including student and small farmer schemes; and
(6) Undertakes investment promotion for the government.

Loan Program. The DFC loan program from 1973 to June 1982, by sector, is presented in Tables 66 and 67. Out of a cumulative loan portfolio of B$47.9 million, agriculture accounted for B$26.1 million or approximately 55 percent. Livestock, poultry, and dairy accounted for B$3.9 million or about 15 percent of total agricultural lending. Over this period, DFC granted a total of 3,825 loans, the greater share to individuals. The average loan to individuals was B$8,895 and to farmer associations, B$95,688.

Table 68 shows the number of loans approved by sector and year from 1976 to 1980. The number of agricultural loans per year fluctuated, but the total value increased from B$2.3 million in 1976 to B$3.6 million in 1980. The number of loans made to livestock producers varied between 10 and 25 per year, and represented the second highest sector loan value in 1980. Preliminary information indicates that the volume of loans for agriculture, forestry, and fishing declined to B$2.9 million in 1981.

Credit Lines. Three lines of credit are available for agriculture at DFC. They are:

FIC - Farm Improvement Credit
APC - Agricultural Production Credit
AIC - Agriculture Investment Credit

The FIC line of credit has been in existence since 1973. Through 1980, a total of 380 loans were approved for a value of B$8.5 million. In 1980, 57 loans were approved for a total of B$1.3 million. The purpose of FIC loans is to assist small commercial farmers in expanding their existing operation. The current rate of interest is 10 percent and the length of the loan is 5 to 15 years. Loans can be used for machinery, tractors, land clearing, etc. Loan size may be from B$3,000 to B$150,000. Those over B$100,000 must be approved by CDB.

The APC line of credit is funded by USAID and has been in existence since 1977. An evaluation of this program was completed last year but was not available for review. A total of 651 APC loans or B$1.6 million have been approved through 1980. In 1980 there were 217 loans approved, for a total value of B$.6 million. The original purpose of APC was to provide crop production loans to small farmers (farm size of 30 acres or less). The maximum loan was B$8,000, at an interest rate of 12 percent. Repayment has been good partially because proceeds from crop sales have been withheld by the BMB to repay DFC.

Under existing guidelines, it became clear that DFC would be unable to utilize the full US$2.4 million available to them. The guidelines were changed in early 1982 to allow farmers to borrow money for livestock purchases and land improvements. The repayment period was extended to five years. In a space of three months, 24 loan requests averaging about B$6,000 were received. However, unless the program is extended, the DFC will still have approximately US$750,000 uncommitted which will be rescinded by CDB.

Preliminary assessment indicates that the APC program has had positive results. Belize moved from a deficit to surplus position in several basic crops. The change can be partially attributed to this credit program.

The AIC line of credit is earmarked for larger investment projects. The maximum loan is B$200,000 with an interest rate of 12 percent. Minimum net worth of the borrower is B$150,000. The loan program is available to expatriots who have lived in the country a minimum of five years. Repayment ranges from 5 to 20 years. Loan proceeds can be used for land clearing, livestock development, fencing, tractors, and some forms of housing. They may not be used for land purchase.

CDB has had some problems administering this program. Minimum tranches are set by CDB at US$100,000 to US$200,000, with a holding fee of 1 percent assessed on amounts not yet disbursed. Thus, if DFC receives an amount from CDB, and is unable to disburse the entire quantity in a reasonable time frame, a 1 percent holding fee is required.

Staffing. While the present level of staff training is adequate, staff experience with livestock loans is limited. Livestock loans are made on a project-by-project basis with little available technical data and analysis. Budget analysis for livestock operations are not made and information on cost of production is not gathered in an organized way. With the exception of studies by Belisle and Brabyn, the profitability of livestock operations has not been seriously analyzed.

Field Operations. DFC has offices in all districts of Belize. Loan officers can approve loans up to B$3,000 on their own and up to B$8,000 with consultation from the Central Office. Loans can be approved within seven days, but in general is a more lengthy process. Procedure requires that the DFC pay for items directly rather than giving the farmer the loan proceeds, although the latter does occur.

Credit Constraints

Credit constraints faced by Belizean livestock producers can be summarized as follows: (1) limited investment credit, (2) uncertainty about government policies, (3) orientation and experience of credit institutions in administering livestock credit, and (4) loan security.

Limited Investment Credit

Most agricultural credit in Belize has traditionally been for crop production with a payback of less than one year. Investment credit, with paybacks from 5 to 15 years, has generally been limited to large scale development projects. It is estimated that less than 10 percent of the cattle producers have obtained investment credit, even though access to long-term investment credit is needed for the individual farmer to become established in livestock production. Unless he is able to secure investment credit, limited reserves will allow him to expand at an extremely slow rate.

Uncertainty about Government Policies

Because of frequent changes in government policies, livestock producers and loan officers are not secure with their projected costs and returns. The expected consequences of market controls such as restricting movement and trade of livestock and meat, slaughter weights, and slaughter of specific species, must be determined and thoroughly analyzed to reduce producer uncertainty and encourage long-term investment.

Orientation and Experience of Credit Institutions

The orientation and experience of Belizean credit institutions have not been in the direction of livestock loans. Livestock producers are not well represented on the Board of Directors of credit agencies, and thus their needs are not adequately expressed at the policy making level. In addition, the lack of budget and production cost information on livestock enterprises makes the assessment of credit needs and the loan decision-making process difficult.

Loan Security

Current guidelines for securing loans limit the livestock producer's ability to increase his herd size within a reasonable length of time. Security requirements equal to 133 percent of loan value are difficult to meet, especially in a country where land values are minimal relative to other costs of production. The breeding herd represents the major investment cost to the producer so the amount of assets he has in land, equipment, and buildings will seldom be sufficient to cover 133 percent of loan value. Only those producers with substantial assets either in crop agriculture or other sectors will be able to utilize significant quantities of investment credit.

Table 64. Loans Outstanding to Agriculture, 1977-1981, Belize (B$1,000)[a]

1977	21,896
1978	24,311
1979	30,097
1980	32,592
1981	33,551

[a] Does not include loans to agro-industries.
Source: The Monetary Authority of Belize.

Table 65. Loans Outstanding in Agriculture by Sector as of December 31, 1980 and 1981, Belize (B$1,000)

Sector	1980			1981		
	Commercial Banks	DFC	Total	Commercial Banks	DFC	Total
Sugar	12,553	3,580	16,133	13,293	3,585	16,878
Citrus	2,514	233	2,747	2,128	428	2,556
Rice	2,751	133	2,884	3,025	241	3,266
Bananas	3,585	1,502	5,087	3,011	1,390	4,401
Poultry/Eggs	162	61	223	133	97	230
Cattle/Dairy	757	1,719	2,476	855	1,925	2,780
Honey	85	62	147	104	65	169
Land Clearing/Prep.	365	--	365	177	--	177
General/Misc.	1,287	1,243	2,530	1,360	1,734	3,094
Total	24,059	8,533	32,592	24,086	9,465	33,551

Source: The Monetary Authority of Belize.

Table 66. Development Finance Corporation Loan Portfolio, 1973 Through June 1982, (B$)

Livestock	3,625,234
Citrus	1,792,856
Sugarcane Production	5,660,257
Sugarcane Machinery	2,418,188
Corn	1,366,387
Rice	1,062,310
Poultry	209,938
Bananas	2,754,647
Fishing	2,617,800
Forestry	373,000
Mixed Farming	1,243,943
Vegetables	98,095
Beans	284,110
Dairy	68,597
Agro-industry	1,501,956
Tobacco	350,000
Agriculture (other)	704,791
Subtotal	26,132,109
Tourism	3,952,262
Industry	4,205,141
Services	2,768,620
Student Loans	725,118
Housing	10,076,255
Subtotal	21,727,396
Grand Total	47,859,505

Source: Development Finance Corporation

Table 67. Development Finance Corporation Loan Portfolio by Beneficiary Group, 1973 Through June 1982

Beneficiary	No. of Loans	Value (B$)	Average Size Loan (B$)
Individuals	3,663	32,580,709	8,895
Private Companies	45	6,290,972	139,799
Farmer Associations	59	5,645,585	95,688
Cooperatives & Credit Unions	58	3,352,231	57,797
All	3,825	47,869,497	12,515

Source: Development Finance Corporation

Table 68. Development Finance Corporation, Number of Loans Approved and Value of Loans by Sector and Year, 1976-1980

Sector	1976		1977		1978		1979		1980	
	No.	B$	No.	B$	No.	B$	No.	B$	No.	B$
Sugarcane Prod.	15	205,285	126	345,392	158	363,688	51	1,079,763	64	1,376,048
Sugarcane Mach.	3	144,565	3	111,950	12	354,642	8	210,500	7	249,480
Citrus	3	547,758	2	33,352	1	25,000	5	149,072	8	279,004
Bananas	1	160,551	-	--	31	714,832	-	--	-	--
Livestock	17	328,267	25	724,559	19	331,365	12	267,845	10	735,838
Poultry	2	32,880	-	--	4	3,668	1	34,000	1	6,200
Agro-industry	-	--	5	235,018	3	136,600	1	36,000	4	202,100
Fishing	8	266,400	1	175,000	8	446,000	8	479,980	8	93,110
Forestry	1	19,000	-	--	-	--	-	--	1	220,000
Rice	73	148,847	41	78,600	39	140,306	55	61,902	34	214,653
Corn	157	269,729	72	90,155	17	14,796	44	36 507	90	101,304
Vegetables	-	--	-	--	1	7,505	2	27,935	2	17,555
Mixed	28	127,150	14	65,533	15	63,898	13	346,419	34	69,239
Apiculture	10	10,260	1	600	3	20,790	-	--	-	--
Dairy	1	4,000	-	--	1	32,437	1	3,700	-	--
Tobacco	-	--	-	--	1	350,000	-	--	-	--
Other	7	60,978	2	70,600	11	25,113	5	201,748	46	47,825
Total Agriculture	326	2,325,670	292	1,930,759	324	3,030,645	206	2,935,371	309	3,612,356
Total DFC	420	4,115,091	400	4,715,884	463	6,674,356	326	5,624,497	478	8,054,979

Source: Development Finance Corporation

AGRICULTURAL POLICY

AGRICULTURAL POLICY

In order to understand how agricultural policy relates to the livestock industry in Belize, a review of agricultural administration is presented in terms of present organization, policy decision bodies, and policy analysis support services. Next, current legislation impacting upon the livestock industry is discussed. Finally, an evaluation of policy effects on production is presented.

Agricultural Administration

Present Organization

Agricultural policy is formulated by the Ministry of Natural Resources in collaboration with other government agencies. An organizational chart of the Ministry is presented in Table 69. The line of authority runs from the Minister to the Permanent Secretary and then to the various departments. The Department of Agriculture is led by the Chief Agricultural Officer who oversees the divisions of extension, education, research and development, livestock, information, and economics.

A number of official and semi-official agencies interact with the Ministry although their relationship is not indicated in the organization chart. These agencies are: (1) parastatals, such as the Belize Marketing Board, the Banana Control Board, and the Belize Sugar Board; (2) associations such as the Belize Livestock Producers Association, the Cane Farmers Association, the Citrus Growers Association, and the Banana Growers Association; (3) commissions such as the Meat and Livestock Commission; (4) authorities such as the Belize Land Development Authority; (5) councils such as the National Research and Development Council;

(6) committees such as the National Extension Planning Committee; (7) quasi government corporations such as the Development Finance Corporation, Belize Beef Corporation, and Belize Meats Ltd.; and (8) other units of government such as the Central Planning Unit, the Ministries of Trade and of Finance. It is known, for example, that the Belize Marketing Board reports to the Ministry of Natural Resources but relies on the Ministry of Finance to support purchases of basic commodities. The Belize Sugar Board reports to the Ministry of Trade but the sugar industry relies on the Department of Agriculture for extension and research and the Development Finance Corporation for credit.

A description of functions, activities, and personnel of selected sections of the Ministry, related to the livestock sector, is presented in Table 70.

Functions of the Ministry of Natural Resources include: (1) regulation, including meat inspection, slaughter, land subdivision, and taxation; (2) service, including extension, research, machinery hire, and veterinary; (3) education through the Belize School of Agriculture; and (4) policy formulation such as price supports for basic commodities and control of movement of meat and live animals.

Budget Support

The approved budget for 1981/82 and the estimated budget for 1982/83 for the Ministry of Natural Resources are presented in Table 71. They amount to B$9.2 and B$10.5 million, respectively.

Policy Decision Bodies

The highest level of authority rests with the Prime Minister and Legislature. Government policy is coordinated by the Cabinet. At the level of the Ministry of Natural Resources, policy is proposed by the governing boards of the different government agencies. Despite the large number of policy-making groups, coordination of policy should be effective due to the interlocking of members across the governing boards. For example, most governing boards will be represented by either the Minister, Permanent Secretary, or Chief Agricultural Officer (Table 72). Therefore, policy proposed by the Marketing Board should be consistent with policies of the Development Finance Corporation and the Price Control Division of the Ministry of Trade.

Policy Analysis Support Services

Although there is interlocking of members across policy decision bodies, coordination is hampered by the lack of a single unit of government responsible for providing members with ex ante evaluation of the impact of particular policies on prices, income, welfare, as well as implementation costs and other relevant issues. Although a remarkable effort has been made in collecting statistics, their use is restricted to occasional publication rather than comprehensive policy evaluation. Four examples illustrate this point.

The Department of Agriculture has a Division of Information and Economics but only one agricultural economist. The Department does not assume responsibility for analysis of policies that cross over several departments and agencies.

The Development Finance Corporation has a staff of three agricultural economists. However, their major responsibility is finan-

cial analysis of enterprise and project investment rather than analysis of the impact of alternative pricing policies.

The Marketing Board is more heavily involved with mechanics of buying, selling, and storing of basic commodities rather than with policy analysis of issues such as the effects of low cost machinery services on production of those commodities.

The Central Planning Unit which reports to the Financial Secretary of the Ministry of Finance, is involved with broad issues such as constructing national accounts, gathering data on exports and imports, and administering and monitoring aid programs. Little analysis is done on policy issues, particularly as they may affect a specific ministry.

Legislation Impacting Upon the Livestock Industry

Price Policies

The government of Belize has the authority to control and regulate the retail, wholesale, and farm level price of supplies and services essential to the life of the community. The Manifesto for the New and Progressive Revolution states that the government will pursue a flexible policy of price controls to protect the consumer from abuse and to make essentials available to all. The basic authorities are given in the Supplies (Control) Ordinance, 1963 and the Marketing Board Ordinance, Chapter 106, Laws of Belize 1949.

Supplies (Control) Ordinance, 1963. The purpose of this Ordinance is to "provide for the maintenance of supplies and services essential to the life of the community and for regulating the import and export of such supplies, the prices of which such supplies may be sold and for other purposes connected there-

with." A major addition to this Ordinance was made in 1972 to determine the method for arriving at the maximum wholesale and retail prices of imported goods, and the maximum retail price of domestic products. The 1972 regulation posted prices for local produce of several commodities including beef and pork. Statutory instruments have been used to periodically change prices of domestic products and methods of pricing imported goods.

Table 73 illustrates the maximum retail prices for beef from 1970 to 1982. Prices for higher value beef cuts were decontrolled in January, 1982. Prices and structure have been modified over the years to reflect changes in cuts of meat. Retail price controls for pork are given in Table 74. Pork prices for all cuts were held at the same level from 1973 until 1980, when varying prices were assigned to the different cuts. All price controls on pork products were lifted in January, 1982.

For comparison, Tables 75 and 76 show the domestic control prices of fish and seafood, and sugar, respectively. In both cases, the domestic prices are significantly below the prices received on the export market.

Marketing Board Ordinance. This Ordinance states that the Marketing Board, with the consent of the Minister of Agriculture, may:

(a) buy and resell any product, animal, substance or commodity grown or produced or of which the final process of manufacture has been performed in Belize;

(b) operate mills and plants for preparing and processing any product of Belize; assist producers in the cultivation, production, manufacture and marketing of products of Belize;

(c) trade and deal in feeding stuffs for livestock, seeds, fertilizers, and insecticides;

(d) establish depots and agencies for the purchase, sale, and delivery of products of Belize;
(e) act as commission agents for the disposal of products or purchase of supplies;
(f) lend money to aid producers;
(g) pay dividends;
(h) deal in commodities other than products of Belize where it is necessary to maintain supplies.

Although the Marketing Board has been given these broad powers, their activities have primarily been limited to buying, selling, storing, and processing rice, corn, beans, and feedstuffs. The Board has not been involved in buying and selling of livestock and poultry products.

Marketing Controls

Market controls in the livestock industry attempt in part to protect the health of the consumer and restrict the importation of diseased animals. The 1977 Meat and Livestock Ordinance, with Amendments in 1980, 1981, and 1982 (see Appendix IV), is intended "to provide for the establishment of the Meat and Livestock Commission for the development of the livestock industry, for the control of the slaughter, export and import of cattle, and for the imposition, levy and collection of cess on cattle sold to butchers or for export and for matters connected therewith or incidental thereto".

The powers and duties of the Commission include the following:
(a) register and regulate cattle breeding societies;
(b) hold or operate livestock sale auctions;
(c) control female livestock slaughter;
(d) impose minimum weight restrictions on all livestock slaughter;

(e) regulate the movement of catle and meat within and between districts;
(f) grade livestock and meat and specify the standards applied;
(g) control the sale and exportation of live cattle to be used for breeding or slaughter;
(h) control the importation of live cattle for slaughter or breeding;
(i) operate meat packing plants;
(j) establish depots and agencies for livestock purchase;
(k) advise exporters, traders, and the association on any matter pertaining to the meat and livestock industry;
(l) advise the Minister on all matters concerned with the meat and livestock industry.

