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**NEEDS AND OPPORTUNITIES FOR IMPROVED GRAIN MARKETING
IN PANAMA DURING THE DECADE AHEAD**

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**NEEDS AND OPPORTUNITIES FOR IMPROVED GRAIN MARKETING
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CHAPTER I

INTRODUCTION

This study represents an integral segment of over-all analysis for agricultural sector planning and development undertaken by the USAID Mission in cooperation with the National Planning Office of Panama. The services of the Food and Feed Grain Institute were supplied through the Technical Assistance Bureau of AID/Washington under the worldwide contract with Kansas State University at the request of Dr. J. Robert Moffett, Chief of Rural Development for AID in Panama. During his month tour in Panama for the study, Dr. Phillips was given local support as a member of the AID Mission staff advising the Panamanian National Planning Office. He was supported also by the Institute of Economic Development (IFE), the Office of Controller General, and other official agencies of Panama directly concerned.

A. Purpose of the Study

The general objective of the study is to identify the major long-term needs and opportunities for improving grain marketing in Panama within the setting of balanced development for the total agricultural sector of the country. Specific goals include the following:

1. Identify projected patterns of demand for grain and grain products through 1980.
2. Develop projections of grain production potentials by province through 1980.
3. Develop projections of market volumes and distribution patterns for rice, corn, and edible beans.
4. Identify major improvements in existing marketing and processing facilities needed to meet projected requirements.
5. Evaluate grain price policies and price support programs as they affect producers, handlers, and consumers.

6. Identify major needs for production and marketing services to support balanced development of efficient grain marketing in Panama.

B. Summary of Conditions in Panama

In order of importance, the two major food grains in the Panamanian diet are rice and corn. Frijoles and other edible beans also are relatively important. The small grains (wheat, barley, rice, and oats) are not produced in any significant quantities in Panama. Grain sorghum and soybeans have been tried on a very limited scale but have not become established as economic crops.

Rice is the major grain crop in most provinces and the dominant crop in the large mechanized farming areas such as those of Chiriquí and Coclé Provinces. In most areas, rainfall is ample and irrigation is not required for rice production. Rice can be grown the year round and harvest peaks are governed only by the need to time planting and harvest in the relatively dry months. By following the early fall harvest with a winter ratoon, the more skilled producers have learned to grow two crops per year on the same land. Rice is harvested at relatively high moisture contents and must be dried artificially prior to storage and milling.

Corn is grown throughout the country but is relatively most important in the central provinces, particularly Los Santos, Herrera, and Panamá. Most of the production is of the flint type and about 55 percent of the harvest is used for human food. The remainder is used for feed and seed on farms (about 35 percent) and as an ingredient for commercial poultry and livestock feeds (about 10 percent). The crop is grown for both fall harvest (about 60 percent) and spring harvest (about 40 percent). There are large mechanized corn producers in Panama, but compared to rice, corn is relatively more popular among the small non-mechanized farmers.

Frijoles and other edible beans are primarily a spring crop (about 88 percent of the annual production), grown following the fall harvest of rice or corn. Most of the volume is produced by small farmers with little or no mechanization.

Rice production has increased steadily over the past 10 years from about 2.1 million quintals in 1960-1961 to more than 3.6 million quintals in 1969-1970. The increased production has just about kept pace with growing domestic demand, so there has been little opportunity for rice exports but a minimum need for rice imports in recent years. Corn production also has continued to increase over the period but at a slower rate and has kept pace with increasing demand in recent years. The production of edible beans has not increased significantly and the increasing demand has required added imports in recent years.

A large percentage of Panama's grain production is consumed on the farm and does not enter marketing channels. Producers retained for on-farm consumption from their 1969-1970 crop about 47.5 percent of the rice, 67 percent of the corn (26 percent for food and 41 percent for feed and seed), and 50 percent of the edible beans produced in the country. These percentages will decline through time as total production increases and the population continues to migrate to the cities.