The Commission consists of two ex-officio members and seven permanent members appointed by the Minister.

The Ordinance also established the Belize Livestock Producers Association (BLPA) to promote the livestock industry. BLPA can negotiate with companies approved by the Minister and advise on prices paid for livestock. Every producer is eligible for membership in the Association. It is managed by a Committee of eight members elected at the Annual General Meeting. The Association, with the approval of the Minister, imposes levies and collects cess for all cattle sold, either domestically or for the export market.

The Amendment to the Ordinance in March of 1981 prohibited, except under a certificate issued by the Principal Veterinary Officer or a person authorized by him, the (a) slaughter of any cow or heifer, (b) slaughter of any heifer, bull, cow, or steer under 650 pounds liveweight, and (c) the transport or movement of any cattle or meat in excess of 25 pounds from one district to another.

These regulations were designed to promote expansion of breeding herd inventories and to aid in the control of cattle rustling. It is not apparent whether an effective control has been established in carrying out these regulations.

Export-Import Regulations

There are no regulations in Belize on the purchase and sale of foreign exchange at the official rate. Export and import licenses are required from the Ministry of Trade for most goods. For example, import licenses are required for barbed wire, butter, cattle, corn, eggs, fertilizer, hides and skins, meat, milk, pork products and sheep. Export licenses are required for cattle, corn, eggs, hides and pelts, meat, milk, pigs, pork products, poultry, and sheep.

In general, there is a favorable outlook on export promotion. Only two areas of export commodities have export duties: (1) a 5 percent ad valorem on lobsters, shrimp and fish; and (2) a 2 percent ad valorem on sugar. Import duties represent about 40 percent of total government revenue but emphasis is placed on consumption goods. The following list provides an illustration:

Live animals	Duty Free(D.F.)
Meat and edible offals	D.F.
Poultry backs, necks, wings	D.F.
Other poultry (including whole) & sausages	15%
Salted pork and beef and canned beef	5%
Bacon, ham, dried beef	10%
Milk and cream, fresh and preserved	D.F.
Butter, cheese, and eggs for consumption	5%
Eggs for hatching	D.F.
Beet and cane sugar and molasses	45%
Bran, etc.	D.F.
Food for pets	30%
Gasoline	32¢/gal
Kerosene	D.F.
Anhydrous ammonia	30%
Antibiotics and pharmaceuticals	D.F.
Grain	D.F.
Fertilizers	
Ammonium sulfate, ammonium nitrate, urea	12.50/ton

Tractor tires and tubes	25%
Raw hides and skins	D.F.
Bovine leather	15%
Agricultural machinery and equipment	5%
Tractors for agriculture	D.F.
Lorries, trucks and vans	35%

Export-import policy is generally favorable to investment in agriculture, particularly for the livestock industry. No export duties exist for livestock products and import duties encourage local production. Input supplies for the livestock industry and capital investment items are either duty free or have low import duties.

Land Purchase and Development

Current policies favor land ownership and development. Prices of land vary according to location, development, accessibility, etc. Average prices range from B$15 to B$3,000 per acre, depending on production potential and the extent to which land has been developed. Since the mid-1960s, there has been an emphasis on land development for sugar, food crops (i.e., rice, corn, and beans), and pasture.

Important policies directing the development of land include the Land Tax Ordinance Chapter 44, last amended in 1971; the Rural Land Utilization Ordinance, 1966; the Aliens Landholding Ordinance, 1973; the Registered Land Ordinance, 1977; and the Belize Land Development Authority Ordinance, 1980.

Land Tax Ordinance. The current land tax is shown below:

	B$/per acre
Savannah (wet, dry, scrub, and swamp)	12
Savannah (good pasture, land subject to inundation)	14
Pine Ridge - 1st class	20
2nd class	16
3rd class	16

	B$/per acre
Low Forest (Akalche)	18
Medium and High Forest	25
High Forest	30

In addition, land within one mile of any road maintained from public funds will be taxed B$.30 per acre and land between one and ten miles will be taxed B$.15 per acre, provided the parcel exceeds 60 acres in area.

Rural Land Utilization Ordinance. This Ordinance provides for the annual levy and collection of an additional tax on all rural lands exceeding 100 acres in size. It taxes undeveloped land (on a graduated scale) ranging from B$3.00 per acre for land within two miles of a publicly maintained road to B$.50 per acre for land beyond the two mile limit. This tax does not apply to rural lands to which permanent improvements have been made or to land holdings of less than 100 acres.

Aliens Landholding Ordinance. This Ordinance is designed to discourage land speculation and encourage land development by aliens and alien-controlled companies.

To purchase land from private landowners in excess of one-half acre within a city or town or in excess of ten acres outside a city or town, an alien must obtain a license from the Ministry of Lands. The license must be recorded in the General Registry as a Deed. The terms and duration are negotiable. Once the conditions of license have been fulfilled to the satisfaction of the Minister, a certificate declaring the license no longer voidable is granted.

No regulations have been made governing the issuance of licenses. However, in the case of agricultural land, the general requirement is that the licensee agrees to develop at least 10 percent of the arable land annually until all such land is developed.

Government owned (crown) lands are only available to nationals. These lands will be made available to non-nationals on the following conditions:

(1) that the development scheme contributes to the national economy and provided that suitable private lands cannot be obtained;

(2) that allocation of lands to non-nationals will be normally confined to depressed areas of the country to stimulate development in those areas.

Leasing Crown Lands. Land in Belize is considered either crown or freehold property. Crown lands may be leased from the government. Since 1972, lease payment has been applied to the purchase price of the land. Depending on whether the land has been surveyed, there may be either a lease agreement or lease fiat. A lease agreement usually lasts for 20 years. The lease fiat may be obtained if there is an adequate description of the property or if it has been surveyed. It usually lasts for 25 years. Conditions for the lease fiat are drawn up and recorded at the General Registry. Such a document can be used for collateral with the DFC. Rent payments can be reviewed and increased up to 6 percent of the unimproved land value. No land tax is paid for leased crown land.

Once the land is adequately developed, the leasee is interviewed by the Land Officer in charge of the District and a request for title is made. If the land is shown to be adequately developed, application for purchase is granted. The purchase price is stated and the balance paid after rent payments are deducted. If application is approved, an exact survey is made and recorded at the General Registry, and the Deed is granted, thus becoming a freehold.

Smallholders generally hold land on a lease basis whereas the majority of large holders have titles to their property.

Belize Land Development Authority. This authority has only recently been established. Its purpose is to promote the development of land. Few guidelines are presently available, exclusive of the Ordinance itself (see Appendix V).

Evaluation of Agricultural Policy Effects

In spite of high production costs and inefficient technologies, the Belizean farmer has been highly motivated to increase agricultural production. In a matter of a few years, Belize has gone from a net import position on basic commodities to one of self-sufficiency with some commodities available for export.

Government policies acting as incentives to increasing agricultural production are: (1) high support prices for basic commodities; (2) favorable export markets for sugar and citrus; (3) low import tariffs on feeds, fuels, drugs, machinery, breeding stock, etc.; (4) low or non-existent export tariffs on agricultural commodities; (5) import duty protection on domestically produced goods; (6) low land costs, i.e., land prices, land tax and lease payments; (7) subsidized machinery services for land clearing, preparation and harvesting; and (8) subsidized credit through the DFC.

However, certain government policies have acted as disincentives and constrained agricultural production, including the following: (1) controlled domestic prices for several agricultural commodities including beef, pork and sugar; some price controls have been removed, but others remain; (2) low financial support for technology transfer including extension services, farming systems research, and supervised credit; (3) uncertainties relative to

government policies in areas such as price support levels, market controls, payments for government purchases, and cost of machinery services; and (4) high costs of production relative to import costs.

Certain government policies have had both positive and negative effects on agricultural production. The case of price supports for corn serves as an example. Price supports have encouraged corn production. However, without a broad tax base to finance the price supports, the government has been unable to meet payments to producers. In addition, it has been unable to sell corn at the price paid. Consequences include: 1) large government stocks of corn for which storage facilities are not adequate, 2) uncertainty among corn producers because the government cannot pay them, and 3) livestock productivity has suffered because the price of corn is too high to use as feed.

Overall, the agricultural sector in Belize seems highly responsive to government policy. However, disciplined evaluation and comprehensive analysis of potential effects of policies prior to their implementation should be undertaken.

Table 69. Staff Organization Chart for Department of Agriculture, Ministry of Natural Resources

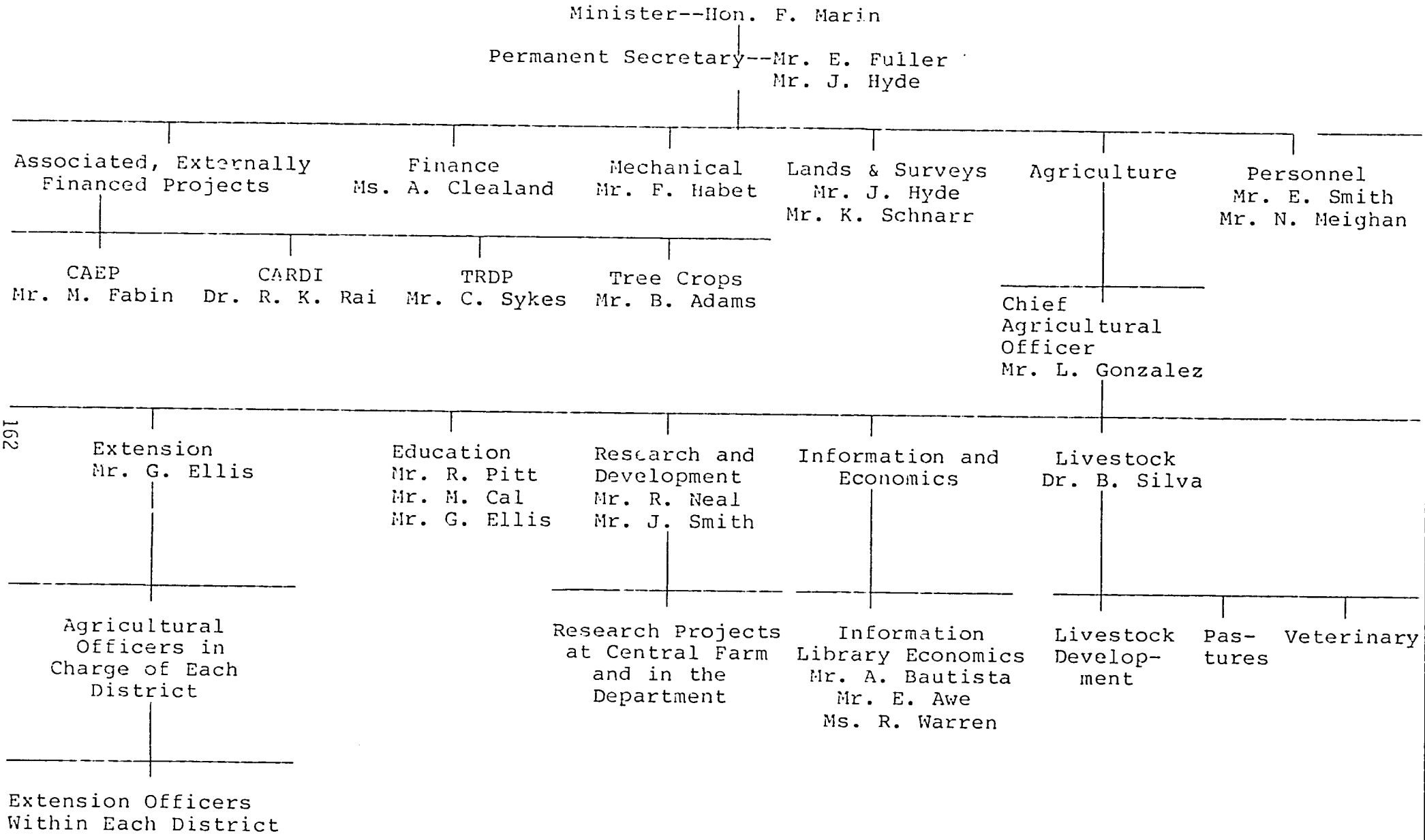

Table 70. Description of Selected Sections of the Ministry of Natural Resources

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Central Administration

Departments: Agriculture, Forestry and Wildlife, Survey and Lands.
Subjects: Agriculture, Lands and Land Settlement; Land Surveyors; Domestic Marketing; Security of Tenure; Surveys; Veterinary and Animal Health; Banana Control Board Forestry, Geological, Surveys, Minerals, Petroleum.
Staff: 44 officials.

General Administration

Description: Functions include:
Initiation and review of policy affecting Agricultural development,
Supervision of operating divisions,
Overall planning in Agricultural development.
Staff: 5 officials, headed by the Chief Agricultural Officer.

Mechanical Services

Description: Functions include:
Use and maintenance of farm machinery and implements and departmental transport;
Carrying out field demonstrations and advising farmers on selection of equipment,
Land preparation, etc., for farmers on hire basis.
Labor force: 109.
Equipment: 27 Land Rovers, 33 wheel tractors, and other.

Agricultural Extension Services

Description: Functions include:
Preparation, production, and distribution of printed popular and technical information on agriculture,
Supplying such materials as the public may need on agricultural matters,
Holding interviews and preparing radio programs on various agricultural subjects,
Participation in agricultural shows.
Staff: 30 officials.
Labor force: 15.

Table 70 (con't)

Research and Development

Description: Functions are the operation and maintenance of agricultural stations and in particular the crop research done at these stations which aims to:
- Increase production of local crops to achieve self-sufficiency,
- Improve the productivity of agricultural crops,
- Develop plants which are resistant to pests and diseases,
- Find ways of improving agricultural practices.

Staff: 15 officials.

Livestock Improvement

Description: Functions include:
- The promotion of livestock development through artificial insemination,
- Advisory services in the field of livestock,
- Livestock and forage legume research,
- Veterinary services,
- Management of veterinary inspection stations.
- The total herd owned by Government is 1,350 animals.

Staff: 47 officials.
Labor force: 100.

Lands Administration

Description: Functions include:
- Administration of lands in the country, land tenure,
- The assessment and collection of land tax, rural land utilization tax,
- Examination of applications for land and granting of leases, transfers, etc.,
- The acquisition of lands for public purposes,
- Development of land policy,
- Correcting and issuing of certificates under the Registered Lands Act.

Staff: 29 officials, headed by the Lands Commissioner.

Pig Production

Description: Functions are the operating cost and maintenance of the two pig breeding units established during 1976 at Yo Creek and Central Farm under U.K. Aid and Heifer Project International respectively, three smaller units have been established in the Stann Creek, Corozal, & Toledo Districts. The offspring will be distributed to farmers for the purpose of better liveweight gains, more efficient meat production and import substitution.

Table 70 (con't)

Animal Health

Description: This subhead includes the following functions:
- Operation and maintenance of the Veterinary Laboratories,
- Management of Veterinary Inspection Stations,
- Survey and control of livestock diseases (rabies, hog cholera, etc.),
- Indemnity Awards for destruction of livestock during disease control operations,
- Meat inspection for local consumption and export.

Agriculture Training

Description: The main function is the training of students at Belize School of Agriculture.

Quarantine Services

Description: The main function is to provide quarantine units at the entry points to prevent the entry of disease and pest of plants and animals.

Source: "Estimates of Revenue and Expenditures for the Year 1982/83." Government of Belize.

Table 71. Approved 1981/82 and Estimated 1982/83 Budgets, Ministry of Natural Resources

Activity	Estimates 1982/83	Approved Estimates 1981/82
	- - - - - - B$ - - - - - -	
Central Administration	1,213,924	1,063,565
General Administration	264,814	258,031
Mechanical Services	808,919	2,163,459
Agricultural Extension Services	403,407	368,161
Crop Research & Development	458,598	397,575
Livestock Improvement	989,312	886,091
Lands Administration	467,530	372,809
Surveys and Mapping	1,903,330	1,572,443
Sale of Maps	15,000	10,000
Pig Production	81,000	74,000
Animal Health	138,000	120,000
Agricultural Training	134,242	88,000
Agricultural Show	30,000	24,200
Revenue Producing Operations	75,000	25,000
Forestry Operations	594,909	532,729
Western Division	404,000	343,000
Southern Division	363,000	284,000
Research Division	49,100	38,500
Forest Management	89,200	71,000
Mechanical Devision	236,000	201,000
Geological Services	39,200	28,200
Seed Lumber Production	150,000	126,000
Belmopan Woodwork Shop	147,360	120,000
Bee Keepers	68,216	
Quarantine Service	111,842	
Land Development Authority	1,256,086	
Total	10,491,989	9,167,763

Source: "Estimates of Revenue and Expenditures for the Year 1982/83." Government of Belize.

Table 72. Membership in Policy-Making Groups

Present Membership	Proposed Members
Meat and Livestock Commission	
Permanent Secretary MONR	
Principal Veterinary Officer	Three members representing Livestock Producers yet to be chosen.
Leslie W. Sharp, John Carr, and Orlando O. Orio, Sr., representing Belize Livestock Production Association.	Mr. Fred Smith, Principal Public Health Inspector is appointed in place of Frank Staine, Mr. Louis Luc, Manager Belize Meats, Ltd., appointed.
Winston Smiling, representing Trade	
Frank Staine and Daniel Meighan, manager of Belize Beef, representing Consumers	
Belize Land Development Authority	
E. W. King, Chairman	
Permanent Secretary, MONR	Members remain the same for another year.
Financial Secretary	
Alvaro Bautista	
Godwin Hulse	
E. Garcia	
David Shaw	
Blas Rosales	
Belize Marketing Board	
L. A. Espat, Chairman	
Chief Agric. Officer	The chairman has been asked to recommend any changes.
Financial Secretary or Representative	
Senator Juan Chun	
A. Matus	
Lorenzo Tun	
Trade Administrator	
General Manager, Secretary	
Banana Control Board	
F. J. C. Curtis, O.B.E., Chairman	Members remain the same.
Clifford Augustine, Rep. Ban. Growers Association	
Antonio Zabaneh	
Financial Secretary	
T. Vernon, Rep. Trade, and Industry	
Eric King, O.B.E., Rep. M/Res.	
W. J. Buckland--Re. Commonwealth Dev. Corp.	

Table 72 (cont.)

Present Membership	Proposed Members
Managing Committee:	Members remain the same.
Belize School of Agriculture Permanent Secretary, Chairman Chief Agricultural Officer Chief Education Officer Deputy Registrar, Belcast Resident Director M. Cal, Principal BSA, Secretary Norris Wade, Manager Hershey's Independent members appoint. A. Cawich, Research Officer B.S.I. by Minister	
National Research and Dev. Council Chief Agricultural Officer, Secretary Principal Agricultural Officer (Research and Development) Secretary Densle Jenkins, Manager Bze Food Products Jose Ona, Agronomist, Big Falls Ranch Agripino Cawich, Research Officer, BSI Dr. B. Rai, Head of CARDI, Bze Unit Frank Norris, B.A.S. R. Cutter, Carver Tropical Prod.	
National Extension Planning Committee Chief Agricultural Officer Principal Agric. Officer, Extension Assistant Manager, Marketing Board Head of Agric. Unit, DFC President, B.A.S. P. Coleman, Rice Farmer, Toledo Severo Tzib, Peanut Farmer, Cayo	

Table 73. Retail Price Controls for Beef (B$/lb)

Item	Jan. 1982	April 1980	Sept. 1978	Nov. 1973	March 1972	1970
Rump steak	2.70	2.25	1.75			
Chuck	2.16	1.80	1.30	0.85	0.50	
Rib	1.32	1.10	0.75	0.50	0.50	
Brisket	1.74	1.45	1.00	0.50	0.50	
Tail	1.32	1.10	0.75	0.50	0.45	0.45
Fore & hind shank	1.74	1.45	1.00	0.50	0.50	
Short plate	1.32	1.10	0.75	0.50	0.50	
Flank	1.32	1.10	0.75	0.50	0.50	
Liver	2.16	1.80	1.50	0.95	0.85	0.85
Heart	1.50	1.25	0.90	0.85	0.65	0.65
Tongue	1.32	1.10	0.90	0.60	0.50	0.50
Lights	1.32	1.10	0.90	0.60	0.50	0.50
Tripe	0.66	0.55	0.42	0.25	0.20	0.20
Cut-u-foot	0.84	0.70	0.48	0.25	0.15	0.15
Ground meat	2.40	2.00	1.60	0.85	0.60	
Round steak	d	2.25	1.75	1.00	0.85	
T-bone	e	2.25	1.75			
Sirloin	c	2.25	1.75	1.00	0.85	
Ground steak	o	2.35				
Forequarter	n			0.60	0.50	0.50
Hindquarter	t			0.80	0.65	0.65
Short loin	r			1.00	0.85	
Kidney	o			0.60	0.50	0.50
Brain	l			0.45	0.45	0.45
	l					
	e					
	d					

Table 74. Retail Price Controls for Pork (B$/lb)

Item	Jan. 1982	April 1980	Nov. 1973
Leg	decontrolled	2.00	
Chop		2.00	
Picnic		1.80	
Butt		1.60	
Flap		1.60	
Feet, etc.		1.60	
Pork			1.00

Table 75. Price Controls for Fish, Shrimp and Lobster (B$/lb)

Item	March 1981	Oct. 1979	Sept. 1978	Feb. 1974	March 1972
Fish Fillet	1.50	1.35	1.10	0.75	0.65
Shrimp					
Whole	1.50	1.25	1.25		
Deheaded	3.00	2.50	2.50	1.50	1.50
Lobster					
Whole	1.00	0.85	0.85	0.50	0.50
Deheaded	3.00	2.50	2.50	1.50	1.50

Table 76. Retail Price Controls for Sugar (B$/lb)

Item	Jan. 1982	Feb. 1980	Sept. 1977	Feb. 1975	Jan. 1974	March 1972
Plantation White	0.30	0.17	0.16	0.13	0.12	0.10
Brown	0.25	0.15	0.14	0.11	0.10	0.08

PROGRAM RECOMMENDATIONS FOR AID CONSIDERATION

PROGRAM RECOMMENDATIONS FOR AID CONSIDERATION

Not all of the recommendations in this section are amenable to AID supported project activities. However, significant improvements in the livestock sector could be realized from support by AID for the following activities. It is proposed that these activities would be addressed by a single, multifaceted program to reduce administrative costs and to promote coordination among complementary activities (e.g., technical assistance in pasture and cattle management combined with an effective credit program to implement improvements).

Integrated Livestock Sector Improvement Project

- Credit and technical assistance for livestock producers
- Technical assistance to improve the operational and financial management of Belize Meats Ltd., to develop capabilities for producing processed meat products, and to develop export markets for Belize beef
- Swine intensification and development for Toledo district
- Tropical pasture research and extension of technology
- Mixed crop-animal systems research and development for small farmers
- Establishment of policy analysis unit in Ministry of Natural Resources
- Facility and faculty development to support diploma program of Belize School of Agriculture
- Short-term training for Government personnel in agricultural administration, policy development, credit supervision, and other topics

Recommendations for Improving the Livestock Sector

Stimulation of the livestock sector will require an integrated approach of market development, credit availability, productivity improvement, and policy changes. Given the importance of beef cattle in Belize and the opportunities for improving their productivity, these recommendations give priority to beef cattle and pasture improvement.

Market Development

Exports. Expansion of the beef cattle industry ultimately depends on development of export markets. The national beef herd, even at its present level of low productivity, supplies national consumption needs. However, population increases and favorable economic development would be expected to increase national demand for beef.

Some potential exists for selling live cattle to Mexico, especially from Corozal and Orange Walk Districts. However, the current state of the Mexican economy is not encouraging for short-term sales. Plans to expand production of the Mexican herd may preclude substantial sales to Mexico from Belize in the longer term.

Thus, greater potential lies in the development of beef markets in the U.S. and beef-deficit Caribbean countries with whom Belize has political ties. The U.S. market will most likely import competitively-priced, boneless manufacturing beef. Principal competition will come from areas such as Australia, New Zealand, and those Central American countries eligible to export beef to the U.S. At present, Belize beef production costs per head slaughtered appear to be higher than production costs of competitors. Thus, the recommendations given elsewhere in this report must be

followed in order to increase productivity and reduce per head costs of Belize beef production.

Demand for improved quality and higher priced beef does exist in several Caribbean countries. This demand is currently being met by other sources. If Belize beef is to enter these markets, a successful market development effort supported by the ability to consistently deliver beef of desired quality will be required. Coordinated efforts by GOB representatives and a BML marketing specialist to open these trade channels are needed.

Consistent supplies of quality beef will necessitate restructuring cattle production systems. For example, systems for finishing cattle at slaughter weights of 800 to 1,000 pounds at less than 30 months of age are needed. Improved pastures and supplemental feeding during the dry season will be necessary.

An efficient slaughter and processing facility which meets export standards is needed. The BML plant has this potential but extensive renovations must be undertaken. Provisions have been made to fund these renovations through a CDB project.

Assuming that these physical renovations will be adequate to meet export requirements, provision must then be made to insure that the plant is operated at efficient and profitable levels. In order for BML to become a principal cattle buyer, a substantial capital base will be required. Payment for frozen meat in the export market occurs weeks, perhaps months, after payment for live cattle has been made. One means of avoiding or reducing this cash flow problem would be for BML to operate on a service-for-fee basis. It is already envisioned that butchers in Belize City will primarily use BML for custom slaughter of their purchased cattle. Similarly, BML might provide fabrication and export marketing services on a custom-fee basis. In this

case, livestock owners would realize the profits and take the risks by owning the cattle, carcasses, and meat through to final sale. This option has many ramifications to the beef industry and BML. Therefore, it should be carefully evaluated.

The CDB project provides for training the Plant Manager and hiring a Marketing Specialist. Additional technical assistance is needed in financial management procedures, including an accounting system to provide cost and revenue information for the separate plant activities: livestock purchase, slaughter, fabrication, curing and processing, by-products, and sales. This accounting system should provide cost information necessary to formulate reasonable rates for slaughter and fabrication in which the plant provides a custom service without taking ownership of livestock or meat products.

In order to better utilize the BML facilities and increase income, attention should also be given to expanding hog slaughter. If successful, recommendations for the swine sector should substantially increase both numbers and weight of swine available for slaughter in the BML facility. In addition, the pork curing and sausage making capacity at BML should be upgraded.

Establishment of Public Market Centers. Transportation and marketing costs are high because of the large numbers of small producers. In addition, production sites are highly dispersed. To decrease the costs of marketing and to increase competition among buyers, it is recommended that the MONR establish market centers where buyers and sellers can interact on a regular and organized basis to buy and sell livestock. The market centers should provide a service for a reasonable fee to the producers and buyers but not become involved with the actual buying and selling of livestock.

Minimal facilities are needed: holding pens, loading chutes, and scales. If sufficient local transport is not available, a trucking service could be provided to bring animals from farms to the Center.

Production Credit for Livestock Producers

At present, neither bankers nor producers are favorably disposed toward credit because neither group considers cattle to be a profitable business. Bankers do not like the long-term payback period or the risk of using cattle as collateral. Producers either do not have sufficient assets to meet the 133 percent of equity requirement or do not want to mortgage these assets because they too consider cattle a low profit potential enterprise, not worth the risk of losing their land or other real assets. Improvement in both market and productivity are needed to change profitability expectations and stimulate use of credit.

Existing lines of credit are either inadequate to cover expansion needs of the beef industry, or do not meet the operational and development needs of producers, particularly of small to medium sized units. To complement existing lines of credit from public (DFC) and commercial sources, it is proposed that an additional line of credit for livestock producers be established through DFC (or, perhaps, commercial banks in Belize). Further, that when Producers Associations (PA) have been developed, authority and responsibility for this line of credit be transferred to the PA. Thus, the PA would provide the operational/capital investment credit critically needed to stimulate the expansion of the beef cattle industry in a manner more suited to needs of producers.

Two possible models are proposed for the long-term development of the livestock industry. One is the Fondo Ganadero Model which has been highly successful in Colombia and other Latin American

countries (Appendix VI). The other is the Production Credit Association (PCA) model found in the U.S. Both are governed and administered by producer members. Operational profits accrue to stockholders, which include the borrowers. The models differ, however, in that the Fondos generally provide livestock (both breeding and feeder cattle) on shares, whereas the PCAs primarily provide conventional loans for operational and development needs.

Either the Fondo or PCA model could be effectively applied in Belize. In either case, however, the following general terms of reference should apply for developing a national and local PCTAA. The national livestock producers association would be composed of local member associations, established to provide integrated technical assistance and credit to cattle producers.

Thus:

a. The national PCTAA would be composed of district associations, governed and administered by representatives from these associations.
b. District associations would receive, renew, and approve loans or determine and enforce criteria for providing cattle to member producers on shares.
c. Loans would be made for breeding and feeder animals, and for pasture and livestock facilities improvement. Limits could be placed on amount of individual loans, (e.g., not more than 50 animals for a single producer, or no more than 200 acres of pasture improvement) to ensure that benefits accrue to small and medium farmers rather than to only a few large operators.
d. The management staff of the PCTAA would provide technical assistance to producer members and supervised credit to loan recipients. District level staff would manage district

associations. Reviews would be undertaken by Boards of producer members. National PCTAA staff would include a manager, a pastures/livestock specialist, and a farm management specialist (M.S. degrees). Staff of district associations would include at least one diploma level person (e.g., from Escuela Agricola Panamericana or from the upgraded Belize School of Agriculture)

e. The funding base for the PCTAA would be long-term and low-interest. An initial revolving loan of US$3 million would be provided from USAID and be channeled through the DFC (or, perhaps, through commercial banks if they develop adequate staffing to supervise livestock credit).

f. Some of the proceeds from interest paid on loans or from membership charges would be used to cover salary and support costs for PCTAA staff, amortize the loan, and increase capital reserves. Thus, technical assistance and loan supervision should be self-supporting. After covering these management costs and debt service, any remaining surplus could be distributed as dividends to producer members.

Technical Assistance for Beef Cattle Improvement

Cattle production systems in Belize are pasture based. Although year-round feed supply is almost exclusively provided from pasture, occasionally cultivated forages and protein supplements are provided to high producing animals or as dry season supplements.

Pasture utilization systems vary from large, commercial beef cattle operations to small farmers with crop-pasture-livestock systems. The majority (76 percent) of cattle are located on farms of over 100 acres, whereas the majority (73 percent) of farms with cattle are smaller than 100 acres. While beef cattle production systems predominate, there are a few "dual-purpose" (meat and milk) cattle operations in which cows are milked for household use and, in some instances, for sale to neighbors.

Most large and medium sized beef cattle units are combined cow-calf and growing/finishing operations. Many small units are cow-calf operations and sell "yearling" type animals as feeders to larger operators who have pastures for growing/finishing.

Although differences do exist in cattle production systems, there are similarities which indicate the types of technical assistance needed. First there is the inefficient use of available natural resources, i.e., land, water and vegetation. Substantial areas of land have been cleared, particularly on larger operations. This cleared land may be left exposed, vulnerable to soil erosion and depletion of soil nutrients. These problems can be resolved only through improvements in pasture management and practices.

Second, in all systems, ways to efficiently increase animal productivity (cow fertility, growth rates, livability) must be found. The first step in increasing animal productivity is to

initiate improved herd and pasture management practices. Inadequate nutrient supply from pastures on a year-round basis is the single most important constraint to animal productivity. Therefore, primary attention must be given to improved pasture management systems that will provide adequate quantity and quality of pasture forage on a year-round basis. These management programs include the establishment of limited areas of improved pastures or legume "protein banks" to supplement native pastures during the dry season. In addition, they will provide adequate nutrient intake for animals with higher nutrient requirements, such as lactating cows during breeding season and weaned calves.

Government centers (such as Central Farm and Yo Creek Station) are presently used to multiply improved breeding stocks as a source of breeding animals for producers. This practice should continue and should be expanded as the cattle industry becomes more profitable and demand for breeding animals (especially bulls) increases. In addition, private seedstock production should be encouraged through access to credit needed to import improved cattle. Emphasis should be on selection for growth rate and adaptation to production on tropical pastures (rather than, for example, selection for performance on concentrate feeds). Breeding stocks should retain a majority of Bos indicus (Zebu) breeding to maintain adaptation to tropical environments. For example, Charbray rather than purebred Charolais breeding is preferable; similarly Braford, Brangus, and Santa Gertrudis breeds (or crosses) should be utilized.

In most instances, the pasture program must be complemented with mineral supplementation since most grasses and legumes grown on infertile tropical soils are deficient in some minerals, particularly phosphorus and copper. Protein and energy supplementation (e.g., urea and molasses or use of green chop and silage) may be advantageous in severe dry seasons when pasture forage is inadequate.

Improved animal management, animal breeding, and animal health programs must be initiated, although constraints in these areas are generally less critical than for feed supply. These improvements can be made by applying available technology. Particular care, however, must be given to introduction of improved breeds developed in temperate climates. Locally adapted stocks generally have production potential already beyond the limits placed by available feeds. A possible exception to this recommendation would be the introduction of high producing dairy breeds, often the most efficient means of developing stocks for dual-purpose production.

Lactating cows should be kept on high quality pastures, at least until they are rebred. When feed supply is inadequate and the nutrient drain from lactation results in dam body weight loss, calves may need to be weaned at younger ages in order to maintain cow weights at levels sufficient for rebreeding or to allow cows to regain weight quickly during the breeding season. Where the nutrient deficit for the lactating animal is extreme, weaning at 3-5 months can keep cows on essentially a 12-month calving interval, whereas normal weaning at 9 months of age often results in doubling the calving interval (24 months) under these conditions. With early weaning programs, high quality forage and, on occasion, protein/energy supplement to support satisfactory growth of early weaned calves should be provided.

Third, as systems become more intensified, as pasture land becomes limiting, and as higher yields (weight gain/acre) are sought, attention must be given to establishing more productive, improved pastures. In many instances, these improved pastures will result in higher beef production per acre and improved individual productivity. The decision on the type and amount of improved pastures to be established must be based strictly on costs and returns over the projected life of the improved pasture.

Labor, equipment, time, and funding constraints generally require phasing of pasture improvement programs. The initial phase is often the establishment of legume "protein banks" for supplementation of animals at critical stages of the production cycle. Subsequent phases involve the introduction of more productive grass species, grass legume combinations, and pasture management.

In addition to improving pastures for breeding cows and weaned calves, improved pastures will often be economically advantageous for the growing/finishing of feeder animals. The development of specialized growing/finishing operations using high producing, improved pastures is critical for the expansion of beef productivity. These operations are needed to absorb increased numbers of feeders from small to medium cow-calf units that lack pasture and capital for finishing cattle. They will generally be located in areas with higher soil fertility that could support improved pastures. Advantages will be increased growth rate, heavier slaughter weights, and higher quality carcasses in a shorter time.

Table 77 summarizes recommendations for pastures and livestock improvements for four types of cattle production systems: cow-calf, cow-calf/growing, growing/finishing, and life cycle production systems.