Grain marketing is accomplished both by private channels and by the Government through Instituto de Fomento Economico (IFE). The domestic production moves through private channels so long as the market price to farmers remains above support levels, but substantial quantities are delivered to the Government by producers when the free market price falls below the support price. IFE is the sole agency for importing grain. In addition to its direct marketing functions, the Government performs a regulatory function, including

control of consumer prices for grain and grain products, as well as a service function, including grain inspection and grading, research and education, and market news.

Rice millers are a dominant factor in the private trade, controlling most of the commercial drying and cleaning capacity and grain storage capacity as well as the milling capacity and marketing services for rice and milling by-products. Many of the larger milling companies also handle tractors, combines, and other farm machinery, fertilizers, pesticides, and other inputs needed by rice producers. Grain elevators and other specialized private and cooperative grain merchandising companies are uncommon. Local assembly functions are performed by the millers, through agents or direct representatives, and by local dealers and merchant truckers.

The major consumer markets for grain products are in Panamá and Colón in the central section of the country. The major production areas are located some distance from these centers. For example, the largest and most rapidly growing area is Chiriquí, the most northern province on the Pacific side of the Isthmus. There are no railroads serving the area, so the grain must be transported by truck or by ship. Because of problems in receiving and shipping by water, most of the transport from the north moves by truck. Shipments from Darién Province in the far south must move by ship, however, because the highway to this section has not been completed.

The major terminal points for grain storage, handling, and processing in Panama are (1) David in Chiriquí Province (645,000 quintals of storage capacity), (2) Penonomé in Coclé Province (370,000 quintals of storage capacity), (3) Panamá (260,000 quintals of storage capacity), and (4) Soná (200,000 quintals of storage capacity) and (5) Santiago (130,000 quintals of storage capacity) in Veraguas Province. All of these except Panamá are

production oriented, being located adjacent to centers of grain production. For example, in the 1970 crop year the three provinces (Chiriquí, Veraguas, and Coclé) accounted for 74 percent of the production and 88 percent of the off-farm marketing of rice together with 54 percent of the production and 58.5 percent of the off-farm marketing of corn in Panama. Panama is demand oriented, being located adjacent to the country's major consumption center. In 1970 this area represented 55 percent of the commercial (off-farm) demand for rice and 68.5 percent of that for corn in the country as a whole.

C. Importance of Grain in Balanced Development of the Agricultural Sector

Although Panama produces a wide variety of crop and livestock products, the nation's agriculture is dominated by rice and other grain production. Average annual rice consumption is 136 pounds per capita. The vast majority of farmers in all provinces of the country produce rice. A large percentage of these same farmers also cultivate corn and edible beans. About 35 percent of the nation's active farm land is devoted to rice production, 28.5 percent to corn production, and 5 percent to the production of frijoles and other edible beans. Clearly, development programs which increase the efficiency and profitability of grain production have a major impact on the primary agricultural sector as a whole.

Grain likewise is dominant in the country's associated agricultural industry. The large fraction of total human and land resources devoted to grain production indicates the relative importance of grain in the total demand for farm machinery and tools, fertilizers, pesticides, agricultural credit and other agricultural inputs. The milling and marketing of rice and corn represent one of Panama's major industries both in terms of numbers employed and in terms of total value added. The industry provides major support for a large number of private truckers, food handlers, and others

as well as for those directly involved in drying, storage, milling, and handling of grain. Considering both the agricultural inputs and the product marketing, the significance of grain to associated agricultural industry approaches that to primary agriculture in Panama.

Rapid strides have been made during the past ten years in increasing yields and production of rice and corn and in increasing the capacity and efficiency of the supporting agricultural industry. Still, the need exists for expanding output at an increasing rate during the next ten years. Domestic demand for milled rice is growing at the rate of nearly 13 million pounds per year and that for corn at the rate of some 10 million pounds per year. In addition, the fraction of the total crop which must be handled through marketing channels from farms to distant urban consumers is increasing by 1.35 percent per year in the case of rice and about 2.0 percent per year in the case of corn. Thus, development of the grain subsector of agriculture must proceed at an increasing rate in order to keep pace with Panama's growing consumer demand.