Government Policies

Productivity and profitability of the livestock sector will benefit from a phase-out of price controls, price supports, and trade restrictions. Some policies which have had unintended but serious negative effects include the following.

Price control on retail cuts. The intent of this policy was to protect consumers from high food prices. The control price on preferred steak and roast cuts (primarily round and loin) was

B$2.50 per pound and B$1.75 for other cuts. No pricing distinction was made with regard to age, sex, quality of carcass or cuts yielded. As a result, there was little incentive to improve offtake and carcass quality through breeding or management. Although price control was at the retail level, it definitely affected the price butchers were willing to pay for live animals.

Earlier this year, price controls on preferred cuts were removed, partially in recognition that controls had not been effective. Consumers were willing to and often did pay a premium over control price to obtain high quality meat. Interviews with meat vendors indicate that preferred cuts are now selling well at B$3.00 per pound but sales volume tended to decrease when prices increased above B$3.00.

Retail price controls on beef appear to have been a major factor discouraging expansion of cattle numbers and productivity. Controls at the retail level generally have their principal impact on the livestock prices at the farm gate. Although consumer demand for low-priced retail products may be great, butchers will not supply this demand unless they can make a profit over costs of purchasing live animals, slaughter, and processing. As slaughter and processing costs tend to be inflexible, cost reduction is primarily at the expense of the livestock producer.

Price supports. With the partial removal of price controls earlier this year, cattlemen (particularly those active in BLPA) have attempted to impose higher prices for live animals. This "bottom up" approach to price control tends to be less effective than "top-down" controls on retail prices. Butchers and retailers will purchase livestock at these higher prices only if they can pass on the increased costs to consumers at the retail level. Beef consumption tends to decrease as prices increase,

especially when other meats such as poultry, fish, and pork are available at lower prices.

Current efforts to support cattle prices through the price recommendations of the BLPA may have other undesirable effects. Setting per pound prices for lightweight cattle lower than for heavier cattle is intended to be an incentive for slaughtering only heavier cattle, thereby increasing beef production. However, an unintended effect is the disincentive of developing a stratified beef industry based on separate cow-calf and growing operations. It is not economical to sell young feeder cattle at lower prices to the growing/finishing operations. Cow-calf operators must receive sufficient prices for young animals sold to cover all costs of the herd plus a profit; often this requires a higher price per pound for feeder than for slaughter cattle.

Another consequence of the proposed prices for slaughter cattle is that the resulting costs for boneless beef will be substantially above U.S. market prices; effectively eliminating the export potential to the U.S. market. Current U.S. price for boneless manufacturing beef (90 percent visible lean) is approximately US$1.00 (B$2.00) per pound. Assuming a 37.5 percent yield of boneless beef from a liveweight basis, the price of boneless beef (based on B$1.00 per pound liveweight) will be B$2.66 before including costs of slaughter, processing, and shipping to the U.S.

Trade restriction. Various policies affect livestock trade at both local and export levels. Desire to increase the national cattle herd has led to a lower limit on slaughter weight (greater than 650 pounds) and restrictions on type (males, cull females) of slaughter animals.

Desire to increase throughput in the GOB-owned BML plant has led to restrictions on the export of live animals to Mexico, and to the requirement that all animals slated for retail in Belize District be slaughtered in the BML abattoir.

These policies attempt to resolve important problems of building the national herd and establishing financial viability of the BML plant.

Unfortunately, the efficacy of these policies is far from certain. Because Belize is essentially self-sufficient for beef production, further growth of the cattle herd necessarily depends on establishing all possible profitable export linkages. Failure to establish trade with Mexico will encourage Mexican buyers to find other sources. Development of all types of profitable markets for Belize beef, whether on the hoof or the hook, should be encouraged.

As cattlemen become convinced that the future for cattle production is good, they will be more inclined to make investments to increase productivity. This will lead to an increase in the number of heifers born each year, more of which will be retained to expand breeding stock numbers. In contrast, policies which limit export and domestic markets will result in lower prices and a tendency for cattlemen to reduce herd numbers. Throughput at the BML plant can be better increased by developing profitable markets for beef rather than by government edict.

Rationale for restrictions on interdistrict movement of livestock and meat as well as restrictions on weight and sex of slaughter animals should be reviewed. The cattle sector is most likely to thrive under a free market environment. Government policies are needed to discourage rustling. An enforced brand inspection service supervised by GOB and/or BLPA is needed. Live cattle in

transport would require proof of ownership; carcasses would be stamped to show that the live animal's brand had been inspected; and, retail cuts in shops or restaurants would require proof of purchase which could be checked back to the supplier. Penalties for rustling and/or dealing in stolen meat should be sufficiently harsh to discourage the practice.

Private vs Public Investment. Some GOB policies have served as disincentives to private investment in the livestock sectors. The effects of pricing and trade policies were discussed in previous sections. Monetary policies which maintain low costs for imported goods tend to raise prices for export products, reducing the competitive position for products such as Belize beef in export markets. GOB has purchased Belize Meats Ltd. so that now the principal meat processing facility in Belize is publicly rather than privately owned. Although the GOB purchase was in response to financial difficulties encountered when BML was privately owned, public ownership of this facility can lead to conflicts of public and private interests in meat production and marketing. In general, private, rather than public, investment and control in the livestock industry should be encouraged.

Table 77. Recommendation for Pasture and Cattle Management to Improve Productivity of Belize Beef Cattle Herd

Production phase	Target producer	Locations	Soil type	Recommend Type of pastures[1] [2]	Pasture species	Stocking rate
Cow-calf	Small farms 50-100 acres & medium size family farms 100-500 acres.	Corozal, Orange Walk, Belize, & Stann Creek District.	Acid, infertile soils on Pine Ridge and degraded alluvial soils.	Natural pastures supplemented with legumes banks and/or small areas (5-10% of farm) in improved pastures for lactating cows & heifers.	Kudzu, Capitata, Centro legumes; and Jaraqua, Gamba, and Brachiaria grass.	2-10 acres per animal unit (all year-round).
Cow-calf/ growing	Same as the above, plus larger farms up to 1000 acres.	Orange Walk and Cayo and Toledo Districts.	Well-drained alluvial and vertisols with small percentage (<10%) flooded land.	Natural pastures supplemented with legume bank and larger areas (10-15%) in improved pasture for lactating cows, heifers, and growing calves, respectively.	Kudzu, Centro, Siratro, Leucaena legumes; and Guinea, Gamba, Pangola, Letaria, Brachiaria grass on well-drained soils; and Carib and Para grass on poor drained soils.	1-2 acres per animal unit (all year-round)
Growing/ finishing	Medium size family farms (100-500 acres) and large ranches (>500 acres).	Orange Walk and Cayo Districts.	Good soil fertility, well-drained alluvial and vertisols, and good proportion (10-20%) of poor drained land.	Natural pastures renovated (interseeded) with legumes and large areas (>50% of farm) in improved pastures with good quality grass fertilized or associated with legumes.	Centro, Siratro, Glycine, Leucaena legumes; Guinea, Pangola, Star, Bermuda grass, Brachiaria grass on well-drained soils; and Carib, Para, Antelope, Aleman grass on poor-drained soils.	0.5-1.0 acres per animal.
Life cycle	Large ranches (>500 acres).	Orange Walk and Cayo Districts.	Well-drained alluvial and vertisols and good proportion (10-20%) of poor drained land.	Natural pastures supplemented with legume bank (<20% farm) the rest in improved pastures grass and grass-legumes.	Similar to cow-calf/growing and growing/fattening.	1-2 acres per animal.

[1] Fertilization with phosphorus and potash will be required to establish forage legumes and improved grasses on infertile s fertilizer. Fertilization requirements will be lower or even unnecessary for the more fertile vertisol and alluvial soil

[2] Most pasture and forage species recommended have been evaluated for adaptation to Belize environmental conditions or to s and Honduras.

[3] Recommendations for herd management practices apply as relevant across production systems at all locations.

of Belize Beef Cattle Herd

Recommendations

Pasture species	Stocking rates	Grazing methods	Feed supplementation	Herd management practices[3]
Kudzu, Centro, Centro leucaena and Jaragua, Gamba, and Brachiaria grass.	0-1 acres per animal unit (all year-round).	Continuous grazing.	Free choice mineral mix of 1:1 salt and dicalcium phosphate and fortified with copper, zinc, cobalt and iodine.	Replacement heifers: breed at 660# (26-28 mos) to calve as 3 year olds. Cows: place on best pastures to re-breed 2-4 months after calving. Weaning: wean at 7 months when cows rebreed 2-4 months after calving, calves wean earlier if rebreeding delayed, provide improved pastures/ supplemental feed for weaned calves.
Kudzu, Centro, Siratro, Leucaena legumes; and Guinea, Gamba, Pangola, Letaria, Brachiaria grass on well-drained soils; and Carib and Para grass on poor drained soils.	1-2 acres per animal unit (all year-round)	Continuous grazing and deferred grazing.	Free choice mineral mix (as above).	Bulls: one bull for 20 cows, rotate bulls, seasonal breeding of 3-4 months starting at beginning of rainy season in May. Animal health: vaccination of calves with TriBac (blackleg, anthrax, malignant edema); dip/spray for ticks every 3 weeks or when ticks build up; treat weaned calves for gastrointestinal parasites, but adults only if fecal egg counts indicate parasite buildup.
Centro, Siratro, Glycine, Leucaena legumes; Guinea, Pangola, Star, Bermuda grass, Brachiaria grass on well-drained soils; and Carib, Para, Antelope, Aleman grass on poor-drained soils.	0.5-1.0 acres per animal.	Continuous, alternate and deferred grazing.	Free choice mineral mix (as above).	Weaned/growing calves: place on good pastures to optimize weight gains and minimize time to get to fattening phase. Finishing animals: place on nutritious and high yielding pastures to optimize beef yield/acre and minimize time to reach market weights of 900-950#.
Similar to cow-calf/growing and growing/fattening.	1-2 acres per animal.	Continuous, alternate, and deferred grazing.	Mineral mix for breeding herd and perhaps urea-molasses in dry season.	

legumes and improved grasses on infertile soils. However, recommended plant species have relatively low requirements for more fertile vertisol and alluvial soils.

Belize environmental conditions or to similar conditions in the tropics of nearby countries such as Mexico, Guatemala,

system at all locations.

Recommendations for the Swine Sector

In 1980, pork imports cost Belize B$4.9 million in foreign exchange. This translates into 2.8 million pounds of pork and pork products. Assuming an average dressed weight of 80 pounds, this is equivalent to approximately 32,600 carcasses. Through improved nutrition and management of the swine population, offtake could be increased in a matter of years to make Belize self-sufficient in pork.

There are no particular constraints to increasing offtake. Adequate supplies of energy concentrates, including feedgrade corn and by-products such as rice bran, are available to meet nutrient requirements. Results from the Feeder Pig Project and elsewhere illustrate the effectiveness of improved management and breeding practices. In addition, GCB has facilities for multiplying and distributing improved breeding stock at competitive prices.

Slaughter and processing facilities (particularly BML) have the capacity to absorb the increased volume of swine necessary to replace imports, most of which go to urban consumers. Rural consumers will likely continue obtaining pork primarily from on-farm slaughter.

Steps necessary to facilitate expansion of the swine industry include multiplication and distribution of improved breeding stocks, availability of protein supplement and milling by-products to producers, establishment of competitive marketing outlets for slaughter stock, and development of pork curing and sausage making capacities.

Toledo District has 29 percent of the national herd and the swine population is primarily in the hands of small farmers. Therefore, it is recommended that this District be used as a focal

point for increasing swine productivity.

The extensive system of production that predominates in Toledo District is not amenable to substantially increasing productivity. However, given the quantities of rice bran readily available at the GOB plant near Big Falls and of locally produced corn, there is good opportunity to intensify production practices and increase productivity of swine in the area. Furthermore, this same model of utilizing relatively low-cost, agri-industrial by-products near the point of production will be transferable to other sites in Belize.

More than 8 million pounds of paddy rice are produced annually, primarily by small milpa farmers in Toledo District. The milling of this paddy rice at Big Falls results in the production of more than 640,000 pounds of rice by-products. Most of these by-products are transported, at high cost (approximately B$3.50/cwt), to other districts. Swine feeding programs in the area that make effective and efficient use of these by-products will increase pork production for the country, thereby reducing imports. In addition, the District's economy will be strengthened and income/market opportunities for the 465 milpa farmers who produce the 4,709 pigs of the District will be increased.

Interested farmers located in areas near Big Falls Rice Mill and in areas with all weather access to the Mill should be assisted in developing feeder pig finishing units.

Feeder pigs will be purchased from farmers within the District at a price established in relation to market value of slaughter pigs. This will promote a stable and equitable market for feeder pigs produced by the small farmers.

A swine improvement and intensification program in Toledo District should provide farmer training, appropriate technology, credit, properly balanced rations, and boars of improved breeding. This will help improve the level of productivity and income of the small milpa farmer and assure an adequate supply of quality pigs for the feeder pig finishing project.

Interested farmers should be assisted in improving their pig production. Focus will be on increasing the number and quality of feeder pigs produced per litter. Farmers and their families should be trained to manage their pigs properly to produce more weaned pigs.

Most small farmers use covered pens to house their pigs at night. These pens could be improved by adding a cement floor and facilities to provide water at all times. Sows will continue to free range during the day and, as is customary, they will be housed and fed at night and in the early morning. Sow nutrition will be improved by supplying a small quantity of protein concentrate to the corn normally consumed each day.

At farrowing, the sow will be penned in the corral and fed adequate quantities of corn and protein supplement. Confined management and feeding should almost double the survivability of the pigs as well as increase weaning weights.

Farmers will utilize farm-grown corn supplemented with a small quantity of protein concentrate purchased from the BMB. When management, nutrition, and productivity have improved, boars of improved breeding stock from Central Farm should be introduced for crossing with local sows. The resulting crossbred pigs should have greater growth potential and produce carcasses with a higher percentage of lean cuts.

Investment and production credit will be supplied through the program and administered by the DFC. Financing improvement of facilities and the acquisition of equipment and protein concentrates will be necessary.

As noted in the assessment of the swine industry, there may be value in locally producing a feed protein source to replace imports of protein concentrates. One possibility showing promise is the use of tropically adapted varieties of soybeans. A few farmers have produced good yields of soybeans, but not in quantities which justified building facilities to extract oil and meal. Production potential for soybeans should be assessed, including an analysis of market demand for oil and meal and the economic feasibility of operating processing facilities.

Recommendation for Research and Development Activities

General emphasis should be on adaptive research; leading to the transfer of technology developed elsewhere. Two adaptive research and development efforts are recommended. One involves research to develop tropical pasture programs adapted to Belize. The other utilizes farming systems methodology to improve productivity of mixed crop-animal systems on small farms.

Recommended Tropical Pasture Research and Development

Most cattlemen consider pasture development and management critical to the success of cattle production. The present pasture situation in Belize is not adequate to support substantial expansion of the cattle industry. Considerable effort has been made by the Pasture Research Program at Central Farm to improve the situation but there are still areas of applied research which need to be strengthened. Accomplishments of the MONR/IDRC Pasture Research Program have been useful but additional work is needed in the following areas.

Choice of adapted species. Criteria for selecting plant species to be evaluated in Belize include:

- Is easily propagated, by seed, if possible
- Can produce tissue of good to high nutritive value for ruminants
- Has low requirements for fertilizer
- Can be adapted to part-year flooding (for pastures on poorly drained soils)

Using results from Jenkin et al. (1976), Keoghan (1979), and MONR/IDRC research, the following species should be considered for on-site evaluation.

a) Species adapted to moist and wet areas (poor-drained Vertisols and Alluvials):

Limpo grass, Hemarthria altissima
Antelope grass, Echinochloa pyramidalis
Aleman grass, Echinochloa polystachya
Para grass, Brachiaria mutica
Carib grass, Eriochloa procera

Unfortunately, these grass species are propagated only by vegetative material. No compatible legume species were identified.

b) Species adapted to well-drained, acid-infertile soils (Pine Ridge Ultisols and Oxisols):

Grass
Signal grass, Brachiaria decumbens
Gamba grass, Andropogon gayanus
Coronivia grass, Brachiaria dyctioneura
Bahia grass, Paspalum notatum
Paspalum grass, Paspalum plicatulum
Molasses grass, Melinis minutiflora

Legumes
Stylo, Stylosanthes guianensis
Capitata, Stylosanthes capitata
Kudzu, Pueraria phaseoloides
Desmodium, Desmodium ovalifolium

c) Species adapted to well-drained, nonacid, low-fertile soils (degraded Alluvial soils after cultivation or degraded pastures):

Grass
Jaragua grass, Hyparrhenia rufa
Guinea grass, Panicum maximum
Setaria grass, Setaria anceps
Signal grass, Brachiaria decumbens
Gamba grass, Andropogon gayanus

Legumes
Centro, Centrosema pubescens
Kudzu, Pueraria phaseoloides
Leucaena, Leucaena leucocephala
Siratro, Macroptilium atropurpureum

d) Species adapted to well-drained, fertile soils (Alluvial and Vertisols):

Grasses
Guinea grass, Panicum maximum
Pangola grass, Digitaria decumbens
Star grass, Cynodon nlemfuensis
Coast-cross 1, Cynodon dactylon hybrid
Coastal Bermuda, Cynodon dactylon

All of these grasses, except Guinea, are propagated by vegetative material alone.

Legumes
Centro, Centrosema pubescens
Siratro, Macroptilium atropurpureum
Perennial soybean, Glycine wightii

e) Species especially adapted to drought on well-drained, heavy clay soils (Vertisols):

Grass
Makarikari grass, Panicum coloratum
Rhodes grass, Chloris gayana
Buffel grass, Cenchrus ciliaris

Legumes
Siratro, Macroptilium atropurpureum
Perennial soybean, Glycine wightii
Leucaena, Leucaena leucocephala

f) Fodder crops to follow on crop rotation:

Legumes
Lablab, Dolichos lablab
Cowpea, Vigna unguiculata
Velvet bean, Stizolobium deeringianum

Pasture development and renovation. High costs of pasture development and limited supplies of good-quality seeds are principal factors inhibiting development of improved pastures for fattening cattle in Belize. Research goals would include reducing costs and risks of an inefficient pasture system.

Methods of pasture renovation using minimum tillage should improve the carrying capacity of native or deteriorated pastures. Such methods may include sod-seeding and aggressive legumes in strips or legume banks with minimum amounts of fertilizers.

Clearing primary forest land for pastures should be discouraged because of the high potential for ecological degradation. However, secondary growth palmetto and bush may be converted to productive pastures with less risk.

More than 500,000 acres of natural grasslands on Pine Ridge soils (Ultisols and Oxisols) have the potential to support 3 to 4 times the current cattle population in Belize. Other areas with good potential are the poorly-drained, fertile Alluvial and Vertisol soils.

Pasture utilization. On the more fertile soils (Alluvial and Vertisols), native legumes could be grown more efficiently by fertilizing with relatively small amounts of phosphorus and, probably, potassium. On more acid infertile soils, clearing palmetto and shrubs will improve the growth of native grasses and the establishment of legumes. Legume banks (small areas of planted legumes in pure stand) will improve natural pasture utilization, especially during the dry season.

Supplementation. Even with proper management of natural and improved pastures, supplementation may be needed. Grasses and legumes grown on infertile soils (Oxisols and Ultisols on Pine Ridge) will generally be deficient in phosphorus. Phosphorus deficiency results in sharply lowered reproduction and growth rates for cattle. It is therefore advisable to provide grazing animals with a mineral supplement (free choice) composed of equal amounts of salt and dicalcium phosphate (or other good phosphorus

sources) and with trace minerals (cobalt, iodine, copper and perhaps zinc).

The cost of supplementation must be considered relative to the value of improved cattle performance. Supplementation during only that part of the year, e.g., when performance benefits would be greatest, could decrease total production cost and should be evaluated.

Fresh-chopped cultivated forages such as elephant grass (Pennisetum purpureum), sugarcane (Saccharum officiniara), and forage sorghum (Sorghum vulgare), provide good supplemental energy. This energy would primarily benefit animals under production stress such as lactating cows, recently weaned cattle, and growing cattle during the dry season.

These trials will be useful for validating technology as well as promoting and demonstrating the importance of improved pasture systems, especially grass-legume associations. Careful consideration should be given to the following: selection of species (emphasizing those already in place), availability of good quality seeds of the species to be promoted, and economical analysis of such factors as total costs and animal performance.

These types of interventions should be field-tested with cooperating producers; therefore, objectives must be clearly defined from the beginning and procedures and data collection should be simple enough not to interfere with the producer's normal operation.

Recommended Research on Mixed Crop/Animal Systems

Approximately 20 percent of the cattle and most of the swine in Belize are found on small mixed crop/animal farms where they make

a positive contribution to family nutrition and income. Interactions between the animal and crop components often greatly affect the productivity of the mixed farm. Some interactions are indirect in the form of competition between crop and animal activities for land, labor, or capital; others are direct and complementary, such as animals feeding on crop wastes and the value of fertilizer as manure (Fitzhugh et al., 1982).

Because small farm families are both an important economic and sociological factor in Belize, research and development to improve animal productivity on small farms should be given priority. There is danger, however, that interventions to the animal component may have unexpected and possibly undesirable effects on the crop component. Thus, evaluation of interventions should be in terms of the net biological and economic impact on the entire farm system. Therefore, research based on this farming systems approach is recommended as a means of improving the productivity of small farms in Belize.

CARE has been involved in farming systems research in Belize for several years. While their project has tended to emphasize crops (e.g., peanuts) rather than animals, useful baseline information on small farms in Belize and Cayo Districts has been obtained.

Two groups of small farmers would be appropriate for targeted farming systems research. These groups are found in western (Cayo District) and southern (Toledo District) Belize. Potential intervention to animal-crop systems in Cayo District might include dual-purpose cattle production, sale of young feeder cattle rather than older slaughter cattle, improved pasture in rotation with crops, improved swine productivity, and marketing. For small farmers in Toledo District, emphasis for research within the animal component would likely involve increasing swine productivity combined with market development. Research with

both groups would provide an opportunity to evaluate credit processes and extension effectiveness, as well as characterize important farming systems. Because a farming system approach would be followed, attention should also be given to the cropping component. Thus, the research team should include agronomists as well as animal scientists and social scientists (agricultural economists and sociologists).

Success of farming systems research is ultimately measured by the degree of implementation of research results. Thus, research efforts should be integrated closely with extension efforts. The Caribbean Agricultural Extension Project (CAEP) should be coordinated with these recommended farming systems research efforts.

Recommendations for Other Segments of the Livestock Sector

Dairy

Recommendations could be made to improve productivity of the dairy sector as a means of reducing annual foreign exchange cost of importing milk products (B$24 million in 1980). Indeed, such development projects have been proposed by others. However, the per capita level of milk consumption in Belize is low and there is an apparent preference for sweetened condensed milk and milk powder (probably because of ease of storage compared to fresh milk). The base of dairy cattle in Belize is small and most cattlemen lack experience and interest in the labor/management intensive aspects of dairy production. The milk processing and delivery infrastructure currently available is limited. Therefore, development of the dairy industry is not given high priority at this time.

Poultry

Recommendations on poultry meat and eggs produced in backyard operations primarily for home use and local sales are not given high priority. Commercial poultry production, based on modern practices similar to those in the U.S., appears to be successful, needing little additional assistance. If a locally grown protein source (e.g., the soybeans discussed in swine recommendations) is developed, the commercial poultry production sector will be a prime beneficiary.

Sheep and Goats

Small ruminants have been an important contributor to meat production in many countries primarily due to such factors as their prolificacy and opportunity for more than one parturition per

year. However, the base populations in Belize are quite small and few producers have experience in raising small ruminants. Therefore, while potential exists for utilizing sheep and goats as complements to cattle production (e.g., mixed species grazing systems), their current status in Belizean agriculture does not justify separate programs. However, research with small ruminants would be included in the adaptive research proposed for pasture improvement and small farm systems.

Recommendations for Training

Belize agriculture, particularly animal agriculture, would benefit from increasing the numbers of trained technical personnel working in the country. However, training is only part of the solution. Already there are more well-trained Belizeans than there are suitable positions. Indeed, it is counterproductive to continue sending the best qualified Belizeans for advanced training when suitable positions do not exist upon their return. At present, the absence of good employment opportunities at home has led to a situation where Belizeans do not return after training.

There is a pressing need to add technical capabilities to the MONR in farm management, credit, economic analysis, and policy for agriculture in general and livestock in particular. Many of the better trained technical staff have become administrators with relatively little time available to utilize their technical skills.

Application of improved technology will ultimately depend on acceptance by livestock producers. Shortcourses designed to acquaint producers with new technology and appropriate means of implementation will facilitate acceptance.

The interrelated needs for training to be addressed are:

a. Increase the number of well-trained technical staff to support animal agriculture
b. Increase the placement of technical staff in private and public sectors of animal agriculture
c. Inform producers of available technology and the appropriate procedures for its application.

Recommendations include the following:

1. Support short-term training for staff of MONR, DFC, and other government institutions in topics which will improve their effectiveness (i.e., agricultural administration, extension, credit, policy, marketing). The series of short-term training programs offered by USDA in 1982/83 for foreign agriculturists could serve as an example. Topics included in this program are shown in Table 78.

2. Help expand policy analysis capability of the MONR, by providing scholarships to support training of two individuals at the M.S. level in agricultural economics with emphasis on agricultural policy analysis. Qualified candidates, who are currently employees of the MONR, should be given preference for these scholarships.

3. Support development of facilities, faculty, and curriculum at Belize School of Agriculture to produce technically skilled management for Belize agricultural enterprises (including livestock) and to supply needs of extension service. These same resources at BSA should also be used for short-term training (one- or two-week) courses for agricultural producers. These courses should emphasize:

   - Farm management
     - record keeping
     - use of credit
   - Application of technology
   - Animal husbandry practices
     - improved nutrition
     - herd health programs
     - genetic improvements

   Requirements for physical facilities at BSA include a dormitory to house fifty students, a kitchen and dining area to

serve these students, a new classroom building with four rooms varying in size to meet specific needs, a laboratory with wet bench facilities, and a new library with study carrel space.

Principal among the needs for faculty development is an instructor in farm management. This person would provide instruction in farm records, accounting, credit utilization, and related topics.

4. Utilize the expanded facilities at BSA for shortcourses to acquaint farmers with new technologies. Preference should be given to the more progressive farmers whose successful application of new technologies will demonstrate their value to others in the community. These shortcourses at BSA should be followed by courses at the local communities, conducted by district extension personnel, with the support of farmers who have attended shortcourses at BSA. Training materials developed for shortcourses by BSA faculty would be made available to these extension personnel.

Table 78. USDA Short-Term Training Program, 1982-1983

Policy Formulation and Analysis for Agriculture and Rural Development	Presents analytical techniques for formulating and evaluating alternative agricultural policies. Reviews how policies are formulated and the role of the policy analyst.	5 weeks
Economic Forecasting for Agricultural Policy and Decisionmaking	Alternative techniques for forecasting economic and agricultural information useful for policymaking. Includes forecasting procedures and evaluation of their accuracy.	6 weeks
Establishing Data Bases and Analytical Systems for Economic Decisionmaking in Agriculture	Statistical concepts for design of surveys and sampling of agricultural resources. Reviews ways to translate objectives into quantifiable variables. Discusses the roles of data processing, analysis and reporting, and field observations.	13 weeks
Effective Livestock and Crop Management for Small Farms	Identifies production systems that are compatible with smallscale agriculture. Reviews techniques useful in farm planning, budgeting, cash flow analysis, and evaluation of investment alternatives. Considers farm inputs and marketing.	6 weeks
Developing Markets for Agricultural Products	Discusses ways to improve agricultural marketing systems of developing countries. Includes marketing infrastructure, international trade, and the techniques used in market analysis.	8 weeks
Management and Organizational Change--An Organization Development Approach (for senior and executive officials)	Management skills for senior administrators in public agriculture and rural development organizations. Includes planning and implementing strategies to increase organizational effectiveness.	6 weeks

Table 78 (con't)

Management of Government Organizations in Developing Countries (for entry-to-mid-level managers) (two sections)	Identification and application of essential management principles. Includes program planning, budgeting, supervision, financial, and personnel management, work organization, office management, and control systems.	3 weeks Section I Section II
Management of Agricultural Research Facilities and Organizations	Considers the uniqueness of the agricultural research process. Helps administrators identify research needs, plan research, and establish priorities within staff and budget restrictions. Provides guidance for successful management of research organizations.	6 weeks
Agricultural Policy Seminar (for senior-level officials)	Leading authorities discuss with participants the policymaking process and specific issues such as price policies, land reform, import-export issues, marketing, population growth, and agricultural education.	4 weeks
Project Planning and Analysis for Agriculture and Rural Development (two sections)	An indepth treatment of project design analysis. Includes network analysis, data collection, budget analysis, techniques for financial and economic analyses, design of project proposals, and project refinements.	10 weeks Section I Section II
Strategies for Developing the Agricultural Sector	Techniques for applying economic development theories within the existing framework of a country's capabilities, resources, and traditions.	6 weeks
Small Farmer Credit Policy and Administration	Evaluation of alternative credit policies and programs for small farms. Study of techniques for distributing and administering credit.	6 weeks

Table 78 (con't)

Establishment and Management of Agricultural Cooperative Organizations	Alternative ways to bring smallscale farmers together in production and marketing cooperatives. Management procedures designed to keep cooperatives viable.	6 weeks
Project Implementation for Agriculture and Rural Development	Application of management concepts and skills to solve organizational and technical problems in implementing projects. Includes network analysis, information feedback, cost monitoring, and case studies.	6 weeks

Establishment of a Policy Analysis Unit in the Ministry of Natural Resources

A policy analysis and integration unit should be established within the Ministry of Natural Resources. This unit should report directly to the Permanent Secretary. Primary functions should emphasize analysis of alternative policies and their consequences for consideration by the Minister and other government policy-making bodies. It is recommended that six months of technical assistance be provided to the Policy Analysis Unit each year for the first three years of project life and three months be provided for each of the next two years. In addition, two persons should be trained to the M.Sc. level in agricultural economics with emphasis on policy analysis. It is anticipated that each training participant will need three years to complete prerequisite material and attain completion of the M.Sc. degree.

This unit should also develop and maintain cost and price series and utilize this information to develop farm budgets.

ACTIVITIES SUPPORTED BY OTHER DONOR INSTITUTIONS

LIST OF CONTACTS

REFERENCES

ACTIVITIES SUPPORTED BY OTHER DONOR INSTITUTIONS

A number of collaborative projects have been initiated in Belize to support the livestock industry. Below is a partial list of these activities.

Belize Livestock Feed/Feeder Pig Project

The Belize Livestock Feed Project was initiated in 1976 in collaboration with the Ministry of Agriculture, Belize; Michigan State University; University of Wisconsin; Heifer Project International; and Michigan-Partners of America. Its intent was to develop economical feed rations for animals (primarily swine and poultry) in Belize, maximizing the use of local ingredients. A long-term goal was the replacement of imported, for domestically produced, balanced rations.

The Project was divided into three phases. During Phase I, poultry and swine rations were tested under controlled conditions at Central Farm. Phase II involved field testing selected rations with high economic efficiency. During Phase III, a feed mixing plant was established at the BMB facility at Belmopan.

Current budget allocation is unknown, but most, if not all, external funding for the project has ended.

IDRC Pasture Project

IDRC and the Faculty of Agriculture of the University of the West Indies established a research program in 1972 with the aim of improving the productivity of native pastures through the incorporation of adaptable legumes. Initially, the research centered on testing imported exotic and locally established legumes for

adaptability in different soil conditions.

In 1977, IDRC approved support for a five-year project (Phase I and II) to expand the scope of the initial research project. This expanded project addressed the complete pasture system and allowed for equal emphasis to be placed on the testing of grasses and grass-legume mixtures.

With the completion of Phases I and II of the research project, a field application Phase III project was approved in 1982 by IDRC and the Government of Belize. Project duration is three years; IDRC funding of $270,700 is provided. The general objective is to improve the productivity of pastures in Belize by introducing adapted forage legumes and grasses and improved pasture management methods that are acceptable to beef producing farmers.

CIAT is peripherally involved with the project through provision of improved grass and legume stocks for testing under Belizean conditions.

Caribbean Agricultural Research and Development Institute Project

CARDI and the Ministry of Natural Resources, Belize, joined in 1978 to help increase the productivity and income-generating capacity of the small-scale farmers. This goal was to be accomplished by introducing new and improved techniques of farm management. To date, most research has been directed to crops although some activities have involved livestock.

The initial project was funded under the Caribbean Regional Food Plan, RLA/78/013, UNDP through August 6, 1981. After the original funds were exhausted, project activities were scaled down and financing came from core funding. Currently, approximately US$10,000 per month is being spent, excluding salaries for expa-

triate staff, consultants, and Belize's in-kind contributions. If new funding is not obtained, the project will be terminated.

To date, research has been conducted at San Antonio, Bullet Tree Falls, and Santa Familia. Work has included animal traction and milk goat trials; corn, rice, and legume variety trials; herbicide and fertilizer trials; introduction of peanuts with improved agronomic practices; weed control; feeder pig production utilizing mixed feeds and crop by-products.

Caribbean Agricultural Extension Project

CAEP, in collaboration with the Ministry of Natural Resources, University of the West Indies, and the University of Minnesota initiated a five-year project in Belize. The intent of the project was to improve the economic and social well-being of small farm households by increasing the value of agricultural production and generating agricultural employment.

The goals of the project were to be accomplished by increasing the effectiveness of the Belizean extension service; strengthening the relationship between the Faculty of Agriculture of the University of the West Indies, selected regional institutions, and the Belizean agricultural extension services; and involving women more fully in extension policies and programs.

The project was divided into two Phases. During Phase I (April 1980 - December 1982), an institutional analysis of the Belizean extension service and related agricultural activities was conducted to help develop a National System Improvement Plan. In Phase II (October 1982 - September 1983), CAEP will work with the GOB to help implement the Improvement Plan. This will involve decentralizing the extension service, emphasizing a farming systems approach in extension and training, purchasing equipment,

and providing consultants to help implement the program.

Development Finance Corporation

The DFC, created in 1961, is a primary lender to the agricultural sector of Belize. A detailed summary of DFC activities is in the section, Agricultural Credit.

Caribbean Development Bank

In addition to providing and supervising lines of agricultural credit through the DFC for agricultural loans, CDB is a principal lender to the BML and stockholder in the BBC. Refer to earlier sections of this report for further details on these activities.

Belize Trash Fishmeal Project

The Belize Trash Fishmeal Project, sponsored by the Department of Agriculture, Belize and the Caribbean Producers Cooperative Society, with financial support from HPI and CARE, was initiated in October 1978. Its intent was to develop a fishmeal operation to produce high quality protein feed. Further details are given in the section entitled Feed Resources.