Panama has the basic human and natural resources together with the technology needed to meet the development challenge for grain production and marketing of the next ten years. Additional lands are available for clearing and development for grain production in all provinces except Veraguas. For the country as a whole, available new lands suitable for grain total more than 300,000 hectares -- an area substantially larger than that now devoted to grain production. Potentials for continued yield increase exist through more widespread adoption of improved strains of rice and hybrid corn and the associated crop management practices. The grain marketing structure in Panama is basically sound and capable of making the adjustments needed to meet the development challenge.

The needed development of grain production and marketing of the magnitude called for in the next ten years will not come automatically, however. Careful plans must be made for balanced development and timing in all the subsectors involved. Government policies and programs must be carefully coordinated. Resource requirements must be identified in specific terms, and plans must be laid to insure that these resources will be brought to bear effectively. Finally, the programs for development of grain production and marketing must be integrated with the other agricultural development programs to insure balanced development of the total agricultural sector of Panama's economy.

CHAPTER II

EXISTING PATTERNS OF GRAIN PRODUCTION, DEMAND AND DISTRIBUTION

The historical patterns of grain production, demand, and distribution can be identified quite clearly from the annual statistical publications of the Bureau of Statistics and Census in Panama. Plantings, yields, and production of rice, corn, and edible beans are reported annually by province. Separate figures are reported for the first crop (fall harvest) and the second crop (spring harvest). Sound estimating procedures are used and the reported figures are believed to be quite accurate.

The units of measure used in Panama are quintals (one hundred pounds), hectares, and quintals per hectare. Rice is reported in terms of rough rice (paddy). Corn and beans are reported on a shelled basis. Rice and corn are reported on the basis of 14 percent moisture and no foreign material. Edible beans are reported on the basis of 12 percent moisture and 2 percent foreign material.

In the case of rice and corn, the utilization is reported separately for seed, on-farm consumption, and off-farm marketings. On-farm consumption of corn used for human food is reported separately from that used for poultry and livestock feed.

The total consumption of grain products is not reported separately by province. In order to construct grain supply and utilization tables by province, the consumption was prorated in this study on the basis of relative human populations. Semi-detailed population statistics are reported by city and rural areas within each province by the Bureau of Statistics and Census.

A. Patterns of Grain Production

1. Rice

The reported total annual production of rice by province in Panama for the crop years 1960-1961 through 1969-1970 is shown in Table 2-1. Over the ten-year period, total production increased from 2,114,800 quintals to 3,643,000 quintals. Except for Los Santos, all provinces shared in the increase in rice production, but the major increases have come in Chiriquí, Coclé, and Veraguas Provinces. The average annual increase in production was 81,681 quintals in Chiriquí, 40,709 quintals in Coclé, and 28,810 quintals in Veraguas. On the average over the period, Chiriquí represented 28.3 percent of Panama's total production; Veraguas, 25.5 percent; and Coclé, 9.9 percent. However, in the last reported year, the percentage represented by these three provinces were 46.7, 26.0, and 19.1, respectively.

The greatest percentage increases in rice production have occurred in Coclé (256 percent), Darién (195 percent), and Chiriquí (161 percent). Rice production in these three provinces is dominated by large producers with fully mechanized operations. Their rice fields are relatively large and most of the harvest is done with self-propelled crawler track combines owned by custom operators.

In contrast, rice farms are smaller and less mechanized in Veraguas Province than in any other province in Panama. Land in this area has been settled for many years, and there are limited opportunities for expanding farm size. Fields are too small for harvesting by combine and no suitable small-scale mechanical harvesters have been developed. Even in this area where population pressure on the land is great, labor is a limiting factor during planting and harvest. Farmers reportedly avoid some of the high-yielding strains and heavier seeding rates because of the scarcity of hand labor for harvest.