Toledo Rural Development Project

The Toledo Rural Development Project is supported by British ODA. The project was initiated in 1979 but technical staff were not housed at the headquarters site near Blue Creek, Toledo until November 1981. The objectives of the project are to evaluate and improve farming systems in Toledo, primarily those practiced by Mopan and Ketihi Indians. Emphasis is on cropping systems and

water control (irrigation and drainage); however, their baseline survey indicated the importance of animals, especially swine, as a component of the farming system. Although monitoring and some research with crops and, perhaps, animals will continue on farms, principal activities now planned involve research using the experimental facilities at the Blue Creek headquarters. Originally planned to be a two-year project, it has been extended through 1986.

LIST OF CONTACTS

U.S. Embassy, Belize City

Barnebey, Malcolm. Charge-D'Affaires
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Caribbean Development Bank

Caribbean Development Bank

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APPENDIX I

Estimated Rates of Return for Cattle Operations

Table A1. Small Size Farm, Internal Rate of Return to Cattle Operation, B$[1,2]

Year	Gross Revenues	Residual Value	Investment	Operational Expenses	Net Revenue	D.F.	N.P.V.	D.F.	N.P.V
						- - 3% - -		- - 5% - -	
1	0	--	$16,512	$2,908	$(19,420)	.971	$(18,857)	.952	$(18,488)
2	$ 578	--	700	2,952	(3,074)	.943	(2,899)	.907	(2,788)
3	578	--	700	2,995	(3,117)	.915	(2,852)	.864	(2,693)
4	4,470	--	1,000	2,995	475	.888	422	.823	391
5	3,800	--	--	2,995	805	.863	695	.784	631
6	$3,800	$25,024	--	$2,995	$28,824	.837	$24,126	.746	$21,503
IRR = 3.61%							$635		($1,444)

[1] Assumptions:

Residual value of land, 60 acres @ B$250/acre	B$15,000
Animals	10,024
	B$25,024

[2] D.F.: Discount Factor
N.P.V.: Net Present Value
IRR: Internal Rate of Return

Table A2. Estimated Rate of Return for Small Farm, Weaner Operation, B$[1,2]

Year	Gross Revenues	Residual Value	Investment	Operational Expenses	Net Revenue	D.F.	N.P.V.	D.F.	N.P.V
						-- 8% --		-- 10% --	
1	0	--	$16,512	$2,942	$(19,454)	.926	$(18,014)	.909	$(17,684)
2	$3,740	--	1,400	3,016	(676)	.857	(579)	.826	(558)
3	3,740	--	1,400	3,016	(676)	.794	(537)	.751	(508)
4	4,410	--	1,000	3,016	394	.735	290	.683	269
5	3,740	--	--	3,016	724	.681	493	.621	450
6	$3,740	$29,580	--	$3,016	$30,304	.630	$19,091	.564	$17,091
IRR = 8.88%							$744		-$940

[1] Assumptions:

Residual value of land, 60 acres @ B$250/acre	B$15,000
Animals	14,580
	B$29,580

[2] D.F.: Discount Factor
N.P.V.: Net Present Value
IRR: Internal Rate of Return

Table A3. Medium Size Commercial Farm, Internal Rate of Return to Cattle Operation, B$[1,2]

Year	Gross Revenues	Residual Value	Investment	Operational Expenses	Net Revenue	D.F.	N.P.V.	D.F.	N.P.V
						- - -1% - -		- - 3% - -	
1	0	--	$108,000	$13,717	$(121,717)	.990	$(120,500)	.971	$(118,187)
2	$3,468	--	4,900	14,069	(15,501)	.980	(15,191)	.943	(14,617)
3	3,468	--	4,900	14,420	(15,852)	.971	(15,392)	.915	(14,505)
4	21,850	--	6,900	14,420	530	.961	509	.888	471
5	20,510	--	--	14,420	6,090	.951	5,792	.863	5,256
6	$20,510	$161,150	--	$14,420	$167,240	.942	$157,540	.837	$139,980
IRR = 2.78%							$12,758		($1,602)

[1] Assumptions:

Residual value of land, 270 acres @ B$350/acre	B$94,500
Animals	56,650
Corrals, dipping vat	10,000
	B$161,150

[2] D.F.: Discount Factor
N.P.V.: Net Present Value
IRR: Internal Rate of Return

Table A4. Large Commercial Farm, Internal Rate of Return to Cattle Operation, B$[1,2]

Year	Gross Revenues	Residual Value	Investment	Operational Expenses	Net Revenue	D.F.	N.P.V.	D.F.	N.P.V
						- - 3% - -		- - 5% - -	
1	0	--	$309,700	$37,665	$(347,365)	.971	$(337,291)	.952	$(330,691
2	$10,404	--	12,600	38,799	(40,915)	.943	(38,583)	.907	(37,110
3	10,404	--	12,600	39,933	(42,129)	.915	(38,548)	.864	(36,399
4	73,474	--	6,000	39,933	27,521	.888	24,439	.823	22,650
5	69,454	--	--	39,933	27,521	.863	23,751	.784	21,576
6	$69,454	$418,450	--	$39,933	$447,971	.837	$374,952	.746	$334,186
IRR = 3.51%							$ 8,720		($25,788

[1] Assumptions:

Residual value of land, 610 acres @ B$350/acre	B$213,500
Animals	169,950
Deprec. value vehicle, corral, dipping vat	35,000
	B$418,450

[2] D.F.: Discount Factor
N.P.V.: Net Present Value
IRR: Internal Rate of Return

APPENDIX II

Farm Plan Loans Scheme

Barclays Bank International Limited
P.O. Box 363
Albert Street,
Belize City,
Belize

9th July, 1982.

Dr. H.A. Fitzhugh, Ph.D.,
c/o U.S. Embassy,
Gabourel Lane,
Belize City.

Dear Dr. Fitzhugh,

I promised to give you brief details of our Farm Plan Loans Scheme which is our scheme for finance for the small farmer. The scheme is known as the "Farm Plan". Its objectives are:-

1) To provide farm finance for small farmers (five to fifty acres) who have growth potential.

2) To help stimulate economic development in rural areas.

Target Market

Our target small farmer should have the following characteristics:-

1) His farm whether freehold or leasehold should ideally be not less than five acres and not more than fifty acres. This however does not mean that we cannot lend to a farmer with a smaller or larger landholding.

2) There should be a ready market for the produce. Sales should preferably be made to an established marketing association or to a Government marketing board or to a private buyer under contract, with proceeds mandated to our Bank.

3) The farmer should either have experience and/or knowledge of farming and should be business oriented. The farm would preferably be his sole activity and not just a part-time occupation.

4) The applicant should have a good record of creditworthiness.

We can make loans for the following purposes:-

1) Land clearing and preparation.

2) Purchase of seed, insecticides and stockfeed.

3) Harvesting expenses e.g. rental of equipment, labour and packaging and transportation.

4) Purchase of land, equipment and livestock.

5) Construction of farm buildings, roads, etc.

For the purpose of this Scheme, agricultural activities are:-

1) Animal production, including pigs, poultry, beef and dairy cattle, sheep and goat.

2) Crop production e.g. vegetables, fruit, tree crops, arable crops, ornamental and flowers.

3) Fishing.

4) Agricultural services e.g. marketing of agricultural products, contract ploughing and transportation, etc.

Limits

Any one of our branches may grant to any one person or corporate entity loans up to a maximum of $50,000 of which $15,000 may be unsecured over periods of up to ten years.

Rate of Interest

It is not our intention to subsidise the small farmers through cheap loans and we make these loans available at commercial rates but limited to 1-1/2% over our base rate which at present stands at 18%.

Terms of Repayment

As we have already said, we can lend up to ten years for these loans but naturally in the case of annual crops, loans should be repaid in one year from sale of the crops themselves.

Security

Although we would like to obtain security wherever possible, this is not our main consideration and the unavailability of security does not prevent a farmer getting financial assistance where he has demonstrated that he has a viable project, possesses the necessary skills to operate a successful farm operation and is of established good reputation.

The most common type of security however for lendings under this scheme are:-

1) A charge over freehold land and buildings.

2) Charge over leasehold property.

3) Bill of sale over equipment and machinery.

General

In identifying the small farmer, we limit this Scheme to persons, co-operatives, partnership or corporate bodies whose total assets do not exceed $100,000.

Yours sincerely,

J.M. ATTL
MANAGER

APPENDIX III

What is the DFC?

WHAT IS THE D.F.C.?
WHAT DOES IT DO?
HOW DOES IT FUNCTION?

THE ANSWERS ARE INSIDE

THIS PAMPHLET

Prepared By: The Development Finance Corporation
P. O. Box 40
Belmopan, Belize

DEVELOPMENT FINANCE CORPORATION

I. INTRODUCTION

By now D.F.C. (i.e. Development Finance Corporation) has become almost a household word among the farming and business communities in Belize. It is highly regarded abroad. Just what is it all about? The D.F.C. is a fully owned government statutory Corporation, established under special legislation.

In 1973, Government purchased all old D.F.C. shares from private shareholders and reactivated, reconstituted and modernised the Corporation as an instrument in the overall development strategy of Belize.

II. STRUCTURE AND MANAGEMENT

Who runs the D.F.C.?

The Corporation has a Board of Directors which administers, supervises and controls its affairs. The Corporation is geared to operate along sound financial development banking guidelines. The General Manager and staff are responsible for the day to day management, direction and control of the business of the Corporation.

Under the law, the Corporation is required to ensure that funds are spent for the purposes for which they are borrowed, and to ensure that applications are considered strictly on the financial and economic merits of the project, and in the light of recommendation as to the character of the applicant.

Strict secrecy is observed in all matters relating to the affairs of the Corporation, in order to maintain a good reliable client/banking relationship and to comply with the law.

III. PURPOSE

The D.F.C. Ordinance will go into more detail about the purposes of the Corporation. Its primary objective, however, is to further and foster the development of Belize, by performing development banking and other development functions.

IV. WHAT DOES D.F.C. DO?

The Corporation is presently carrying out the following activities:-

a) (i) offers medium to long term development credit for viable projects in the agricultural, forestry, fishing, tourism, industrial, housing* and services sectors;

(ii) provides technical assistance to potential borrowers and prospective investors in the identification and development of any worthwhile investment project;

(iii) undertakes equity investment in selected projects, which have a significant and favourable effect on the development of Belize.

(iv) develops and operates industrial parks;

(v) administers loan funds of other agencies, including Student and Small Farmers and Housing Loan Schemes; and

(vi) undertakes investment promotion for Government on behalf of the country, both for local and foreign investors.

b) In November, 1976, the Corporation set up a subsidiary called "DFC Investment Company Ltd.", to buy, sell and manage equity investment in approved local enterprises. Four local entities have, so far, been extended such equity financing.

V. LOAN POLICIES

In determining the suitability of a project for financing, the Corporation must generally be satisfied about the following:-

a) Is the enterprise sound and likely to continue to be viable?

b) Is the borrower capable of undertaking the project, or can he get someone suitable to run it for him?

* However, at present DFC is not processing any housing loans, due to lack of funds.

c) Is the financial structure of the enterprise sound?

d) Can suitable arrangements for marketing be made?

e) Is the security offered for the particular program satisfactory? The source of funds, used to finance the project, will normally determine the security requirements and terms and conditions for a particular loan. The loan is normally conditioned to ensure that the funds are disbursed in accordance with the project design.

In addition:

f) That good business practices are employed; and

g) That any procurement and other conditions imposed on the Corporation from external sources are carried out by the borrower, as relevant;

Loans are not normally made to non-nationals, except in special cases, e.g. export oriented enterprises, or linkage, or bottleneck enterprises which open opportunities for Belizeans.

VI. FINANCIAL RESOURCES

The Corporation's authorized share capital is $4 million. Lines of credit have been secured from various sources, including the Caribbean Development Bank for Farm Improvement, Small Industry and Ordinary Resources Credit, other Agricultural and Industrial Credit, Agricultural Production Credit and Industrial Park; from the U.K. Government for small farmers projects; from the Canadian International Development Agency for Agricultural and Industrial Projects and funds for Working Capital and Equity Financing; and from the European Development Fund for small farmers projects. The Corporation also obtains funds from local resources and manages funds on behalf of CARE, Government for Student Loans, Hurricane Rehabilitation, Drought Assistance, Investment Promotion and Housing. The Corporation continues to explore increasing loans from existing sources and new sources of financing.

VII. RANGE OF LENDING PROGRAMMES

A wide range of activities, eligible for financing by the Corporation and new sources of funds are continually being explored, as the need arises for new development activities.

The Corporation currently provides loans for the following:-

a) Direct participation in part, in the financing of any one project, but, in the case of the much larger projects, DFC can arrange for financing from other sources, including international sources.

b) Medium to long-term lending for small, medium and commercial size farmers, for any sound agricultural undertaking, including crops (rice, beans and corn), livestock and agricultural services.

Other purposes for which loans are made:- cultivation of citrus, sugar cane, bananas, vegetables and for bee-keeping, poultry, dairy and mixed farming projects. The normal maximum size of a loan is $400,00, (exceptions for lower loans being made) and the normal maximum size is the equivalent of $200,000 and $300,000 to Cooperatives and farmers organisations.

c) Rural Development Small Farmers loan schemes, preferably on a group or cooperative basis for loans under $3,000, including crop loans on a selected basis. These programmes are more rigidly supervised as a trade-off for the minimal security required.

d) Industrial, including agro-based industrial enterprises. Equity funds are also available in this sector in special cases.

e) Fisheries projects and sound and viable forestry projects, including production and processing operations.

f) Tourism projects, preferably small scale tourism facilities, including ancillary services.

g) Student Loans to a maximum of $5,000 per annum for training in CARICOM countries, with exceptions where such training cannot be obtained within that region.

h) Housing where the project is valued for not less than $12,500 and not more than $60,000 when completed.

VIII. CONTRIBUTION BY BORROWER

Normally, the borrower should provide at least 30% contribution towards the project, but the Corporation may use its discretion in projects of sufficient economic and social importance. The borrowers, except small farmers, will be expected to meet all legal fees, closing out costs, etc. in connection with loans. The Corporation must have satisfactory evidence of the availability of all borrowers' contribution.

IX. SECURITY

The normal security requirement for a good commercial project would be 1 1/3% of the value of the loan, with exception made for small scale Agricultural and Industrial projects where no other security exists. This amount may be increased, depending on the risk nature of the project.

Borrowers are normally expected to contribute a minimum of 30% of the cost of the project for which the loan is being made.

The repayment period for a loan is determined on the basis of the economic life of the assets financed and the ability of the enterprise to repay, as reflected in its cash flow projections. Except for crop loans, the normal minimum period for any loan is three years.

The Corporation normally accepts first class security, including mortgages on real estate and fixed assets, Bills of Sale on equipment and related to the resale value and good Third Party Guarantees. Applicants are advised, in the case where Government-owned lands are offered as security, that the borrower must be in possession of a Lease Fiat, which contains an irrevocable option to purchase at a specified price.

X. INTEREST CHARGES

The interest rate chargeable on loans is determined from the source from which the funds will be relent and the type of activity being financed, the size of the loan, and the commercial banks' current interest rates.

Normally, for loans for agricultural projects, the interest rate varies between 8% and 12%. For small and medium size industrial projects, the interest rate is 10% and for larger industrial undertakings, interest is at 12%. Student loans are lent at 7% and 9% and housing loans at 10 1/2% to 12%.

The interest payable is calculated on the amount withdrawn and outstanding at any one time, and there is no penalty for the early repayment of the outstanding loan.

XI. OTHER FINANCIAL CHARGES

DFC reserves the right to impose a charge of 1% of loan commitment on the undisbursed portion of loans approved, calculated from the date of formal acceptance by the sponsor of the loan. The borrower is expected to pay all necessary valuation, inspection, legal fees, registration expenses and insurance charges before loan funds can be disbursed.

XII. OFFICES

D.F.C. headquarters offices are located on Bliss Parade, Belmopan, Belize, C.A. and there are branches in Belize City, Corozal and Orange Walk towns, Dangriga (Stann Creek) and Punta Gorda (Toledo).

DFC staff stands ready to serve the public at any of these offices.

XIII. LOAN APPLICATIONS

Applications should be submitted, following enquiries, on application forms available at the Corporation's offices. Where necessary, the Corporation assists borrowers in the filling out of loan application forms and in the development of their projects. All loans are approved or ratified by the Board of Directors.

Any person interested in borrowing from DFC for the purposes listed above should write to the -

General Manager,
Development Finance Corporation,
Bliss Parade,
P. O.Box 40,
Belmopan, BELIZE, C.A.

Telephone: 08-2350 or 08-2360
Telex Address: 240 DEFINCO

XIV. INVESTMENT PROMOTION UNIT

This unit serves as a front desk information centre on behalf of Government. It provides all information on incentives which the Government offers to investors and all other data connected with investment, e.g. land purchase, work permit, trade licence, concession, markets, weather, etc.

The Corporation, through its Investment Promotion Unit, administers the Ladyville Industrial Park and makes pre-built factory facilities available on competetive long-term leasehold arrangements. The facilities include both standard and customized structures.

At present, we have over 6,000 sq.ft. factory shell available for lease. Other factory shells of the same size and of 20,000 sq.ft. may be provided to interested clients within 9 months of signing a letter of intent for such a building. Standard Lease forms are presently available for distribution to interested parties.

For further particulars on Investment Promotion and or the Ladyville Industrial Park, please address enquiries to:-

The Investment Promotion Unit,
Development Finance Corporation,
#17 Regent Street,
P. O. Box 878,
Belize City,
BELIZE, C.A.