TABLE 2-1. PRODUCTION OF RICE BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Quintals, Rough Rice)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	4.2	523.4	657.5	223.7	285.9	157.3	184.0	36.4	42.4	2,114.8
1961-62	6.8	645.8	634.4	206.3	325.9	182.9	271.1	57.1	70.3	2,400.6
1962-63	6.1	639.7	606.0	250.8	313.6	217.5	255.7	59.8	69.3	2,418.5
1963-64	8.4	637.6	567.5	266.4	339.1	190.7	272.2	61.8	107.3	2,451.0
1964-65	17.9	677.5	689.3	357.4	394.5	199.6	285.0	82.8	111.8	2,815.8
1965-66	9.3	878.6	940.7	360.1	265.7	318.9	347.2	79.5	139.4	3,339.4
1966-67	9.0	767.2	814.2	289.1	287.3	276.8	408.6	78.8	157.0	3,088.0
1967-68	9.0	1,035.5	893.1	282.2	270.3	295.9	334.9	69.1	147.3	3,337.3
1968-69	5.4	1,117.6	833.7	376.2	279.8	514.9	273.4	68.4	125.0	3,594.4
1969-70	<u>6.8</u>	<u>1,368.5</u>	<u>761.0</u>	<u>260.1</u>	<u>281.9</u>	<u>559.9</u>	<u>223.1</u>	<u>57.6</u>	<u>125.0</u>	<u>3,643.0</u>
Average	8.3	829.2	748.8	287.2	304.4	291.4	285.5	67.7	109.5	2,932.0
Percent	0.3	28.3	25.5	9.8	10.4	9.9	9.7	2.3	3.8	100.0

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol. 1961-1970. Dirección de Estadística y Censo.

This strategy keeps the cost of production per hectare relatively low but makes the cost per quintal very high relative to that in the mechanized areas. These same characteristic small farm problems exist to a somewhat lesser extent in Herrera, Los Santos, Panama, and Colon Provinces.

2. Corn

The total annual production of corn for the past ten years is shown by province for Panama in Table 2-2. Over the period, production has increased from 1,295,500 quintals to 1,929,900 quintals, or by one-half. Corn production has increased substantially in all nine provinces but most rapidly in Chiriquí (an average of 17,528 quintals per year) and Veraguas (an average of 15,471 quintals per year). These two provinces represented 24.4 percent and 20.6 percent of the average total production over the ten-year period and 24.7 percent and 22.9 percent of the 1969-1970 production. Each of the two provinces has increased corn production by 80 percent during the last ten years.

The production cost disadvantage to the characteristic small farms of Veraguas Province compared to the characteristic large farms of Chiriquí Province is less for corn than for rice. Hand harvesting is far less costly for corn. Even where corn fields are large enough to harvest mechanically, custom operators are reluctant to invest in corn heads when they can keep their machines busy harvesting rice. Consequently, many of the larger farmers still harvest by hand.

3. Edible Beans

The production of edible beans occurs throughout Panama but is also concentrated in Chiriquí and Veraguas Provinces (Table 2-3). Over the ten-year period Veraguas accounted for 36 percent and Chiriquí for 29.6 percent

TABLE 2-2. PRODUCTION OF CORN BY PROVINCE IN PANAMA, 1960 - 1970.
(1000 Quintals, Shelled)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	7.8	264.5	276.5	175.4	298.0	75.5	152.6	23.0	22.2	1,295.5
1961-62	3.9	422.7	312.3	178.6	305.6	93.9	208.6	47.6	59.6	1,632.8
1962-63	9.3	334.8	255.9	198.5	351.0	123.0	207.5	48.6	61.2	1,589.8
1963-64	8.8	469.6	332.2	174.5	311.0	85.9	156.1	60.0	74.1	1,672.2
1964-65	14.8	398.5	412.6	191.2	355.8	83.9	200.7	51.7	91.0	1,805.6
1965-66	6.9	444.7	396.6	169.8	366.2	115.8	200.5	44.0	115.6	1,860.1
1966-67	5.0	460.5	364.7	212.0	349.2	103.5	218.5	42.7	92.9	1,849.0
1967-68	111.0	513.7	419.4	170.5	315.0	140.0	252.2	43.7	93.9	1,959.5
1968-69	9.6	433.7	336.8	183.8	372.3	127.2	236.4	54.1	92.2	1,846.1
1969-70	<u>9.6</u>	<u>475.8</u>	<u>441.2</u>	<u>201.0</u>	<u>338.2</u>	<u>120.4</u>	<u>204.3</u>	<u>50.9</u>	<u>87.9</u>	<u>1,929.3</u>
Average	8.7	421.9	354.8	185.5	316.2	106.9	203.7	47.2	83.0	1,727.9
Percent	0.5	24.4	20.6	10.7	18.3	6.2	11.8	2.7	4.8	100.0

Estadística Panamena. Información Agropecuria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

TABLE 2-3. PRODUCTION OF EDIBLE BEANS BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Quintals, Frijol de Bejuco)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	.60	29.00	33.90	13.20	17.10	8.10	9.30	2.70	.80	114.70
1961-62	.20	56.30	52.10	12.20	9.70	5.80	11.40	1.50	.10	149.30
1962-63	1.00	52.20	57.10	14.50	10.70	9.10	12.90	1.10	.20	158.80
1963-64	.10	39.50	30.90	6.10	13.50	6.30	7.80	1.50	.10	105.80
1964-65	.20	29.00	30.70	8.40	7.60	3.70	8.50	1.20	2.00	91.30
1965-66	.05	33.40	66.20	9.80	15.30	14.90	9.00	3.50	.10	152.25
1966-67	.05	49.60	58.20	6.40	10.80	9.60	20.00	2.30	4.20	161.15
1967-68	.05	27.80	65.00	7.80	6.70	5.90	10.50	2.00	4.30	130.05
1968-69	.05	23.70	48.10	5.80	7.40	11.20	7.70	3.00	4.30	111.25
1969-70	<u>.05</u>	<u>31.00</u>	<u>38.60</u>	<u>6.50</u>	<u>7.20</u>	<u>7.30</u>	<u>11.90</u>	<u>2.40</u>	<u>4.30</u>	<u>109.25</u>
Average	.23	37.15	45.08	9.07	10.60	8.19	10.90	2.12	2.04	125.38
Percent	0.2	29.6	36.0	7.2	8.5	6.5	8.7	1.7	1.6	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

of the country's production of frijoles. However, production in these two provinces, as well as for the country as a whole, has fluctuated widely from year to year and shows no significant trend through time. Total production reached peaks of 158,800 quintals in 1962-1963 and 161,150 quintals in 1966-1967, but averaged only 125,380 quintals over the period.

Even in the mechanized production areas, edible beans represent a labor-intensive crop. Development of higher yielding strains and other cultural innovations have not kept pace with those for rice and corn. Consequently, production costs per quintal remain quite high and farmers have found it more profitable to expand the production of rice and corn. As is discussed in a later section, the relative support prices have further encouraged them to do so at the expense of frijol and other edible bean production.

B. Patterns in Areas Planted to Grain

1. Rice

Rice is produced primarily for fall harvest in Panama when weather conditions normally are most favorable for the harvest. Plantings of first-crop rice have continued to increase from 73,700 hectares in 1960-1961 to 111,200 hectares in 1969-1970, while plantings of the second crop have remained relatively stable at about 15,000 hectares (Tables 2-4 and 2-5). Over the period, the first crop represented 86.5 percent of total rice plantings; in 1969-1970 the first crop accounted for 88.5 percent of total hectares planted to rice.¹

Normally, two crops of rice are not grown on the same land in Panama because if the first crop is planted for harvest during the dry period, the

¹It will be noted from these tables that the delayed harvest in 1963-1964 made a portion of the first-crop plantings show up in the second-crop statistics.