Telephone: 02-7041
Cable Address: DEFINCO BELIZE
Telex Address: 248 DEFINCO BELIZE

INVESTMENT OPPORTUNITIES IN BELIZE

The following are some of the projects identified as Investment Opportunities in Belize:

1. Livestock for meat and milk.
2. Dairy production/processing unit.
3. Grain crops production/processing operation.
4. Animal Feed Mill for poultry and pigs.
5. Major fish processing plant and deep water fishing.
6. Edible oils, margarine and lard processing plant, with associated products of coconut and cohune.
7. Food processing in: (a) fruits
   (b) vegetables
   (c) meat
8. Major sawmill/logging operation complex, to include dry kiln facilities and the manufacturing of plywood, chipboard, veneer, hardboard and furniture making.
9. Tannery and Footwear.
10. Shark fishing and processing.

Persons interested in specific information on any of these projects, or any other information on investment in Belize, should feel free to write to or visit:

The Investment Promotion Officer,
Development Finance Corporation,
P. O. Box 876,
17 Regent Street,
Belize City,
BELIZE, C.A.

APPENDIX IV

Belize Meat and Livestock Ordinance and Amendments

No. 1 of 1977

I assent,

P. D. McENTEE,

Governor.

7th April, 1977.

AN ORDINANCE to provide for the establishment of a Meat and Livestock Commission for the development of the livestock industry, for the control of the slaughter, export and import of cattle, and for the imposition levy and collection of a cess on cattle sold to butchers or for export and for matters connected therewith or incidental thereto.

[*Gazetted 16th April, 1977*].

BE IT ENACTED by the Queen's Most Excellent Majesty, by and with the advice and consent of the House of Representatives and the Senate of Belize and by the authority of the same as follows:—

1. This Ordinance may be cited as the MEAT AND LIVESTOCK ORDINANCE, 1977 Short Title

Interpretation.

2. In this Ordinance, unless the context otherwise requires:—

"association" means the Belize Livestock Producers Association established under Section 15 of this Ordinance;

"butcher" means any person who slaughters or causes to be slaughtered any cattle the meat of which is intended for sale or for human consumption;

"cattle" means castrated or entire of any bull, cow, bullock, heifer, calf, steer, ox, ewe, wether, ram, goat, kid, boar, sow, gilt or swine;

"cess" means a monetary imposition raised under Section 7 of this Ordinance;

"Commission" means the Meat and Livestock Commission established under Section 3 of this Ordinance;

"exporter" means any person licensed to export any cattle or to process meat for export;

"financial year" means in respect of any matters relating to the revenue, expenditure and accounts of the Commission or the Association, the twelve months ending on the thirty-first day of December inclusive in any year;

"trader" means any person engaged in the wholesale or retail trade in meat, not intended for export;

"livestock" means any cattle as defined in this Ordinance;

"meat" means the flesh or carcass of any cattle intended for human consumption;

"Minister" means the Minister responsible for Agriculture;

"owner" means any proprietor of any cattle and includes any of his authorised agents or managers;

"producer" means any person who breeds or fattens more than five cattle for sale or by way of trade;

"slaughter house" means any premises licensed under the Food and Drugs Ordinance or maintained at public expense for the slaughter of cattle for sale or human consumption.

Chapter 90.

Establishment of the Commission.

3.—(1) There is hereby established a Meat and Livestock Commission to be known by that name which shall be a body corporate having perpetual succession and a common seal, which shall be judicially noticed and which may sue and be sued in its corporate name and may make contracts and hold and dispose of land of whatever tenure and other property for the purpose of carrying out its functions under this Ordinance.

(2) All deeds, documents or other instruments requiring the seal of the Commission shall be sealed with the common

seal of the Commission in the presence of the Chairman and one other member of the Commission who shall sign every such deed, document or other instrument to which the common seal is affixed.

Constitution of the Commission.

4. The Commission shall consist of

(a) [illegible] members, namely:

(i) the Permanent Secretary to the Ministry of Agriculture and Lands; and

(ii) the head of the Livestock Development Division of the Ministry of Agriculture and Lands; and

(b) seven other members appointed by the Minister, namely:

(i) one person representing the exporters;

(ii) one person representing the traders;

(iii) three persons from among not less than five members nominated by the Belize Livestock Producers' Association; and

(iv) two persons having no connection with the meat and livestock industry.

Membership of the Commission.

5.- (1) The Permanent Secretary to the Ministry of Agriculture and Lands shall be the Chairman of the Commission.

(2) Every member appointed by the Minister shall, unless he earlier vacates office by death or resignation, hold office for a period of two years. Any appointed member who vacates office by passage of time shall be eligible for re-appointment.

(3) Any appointed member may at any time resign his office by letter addressed to the Minister.

(4) Any vacancy in the membership of the Commission shall be filled as soon as may be convenient, with due regard to the provisions of Section 4.

(5) No act or proceeding of the Commission shall be invalid by reason only of the existence of any vacancy amongst its members or any defect in the appointment of a member thereof.

(6) If the Chairman or any appointed member is temporarily unable to discharge the duties of his office on account of ill health or absence from the country or for any other cause, the Minister may with due regard to the provisions of Section 4 appoint some other person to act in his place as Chairman or as such member.

(7) Any person appointed in place of any member who has vacated office by death or resignation shall hold office

only for the unexpired term of office of such member who has vacated office.

(8) Any member of the Commission shall be deemed to have vacated his seat if he:—

(a) dies, is certified insane, is adjudicated a bankrupt or accepts any office of profit under the Commission;

(b) not being an ex-officio member, is absent without the leave of the Commission from four consecutive meetings of the Commission;

(c) not being an ex-officio member, ceases to be eligible to serve on the Commission.

Meetings and quorum.

6.—(1) The Commission shall hold meetings for the transaction of its business at such time and place and upon such days as the Chairman may determine from time to time.

(2) The Chairman may at any time, and shall within seven days of the receipt of a requisition for that purpose addressed to him by any three members, call a special meeting of the Commission.

(3) The Chairman shall preside at all meetings at which he is present and in his absence the members present shall elect one of their number to preside at that meeting.

(4) At any meeting of the Commission five members shall constitute a quorum, and the business shall be transacted on the vote of the majority present and voting.

Cess on cattle.

7.—(1) The Commission shall with the approval of the Minister impose, levy and collect a cess upon all cattle sold to butchers, or sold for export. The rate of cess approved by the Minister shall be published in the *Gazette* before the start of each financial year, and shall not exceed one cent per pound of liveweight on each cattle without the prior consent of the Association.

(2) Cess on cattle slaughtered shall be paid by the butcher at the slaughter house, the operators of which shall be liable to the Commission for the amounts collected.

(3) The rate of cess shall not be varied during the financial year in respect of which it was imposed.

(4) Until the cess on cattle sold for export is fixed by the Commission with the approrval of the Minister,—

(a) any exporter of live cattle for slaughter shall pay to the Commission a cess of ten dollars plus an *ad valorem* tax of two percent on the sales value, and

(b) any exporter of live cattle for breeding shall pay to the Commission an *ad valorem* fee of two percent on the sales value.

Powers and duties of the Commission.

8.—(1) The powers and duties of the Commission shall be—

(a) to employ such officers and servants upon such terms and conditions as it may deem fit;

(b) to specify the records to be kept and the returns to be made by the Commission, Association, owners, exporters, importers, butchers and traders;

(c) to receive and deal with returns made in terms of paragraph (b) above;

(d) to register and regulate cattle breeding societies;

(e) to hold or otherwise operate auction sales of livestock;

(f) to grade livestock and meat and to specify the standards to be applied therefor;

(g) to control the sale and exportation of live cattle to be used for breeding and to specify the standards to be applied thereto;

(h) to control the importation of live cattle for slaughter;

(i) to operate meat packing plants;

(j) to establish depots and agencies for the purchase of livestock;

(k) to advise exporters, traders and the Association on any matter concerning the meat and livestock industry;

(l) to advise the Minister on all matters concerned with the meat and livestock industry;

(m) to appoint such executive committees or sub-committees as may be required for the efficient performance of its duties and functions under this Ordinance;

(n) to be an arbitrator, when requested, in any dispute, issue or disagreement arising between any exporter and any trader or between either or both of these and the Association or between the Association and such company or companies as may be approved by the Minister under Section 21: Provided that the Commission's decision thereon shall be final and binding on all the parties concerned;

(o) to receive and expend such monies as may accrue to the Commission;

(p) to do any other act that may be necessary to give effect to one or more of the above.

(2) The Commission shall comply with any direction whether general or particular given by the Minister in connection with the exercise or discharge of any powers or duties conferred upon the Commission.

Regulations.

9.—(1) The Commission may, with the approval of the Minister, make regulations for carrying out its powers and duties under the Ordinance, for the development of the Livestock industry and in particular for prescribing anything required to be prescribed.

(2) Any person who contravenes the provisions of any regulation made under this Ordinance shall be guilty of an offence under this Ordinance.

Funds of the Commission.

10.—(1) The Commission shall have its own fund.

(2) There shall be paid into the fund of the Commission:

(a) all such sums as may be collected by the Commission by way of cess;

(b) any other sums due to the Commission from any other source.

(3) There shall be paid out of the fund in respect of each financial year:

(i) all such sums as are required to defray the expenses incurred by the Commission in the exercise, discharge and performance of its powers, functions and duties under this Ordinance or any regulation made thereunder; and

(ii) all such sums as are required to defray the expenses of the Association:

Provided that the annual budgets of the Commission and the Association shall have been approved by the Minister.

(4) Any sum remaining after defraying the expenses referred to in subsection (3) shall be paid into a fund to be known as the "Livestock Industry Development Fund".

(5) The administration of the fund referred to in subsection (4) shall be vested in a Board of Trustees consisting of three trustees, one nominated by the Minister, one by the Commission and one by the Association. Regulations may be made by the Minister for the Administration of the Livestock Industry Development Fund.

Accounts of the Commission.

11. The Commission shall cause proper accounts to be kept of its financial transactions. Such accounts shall be made up in respect of each financial year and audited by an auditor appointed by the Commission and approved by the Minister and when so audited shall be submitted to the Minister, who shall cause the same to be published in the *Gazette* and at least one local newspaper within six months of the close of the financial year.

Estimates.

12.—(1) The Commission shall in respect of each financial year, as early as may be convenient, prepare and submit to the Minister in such form as required by the Minister, the estimates of the income recoverable and expenditure to be incurred during that financial year. The Commission shall also obtain and submit the estimates of the Association, together with the comments if any on them.

(2) The Minister may approve or amend such estimates.

(3) When the Minister has approved the said estimates he shall cause the same to be published in the *Gazette*.

(4) All new or special expenditure with the exception of emoluments shall receive the approval of the Minister before being included in the estimates.

(5) Save with the approval of the Minister, no further sum shall be expended during any financial year other than is provided in the estimates relating to such financial year.

Annual report.

13.—(1) The Commission shall prepare annually a written report of its activities during the financial year together with a complete statement of its financial position and its accounts, audited as provided for in Section 11.

(2) The Commission shall transmit certified copies of such report, statement and accounts to the Minister who shall lay them before the National Assembly.

Rules

14. The Commission may, with the approval of the Minister, make rules for regulating its proceedings and may from time to time alter or amend the same.

Belize Livestock Producers Association.

15. For the purposes of this Ordinance, there is hereby established an association of Livestock producers in Belize known as Belize Livestock Producers Association.

16. The objects of the Association shall be:—

(a) to promote understanding and goodwill among the members of the Association;

(b) to promote the development of the livestock industry;

(c) to nominate the Association's representatives on the Meat and Livestock Commission to safeguard the interests of members in all matters concerned with the production and marketing of livestock;

(d) to encourage the production of better livestock and the formation of cattle breeding Societies;

(e) to provide technical and other information of assistance to members;

(f) to promote increased consumption of beef and livestock products;

(g) to participate in livestock exhibitions;

(h) to provide for the benefit of members educational and training facilities in the livestock industry;

(i) to negotiate with such company or companies as may be approved by the Minister under Section 21, from time to time, the prices payable for livestock;

(j) generally to do all things necessary to be done in the best interests of the Livestock industry.

Membership.

17.—(1) Every producer shall be eligible to be a member of the Association.

(2) The Association may with the approval of the Minister, make rules specifying the procedure to be adopted in the registration of members.

Register of Members.

18.—(1) The Committee of management of the Association shall keep in such form as may be prescribed by the Commission a register containing, in respect of each member of the Association, particulars of:

(a) his full name and address;

(b) the number and kinds of cattle belonging to him; and

(c) such other particulars as the Commission may from time to time prescribe.

(2) Separate registers shall be maintained in respect of the various administrative Districts.

(3) The registers shall be open to inspection during normal office hours by any member of the Association or of the Commission.

(4) Every registered producer shall be issued with a certificate of Registration, which shall be surrendered when he ceases to be a member.

Committee of management.

19.—(1) The affairs of the Association shall be managed by a Committee of management hereinafter referred to as the Committee, which shall have control of the income, capital and property of the Association and shall have full authority in all matters connected with the appointment and dismissal of the officers and employees of the Association and with the administration of the affairs and the accomplishment of the objects and purposes of the Association.

(2) The Committee shall consist of eight members.

(3) The Committee shall be elected at the Annual General Meeting. The election shall be by ballot.

(4) The term of office of a member of the Committee shall be two years from the date of his election and he shall be eligible for re-election:

Provided however that half the number of members determined by the drawing of lots shall resign their seats at the end of the first year.

(5) The Committee shall elect annually from among its members a Chairman, Vice-Chairman, Treasurer, Secretary and other office-bearers as it deems necessary.

(6) A member of the Committee may resign his seat by a letter addressed to the Chairman.

(7) When any member resigns or vacates his seat or is deemed to have vacated his seat a person may be nominated by the Committee in his place. The person so nominated shall hold office for the remainder of the term of office of such member.

(8) Subject to the existence of a quorum, the powers of the Committee shall not be affected by any vacancy in the membership thereof.

(9) Any member of the Committee who:—

(a) dies

(b) is adjudicated bankrupt

(c) is certified insane

(d) holds any office of profit in the gift of the Association

(e) is absent from three consecutive meetings without valid reasons acceptable to the Committee, or

(f) is serving a prison sentence,

shall be deemed to have vacated his seat.

(10) The first Committee shall, however, be nominated by the Minister and it shall hold office till the first Annual General Meeting of the Association.

(11) The Committee shall meet on a regular basis for the transaction of business.

Functions of the Committee.

20.—(1) The Committee shall comply with any lawful direction given to the Association by the Commission.

(2) The Committee shall have and may exercise all the powers conferred upon the Association under this Ordinance.

(3) The Committee shall submit an annual return to the Commission at such time and in such form as the Commission may determine, of all registered members of the Association together with such other information as may be contained in the Register of the Association.

(4) The Committee shall take notice of any resolution passed by the Association in general meeting.

Prices for livestock.

21.—(1) The prices payable for cattle intended for slaughter or export, shall, from time to time be determined by negotiation between the Association and such company or companies as may be approved by the Minister under subsection (2) of this Section. In the event of a failure to arrive at a price by negotiation as aforesaid, the matter shall be referred by the Association to the Commission for arbitration.

(2) The Minister shall, by Order published in the *Gazette* approve such company or companies incorporated in Belize as are engaged in the meat and livestock industry with which the Association is to enter into negotiations as provided for in subsection (1).

Meetings of the Association.

22. (1) There shall be an Annual General Meeting of the Association before the end of the month of February of each year. This meeting shall be called by the Committee and shall consider Annual Reports dealing with the finances and management of the Association and the election of the Committee.

(2) The Committee shall if requested to do so in writing by twenty members of the Association call a special General Meeting giving twenty-one days notice thereof to all members. Discussions at such meeting shall be restricted to the matter for which the meeting was called.

Rules regulating business of the Association.

23. The Association may with the approval of the Commission, make rules to regulate the procedure at meetings of the Association and the Committee and the transaction of business at such meetings.

Accounts of the Association.

24. The Committee shall keep full and proper accounts of their financial transactions in respect of each financial year, and such accounts shall be audited and submitted to the Commission within six months of the close of the financial year and the accounts together with the auditor's report shall also be laid before the Association at the next Annual General Meeting.

Committee to submit estimates of revenue and expenditure.

25. The Committee shall in respect of each financial year prepare and submit to the Commission in the form required by the Minister estimates of the income receivable and expenditure to be incurred by the Association during that financial year.

Annual Report of Association.

26. The Committee shall also prepare and present to the Annual General Meeting of members of the Association a report of its proceedings for each financial year.

Liability of the members.

27. No member of the Commission, or the Committee of Management of the Association shall be personally liable for any act or default done or omitted to be done in good faith in the course of the operations of the Commission or the Association as the case may be.

Duties of the Minister.

28. (1) The Minister may give to the Commission in writing general or special directions as to the performance of the duties and the exercise of the powers of the Commission.

(2) The Minister may from time to time direct the Commission or the Association in writing to furnish to him in such forms as he may require returns, accounts and other information with respect to the property and business of the Commission or the Association and the Commission or the Association as the case may be, shall carry out every such direction.

(3) The Minister may order all or any of the activities of the Commission or the Association to be investigated and reported upon by such person or persons as he may specify and upon such order being made, the Commission or the Association, as the case may be shall afford all such facilities to carry out such order.

Offence and penalty.

29. Any person who contravenes any of the provisions of this Ordinance or of any regulation made thereunder, or is guilty of an offence under this Ordinance, shall be liable on summary conviction to a fine not exceeding one thousand dollars or to imprisonment for a period not exceeding six months or to both such fine and imprisonment.

Printed by the Government Printery.