TABLE 2-4. PLANTINGS OF FIRST-CROP RICE BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	0.3	15.1	22.8	7.1	9.4	7.7	7.4	2.3	1.6	73.7
1961-62	0.2	16.2	24.8	7.0	9.7	9.8	8.9	2.9	1.8	81.3
1962-63	0.4	18.1	26.6	7.7	10.6	10.0	8.2	2.8	2.1	86.5
1963-64	0.5	9.5	11.9	4.6	8.6	4.1	7.5	2.3	1.9	50.9
1964-65	0.9	22.1	27.4	11.8	12.7	11.2	12.6	3.9	3.6	106.2
1965-66	0.5	23.2	25.8	11.6	11.7	13.5	12.7	4.0	4.3	107.3
1966-67	0.5	22.6	35.6	11.3	12.0	13.1	13.2	4.9	4.9	118.1
1967-68	0.5	24.8	36.9	9.7	10.5	12.7	11.5	4.0	4.6	115.2
1968-69	0.3	22.2	31.0	11.6	11.4	17.2	11.0	3.8	3.8	112.3
1969-70	<u>0.4</u>	<u>26.1</u>	<u>30.0</u>	<u>9.5</u>	<u>10.2</u>	<u>18.6</u>	<u>9.0</u>	<u>3.6</u>	<u>3.8</u>	<u>111.2</u>
Average	0.5	20.0	27.3	9.2	10.7	11.8	10.2	3.4	3.2	96.3
Percent	0.5	20.8	28.3	9.6	11.1	12.3	10.6	3.5	3.3	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

TABLE 2-5. PLANTINGS OF SECOND-CROP RICE BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	0.1	5.9	2.0	0.9	2.3	1.0	2.5	0.2	0.1	15.0
1961-62	0.2	7.0	3.0	1.4	2.7	1.5	3.0	0.3	0.1	19.2
1962-63	0.2	3.8	2.5	0.9	2.2	0.9	2.3	0.3	0.1	13.2
1963-64	0.1	11.1	8.4	4.5	8.6	2.0	5.0	1.4	2.0	43.2
1964-65	0.1	3.0	3.0	1.2	2.6	1.2	3.2	0.1	0.1	14.6
1965-66	0.1	3.7	1.7	1.1	3.2	1.4	4.3	0.1	0.2	15.8
1966-67	0.1	4.5	1.3	0.6	1.6	1.3	3.8	0.1	0.2	13.4
1967-68	0.1	3.1	1.0	0.7	1.9	1.6	5.4	0.1	0.1	14.0
1968-69	0.1	6.0	1.0	0.8	1.3	2.3	4.6	0.1	0.1	16.3
1969-70	<u>0.1</u>	<u>5.3</u>	<u>0.9</u>	<u>0.6</u>	<u>1.7</u>	<u>1.6</u>	<u>4.1</u>	<u>0.1</u>	<u>0.1</u>	<u>14.5</u>
Average*	0.1	4.7	1.8	0.9	2.2	1.4	3.7	0.2	0.1	15.1
Percent	0.7	31.1	11.9	5.9	14.6	9.3	24.5	1.3	0.7	100

*Excluding 1963-64

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol. 1961-1970. Dirección de Estadística y Censo.

fall rains start before the ground can be worked for planting the second crop. Waiting to plant in the winter delays harvest of the second crop beyond planting time for next year's first crop. Second-crop rice usually is grown on land in first-crop fallow or following edible beans or corn. In recent years, however, the bigger and more successful farmers have learned to grow a ratoon second crop by harvesting the first crop just ahead of the rains so that the volunteer crop can be harvested in plenty of time for plowing and working the land for the first crop the following year. The increasing adoption of this practice is reflected in the plantings of second-crop rice in Chiriquí Province for the two most recent reporting years (Table 2-5).

The total area planted to rice has increased steadily over the past ten years in all provinces. The greatest increase in plantings has occurred in the major rice-producing provinces of Chiriquí, Veraguas, and Coclé. The average annual increase in plantings has been about 1,100 hectares in each of these three provinces. The average annual increase in rice plantings for the country as a whole has been about 5,000 hectares over the ten-year period.

2. Corn

Significant numbers of hectares of corn are planted for both fall and spring harvest in Panama (Tables 2-6 and 2-7). First-crop plantings represent about 60 percent of the total; the percentage has remained relatively stable over the past ten years. The plantings of corn have increased rather steadily in all provinces. For the country as a whole, plantings of the two corn crops have increased from 77,300 hectares in 1960-1961 to 102,500 hectares in 1969-1970, for an average increase of about 2,900 hectares per year. Approximately one-third of the increase has been in Veraguas Province

TABLE 2-6. PLANTINGS OF FIRST-CROP CORN BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	0.4	9.9	11.1	4.2	8.6	3.8	7.2	2.0	1.0	48.2
1961-62	0.1	11.7	11.1	4.7	9.1	4.0	8.6	2.0	1.4	52.7
1962-63	0.5	9.8	12.2	4.9	9.5	4.5	7.5	2.4	1.6	52.9
1963-64	0.5	9.5	11.9	4.6	8.6	4.1	7.5	2.3	1.9	50.9
1964-65	0.8	11.1	13.7	4.8	9.6	4.7	9.8	2.5	2.4	59.4
1965-66	0.4	11.6	16.3	5.6	10.6	6.0	9.6	2.2	2.7	65.0
1966-67	0.3	10.9	15.3	6.3	10.2	5.5	10.2	2.6	2.7	64.0
1967-68	0.6	13.2	17.2	4.9	9.9	6.1	10.6	3.1	2.4	68.0
1968-69	0.5	10.6	15.2	4.2	11.4	5.2	9.1	2.0	2.6	60.8
1969-70	<u>0.5</u>	<u>11.6</u>	<u>16.0</u>	<u>4.5</u>	<u>10.4</u>	<u>5.2</u>	<u>8.3</u>	<u>2.5</u>	<u>2.4</u>	<u>61.4</u>
Average	0.5	11.0	14.0	4.9	9.8	4.9	8.8	2.4	2.1	58.4
Percent	0.9	18.8	24.0	8.4	16.8	8.4	15.0	4.1	3.6	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

TABLE 2-7. PLANTINGS OF SECOND-CROP CORN BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	0.2	6.4	5.2	3.0	6.9	1.3	4.4	0.9	0.8	29.1
1961-62	0.2	9.9	6.7	3.7	8.0	2.5	5.4	1.1	1.6	39.1
1962-63	0.2	6.3	5.4	3.1	7.7	0.9	4.4	0.6	1.6	30.2
1963-64	0.2	11.1	8.4	4.5	8.6	2.0	5.0	1.4	2.0	43.2
1964-65	0.2	10.3	8.2	3.9	7.8	1.7	5.0	0.9	1.6	39.6
1965-66	0.1	9.7	6.8	3.2	9.0	1.8	6.2	1.4	2.2	40.4
1966-67	0.1	11.8	9.7	4.0	7.9	2.8	5.6	1.1	1.4	44.4
1967-68	0.2	13.2	8.8	4.5	7.1	2.6	6.2	1.0	1.2	44.8
1968-69	0.2	10.9	7.3	3.3	7.2	3.1	4.6	1.7	1.2	39.5
1969-70	<u>0.2</u>	<u>9.9</u>	<u>8.9</u>	<u>4.1</u>	<u>5.7</u>	<u>3.2</u>	<u>6.2</u>	<u>1.7</u>	<u>1.2</u>	<u>41.1</u>
Average	0.2	10.0	7.5	3.7	7.6	2.2	5.3	1.2	1.5	39.2
Percent	0.5	25.5	19.1	9.5	19.4	5.6	13.5	3.1	3.8	100