No. 30 of 1980

I assent,

J. P. I. HENNESSY,

Governor.

16th December, 1980

AN ORDINANCE to amend the Meat and Livestock Ordinance (No. 1 of 1977) to empower the Commission to regulate the movement of cattle and meat within and between districts and to provide for the cess levied on cattle payable to the association rather than to the Commission and for matters connected therewith or incidental thereto.

(*Gazetted 20th December*, 1980.)

BE IT ENACTED by the Queen's Most Excellent Majesty, by and with the advice and consent of the House of Representatives and the Senate of Belize and by the authority of the same as follows:—

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1. This Ordinance may be cited as the **Short Title.**

MEAT AND LIVESTOCK (AMENDMENT) ORDINANCE, 1980

and shall be read and construed as one with the Meat and Livestock Ordinance, No. 1 of 1977, which Ordinance is hereinafter referred to as the principal Ordinance.

Amendment of section 2.

2. Section 2 of the principal Ordinance is amended by the substitution in the definition of the word "cess" the word, figure and letter "section 21A" for the word and figure "section 7" occurring therein.

Amendment of section 4.

3. Section 4 of the principal Ordinance is amended by the addition at the end thereof of the following:—

"Where the officer mentioned in paragraph (*a*) (*i*) or (*a*) (*ii*) of this section is unable to be present at any meeting of the Commission, he may appoint an alternate to represent him at that meeting".

Repeal of section 7.

4. Section 7 of the principal Ordinance is repealed.

Amendment of section 8.

5. Section 8 of the principal Ordinance is amended in subsection (1) of that section as follows:—

(*i*) by the insertion immediately after item (*e*) of the following new items:—

(*ea*) to control the slaughtering of female livestock;

(*eb*) to impose minimum weight restrictions on the slaughtering of all livestock;

(*ec*) to regulate the movement of cattle and meat within and between districts;

(*ii*) by the substitution in item (*g*) of the words "breeding or for slaughter" for the word "breeding" occurring therein;

(*iii*) by the substitution in item (*h*) of the words "slaughter or for breeding" for the word "slaughter" occurring therein.

Amendment of section 10.

6. Section 10 of the principal Ordinance is amended as follows:—

(*i*) by the repeal in subsection (2) of that section of item (*a*) and replacement therefor of the following:—

"(*a*) such sums provided for in the annual budget as may be approved by the Minister;"

(*ii*) by the repeal of subsection (3) of that section and the replacement of the following:—

"(3) There shall be paid out of the fund in respect of each financial year all such sums as are required to defray the expenses incurred by the Commission in the exercise, discharge and performance of its powers, functions and duties under this Ordinance or any regulation made thereunder."

(*iii*) by the repeal of subsections (4) and (5) of that section.

Insertion of section 21A, 21B, and 21C.

7. The principal Ordinance is amended by the insertion immediately after section 21 of the following sections: —

"Cess on cattle.

21A.(1) The Association shall with the approval of the Minister impose, levy and collect a cess upon all cattle sold to butchers or sold for export. The rates of cess approved by the Minister shall be published in the *Gazette* before the start of each financial year.

(2) The butcher is responsible for the collection of cess from the producer at the time of purchase and for payment of the same at the time of slaughter to the slaughter house operators or such other person as may be designated by the Minister.

(3) The cess shall be levied on the basis of per head of cattle and shall not be varied during the financial year in respect of which it was imposed.

(4) Until the cess on cattle sold for export is fixed by the Association with the approval of the Minister,

(*a*) any exporter of live cattle for slaughter shall pay to the Association a cess of ten dollars plus an ad valorem tax of two percent on the sales value, and

(*b*) any exporter of live cattle for breeding shall pay to the Association an ad valorem fee of two percent on the sales value.

Fund of the Association.

21B.(1) The Association shall have its own fund.

(2) There shall be paid into the fund of the Association—

(*a*) all such sums as may be collected by the Association by way of cess;

(*b*) any other sums due to the Association from any other source.

(3) There shall be paid out of the fund in respect of each financial year:—

(*i*) all such sums as are required to defray the expenses incurred by the Commission in the exercise, discharge and performance of its powers, functions and duties under this Ordinance or any regulation made thereunder; and

(*ii*) all such sums as are required to defray the expenses of the Association and which have been provided for in the budget submitted to and approved by the Commission:

Provided that annual budget of Commission and the Association shall have been approved by the Minister.

(4) Any sum remaining after defraying the expenses referred to in subsection (3) shall be paid into a fund to be known as the "Livestock Producers Development Fund."

(5) The administration of the Fund referred to in subsection (4) shall be vested in a Board of Trustees consisting of three trustees one nominated by the Minister, one by the Commission and one by the Association. Regulations may be made by the Minister for the Administration of the Livestock Producers Development Fund.

Accounts of the Association.

21C. The Association shall cause proper accounts to be kept of its financial transactions. Such accounts shall be made up in respect of each financial year and audited by an auditor appointed by the Association and approved by the Minister, and when so audited shall be submitted to the

Minister who shall cause the same to be published in the *Gazette* and at least in one local newspaper, within six months of the close of the financial year."

Printed by the Government Printery.

BELIZE:

STATUTORY INSTRUMENT

No. 17 of 1981

REGULATIONS made by the Meat and Livestock Commission with the approval of the Minister of Natural Resources, in exercise of the powers conferred upon the Commission by section 9 of the Meat and Livestock Ordinance, No. 1 of 1977 and all other powers thereunto it enabling.

(*Gazetted 21st March*, 1981)

1. These Regulations may be cited as the

MEAT AND LIVESTOCK REGULATIONS 1981.

2. Except under a certificate issued by the Principal Veterinary Officer or a person authorised by him in writing no person shall –

(*a*) Slaughter any cow or heifer; or

(*b*) Slaughter any heifer, bull, cow or steer under six hundred and fifty pounds (two hundred and ninety five kilograms) live weight.

3. Except under a valid permit issued by the Principal Veterinary Officer or a person authorised by him in writing, no person shall transport or move any cattle or any meat in excess of twenty five pounds (11.35 kilograms) weight from one district to another.

4. For the purposes of these regulations the term "district" shall mean an administrative district as established under the District Administrative Ordinance.

MADE by the Meat and Livestock Commission this 12th day of March 1981.

JAME V. HYDE

Chairman, Meat and Livestock Commission

APPROVED by the Minister of Natural Resources this 12th day of March, 1981.

FLORENCIO J. MARIN

Minister of Natural Resources.

Printed by the Government Printery

BELIZE:

STATUTORY INSTRUMENT

No. 40 of 1982

REGULATIONS made by the Meat and Livestock Commission with the approval of the Minister of Natural Resources, in exercise of the powers conferred upon the Commission by Section 9 of the Meat and Livestock Ordinance (No. 1 of 1977) and all other powers thereunto it enabling.

(*Gazetted* 15*th May*, 1982)

Short Title.

1. These Regulations may be cited as the

MEAT AND LIVESTOCK (AMENDMENT) REGULATIONS 1982

and shall be read and construed as one with the Meat and Livestock Regulations 1981 hereinafter referred to as the principal Regulations. S. I. 17 of 1981.

Addition of new regulation to principal Regulations.

2. The principal Regulations are hereby amended by the addition immediately after Regulation 4 of the following new regulation:

Penalty

"5. Any person who contravenes the provisions of these regulations shall be guilty of an offence and shall be liable on summary conviction to a fine not exceeding five hundred dollars or to imprisonment for a term not exceeding three months or to both such fine and imprisonment."

Made by the Meat and Livestock Commission this 27th day of April, 1982.

E. W. KING,
Chairman
Meat and Livestock Commission.

Approved by the Minister of Natural Resources this 27th day of April, 1982.

FLORENCIO MARIN,
Minister of Natural Resources.

Printed by the Government Printery.

APPENDIX V

Belize Land Development Authority Ordinance, 1980

No. 29 of 1980

I assent,

J. P. I. HENNESSY,

Governor.

16th December, 1980

AN ORDINANCE to establish a public authority to develop and promote development of national land in Belize.

(*Gazetted 20th December*, 1980.)

BE IT ENACTED by the Queen's Most Excellent Majesty, by and with the advice and consent of the House of Representatives and the Senate of Belize, and by the authority of the same as follows:--

1. This Ordinance may be cited as the BELIZE LAND DEVELOPMENT AUTHORITY ORDINANCE 1980 Short Title.

Establishment of the Authority.

2.—(1) There is hereby established an Authority to be called the Belize Land Development Authority which shall be a body corporate with perpetual succession and a common seal and shall have capacity to purchase, take, hold and dispose of land and other property of whatever kind, to enter into contracts, to sue and be sued in the said name and to do all things necessary for the purpose of this Ordinance.

(2) The seal of the Authority shall be affixed to any instrument in the presence of the Chairman and shall be authenticated by the joint signature of one director of the Board and of the Secretary. A seal shall not be affixed except by the authority of a resolution of the Board.

(3) The seal of the Authority shall be kept in the custody of the Secretary.

3. The objects of the Authority shall be-

(*a*) to acquire, develop and improve land including the provision of infrastructure such as roads, bridges, drainage and irrigation alone or in association with others;

(*b*) to divide land in its possession and to grant leases or to sell parcels of such land for development, and in particular to provide for the interests of small farmers;

(*c*) to engage in the development of land and related projects alone or in association with others;

(*d*) to promote, foster and encourage the development of land related projects;

(*e*) to sell or export produce;

(*f*) to trade and deal in agricultural chemicals and fertilizer, foodstuffs and other commodities required for its purpose;

(*g*) to enforce the pattern, extent and restriction on land use to be applied in any given location;

(*h*) where feasible and desirable to provide processing plant and marketing facilities;

(*i*) to own, hire and operate machinery for agricultural development;

(*j*) to supply finance alone or in association with others for the development of land;

(*k*) to advise, manage and superintend and to generally assist in the development of land;

(*l*) to borrow money for the purpose of fulfilling its functions;

(*m*) to employ personnel to further the interests and efficiency of the Authority;

(*n*) to establish offices and depots as needed;

(*o*) with the sanction of the Minister to engage in any other activities not specified herein which are conducive to beneficial land development.

Powers.

4. For the purpose of fulfilling its functions and objects under this Ordinance, the Board may—

(*a*) provide finance in the form of loans;

(*b*) guarantee loans from other sources;

(*c*) borrow funds for the purposes of the business of the Authority from sources either in Belize or abroad and give security for any loans obtained;

(*d*) furnish managerial, technical and administrative services;

(*e*) acquire, hold, take or give on loans or hire mortgage, pledge and sell or otherwise dispose of any immovable or movable property;

(*f*) open deposit accounts with any bank;

(*g*) make appropriate provision for the welfare of employees of the Authority and of their dependents;

(*h*) give any guarantee or indemnity to, and enter into any arrangements with, the Government, any local authority, or any body corporate or other person in order to obtain any rights, concessions and privileges that may seem to the Board to be conducive to any object of the Board;

and

(*i*) do all such other things as are incidental or conducive to the attainment of its purposes.

Constitution.

5. (1) The Authority shall be administered by a Board consisting of the Permanent Secretary of the Ministry responsible for Agriculture, the Financial Secretary and five other members appointed by the Minister responsible for Agriculture (hereinafter in this Ordinance referred to as "the Minister").

(2) The Permanent Secretary of the Ministry responsible for Agriculture and the Financial Secretary may be represented by persons nominated by them whenever they are unable to be present in person.

(3) The Chairman shall be nominated from among the members by the Minister and in his absence the members present shall elect one of their members to preside at the meeting.

(4) The Minister may appoint another person to act as a member of the Board in place of a member who is temporarily absent or unable to act as such.

(5) A member of the Board shall hold office for such period not exceeding three years as may be prescribed by the Minister at the time of the appointment of the members but may be reappointed.

(6) A member who is not holding office of emoluments in the Public Service may resign his post by giving the Minister through the Chairman written notice of resignation.

(7) The names of the members appointed to the Board and every change and new appointment shall be published in the *Gazette*.

(8) The Board may act by any five of their number including at least one of the ex-officio members and may so act notwithstanding any vacancy in the number of members constituting the Board, and shall have the power to regulate their procedure.

6.—(1) The Board members shall administer, supervise and control the affairs and business of the Authority subject to an annual programme approved by the Minister as to policy to be followed by the Authority in the exercise or performance of its functions.

(2) No payment out of the funds of the Authority shall be made unless it has been authorised by writing authenticated by the joint signature of the Chairman or one member authorised to act in that behalf and of the Secretary;

Provided that the officers of the Authority who specifically authorised by the Board may effect petty disbursements or immediate payments out of the funds they may be permitted by the Board to hold from time to time.

(3) The Board shall furnish the Minister with such returns, accounts information as he may require with respect to the property, transaction, activities of the Authority and shall afford him or his duly accredited representative all facilities for verification thereof.

7.—(1) The Board shall keep proper accounts of all its financial transactions, of assets and liabilities and complete record of all other matters relating to its finances and shall prepare annually a statement of accounts in a manner satisfactory to the Minister and in conformity with sound commercial practice.

(2) The accounts of the Authority shall be audited annually by an auditor or auditors appointed by the Minister.

(3) The auditor of the Authority shall be supplied with a copy of the annual balance sheet of the authority, and it shall be his duty to examine such balance sheet together with accounts and vouchers of the Authority and shall be entitled to require from the members and the officers of the Authority such information and an explanation as may be necessary for the performance of his duties.

(4) The auditor of the Authority may if he so desires, make a continuous audit of the accounts of the Board.

(5) The Auditor of the Authority shall make written report upon the annual balance sheet and accounts of the Board.

(6) Copies of the report of the auditor shall be transmitted by him to the Board and to the Minister.

(7) Notwithstanding anything contained in this section the Minister may in his discretion, at any time require the Auditor General of Belize to examine the report on the accounts as well as the accounts of the Authority, in which event the Board shall afford the Auditor General with all facilities for examinations as he may require.

(8) All the expenses incurred for the purpose of auditing shall be paid out of the funds of the Board.

Annual Report.

8. (1) The Board shall prepare an annual report of its activities as soon as may be after the close of each financial year.

(2) The annual report shall be submitted to the Minister not later than four months after the close of the Authority's financial year and shall be laid on the table of the National Assembly.

Secretary.

9. (1) The Board shall appoint a Secretary.

(2) The Secretary shall be the Principal Administrative Officer responsible for management and control of the business of the Authority.

Regulations.

10. (1) The Minister may after consultation with the Board make regulations generally providing rules governing the control of soil erosion, water conservation, planting, growing, cultivation, harvesting, preventing and curing of infestation and disease, and transportation of crops and without prejudice to the generality of this provision, for—

(*a*) prescribing the form of any licence notice or any other document required to be prescribed;

(*b*) disinfection, treatment of diseased crops and produce thereof;

(*c*) destruction and disposal of seeds or plants not suitable for planting or likely to infect or adversely affect other seeds and plants because of infestation or disease;

(*d*) prohibition, restriction of methods of cultivation, harvesting transportation not in keeping with the best practices in that field;

(*e*) the enforcement of soil and water conservation methods and cropping patterns;

(*f*) provision of drying and storing areas;

(*g*) measures to be taken to prevent the spread of plant diseases or pests, including the quarantine of infested or infested plant area;

(*h*) disinfection and treatment services and payment of fees, if any, therefor;

(*i*) generally carrying into effect any of the provision of this Ordinance.

(2) Any person who contravenes or fails to comply with any regulation made under the provisions of this section shall for each offence be liable on summary conviction to imprisonment for a period not exceeding six months, or to any lesser penalty that may be annexed to the breach of any regulation and, in addition, there may be annexed to any such breach a provision for forfeiture to the Crown of any produce.

(3) All regulations made pursuant to this section shall be laid before the National Assembly as soon as may be after making thereof and if the Assembly by resolution request that such regulations or any of them be rescinded, the same shall be rescinded by the Minister, but without prejudice to the validity of anything done thereunder.

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APPENDIX VI

Fondos Ganaderos

Fondos Ganaderos

Fondos Ganaderos are public autonomous organizations whose purpose is to develop and improve the livestock industry. They are not government agencies, even though Fondos are considered as auxiliary credit agencies to the Ministry of Agriculture.

The capital of Fondos is composed of two types of stocks, i.e., Class A held by national, state, and municipal public agencies and Class B held by private individuals. The profits that accrue to the Fondo are distributed to shareholders. However, those that accrue to Class A shareholders are retained and reinvested in the Fondo.

Fondos are governed by a Board of Directors composed of equal numbers of Class A and Class B shareholders.

Through contracts, Fondos provide breeding and feeder animals on shares to livestock producers, and also credit for livestock development programs when funds are available. Also, the Fondo provides technical assistance to producers in planning and implementing livestock loan programs. To be eligible to receive animals, the livestock producer must provide all inputs required (e.g., feed, facilities, labor, veterinary services, management) for the production program for which animals are provided on shares. At the termination of the contract, the Fondo receives 35% and the producer 65% (i.e., 60% in cash and 5% in shares of Class B stock in the Fondo) of the increase in value of animals provided by the Fondo.

Other complementary Fondo activities include the multiplication of breeding animals, and the growing/fattening of animals directly by the Fondo, production and distribution of production inputs e.g., mineral supplements, and construction of public livestock facilities.

The method of operation of Fondos differs markedly from traditional credit agencies. Principal differences are:

- Since animals are owned by the Fondo, no property mortgage is necessary.

- No interest is paid by the producer.

- Net profits for producers are generally higher than in conventional loans.

- Producers have first option to purchase contract animals when the contract is liquidated.

- Participants become stockholders in the Fondo and receive a prorated share of Fondo profits.

NSR
8/16/82