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alone, with Chiriquí and Coclé together accounting for another one-third. However, corn plantings still are somewhat less concentrated in these three provinces than is true of rice plantings. Compared to rice, the area devoted to corn production is relatively more important in the central provinces of Los Santos, Panama, and Colon. For example, in 1969-1970 the area planted to corn was 135 percent of that planted to rice in Los Santos and 68 percent of that planted to rice in Chiriquí.

3. Edible Beans

The area devoted to edible bean production in Panama is small compared to that devoted to rice and corn production (Tables 2-8 and 2-9). Furthermore, plantings have fluctuated widely from year to year and have exhibited a downward trend over the period. The average annual decline in area planted to the two crops of frijoles has been 660 hectares. The biggest annual decline has been in Chiriquí (455 hectares), but the trend has been downward in all provinces except Coclé, where there has been no trend.

Edible beans are predominately a winter crop, following rice or corn (Tables 2-8 and 2-9). Over the ten-year period, second-crop plantings of frijoles represented 81 percent of the total area devoted to the crop. During 1969-1970, second-crop plantings represented 88 percent of the total. The same pattern prevails in all provinces but is most pronounced in Chiriquí, where second-crop plantings represented 97 percent of the total during 1969-1970.

Geographically, the plantings of edible beans are heavily concentrated in Veraguas and Chiriquí Provinces. These two accounted for 70 percent of total plantings in 1969-1970 and 71 percent of total plantings over the ten-year period. Herrera, Coclé, Los Santos, and Panamá each account for six to eight percent of the total area planted. The areas devoted to edible

TABLE 2-8. PLANTINGS OF FIRST-CROP FRIJOLES BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	Not	2.6	2.5	0.8	0.7	0.4	0.5	0.1	Not	7.6
1961-62	Reported	1.3	0.8	0.5	0.1	0.3	0.2	0.1	Reported	3.3
1962-63		1.8	1.8	1.0	0.1	0.5	0.4	0.1		5.7
1963-64		2.2	1.2	0.5	0.2	0.2	0.4	0.2		4.9
1964-65		1.0	1.3	0.5	0.1	0.4	0.4	0.1		3.8
1965-66		0.4	1.3	0.7	0.1	0.4	0.1	0.1		3.1
1966-67		0.3	0.8	0.3	0.1	0.3	0.1	0.1		2.0
1967-68		0.3	0.9	0.3	0.1	0.2	0.2	0.1		2.1
1968-69		0.2	0.9	0.4	0.1	0.3	0.1	0.1		2.1
1969-70		<u>0.2</u>	<u>0.9</u>	<u>0.5</u>	<u>0.1</u>	<u>0.3</u>	<u>0.1</u>	<u>0.1</u>		<u>2.2</u>
Average		1.03	1.24	0.55	0.17	0.33	0.25	0.11		3.68
Percent		28.0	33.7	14.9	4.6	9.0	6.8	3.0		100

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1961-1970. Dirección de Estadística y Censo.

TABLE 2-9. PLANTINGS OF SECOND-CROP FRIJOLES BY PROVINCE IN PANAMA, 1960 - 1970
(1000 Hectares)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	Not	3.4	3.9	0.9	0.9	0.9	0.9	0.3	Not	11.2
1961-62	Reported	10.6	6.9	1.1	1.0	1.5	1.0	0.1	Reported	22.2
1962-63		8.3	6.4	1.3	1.3	1.1	1.0	0.1		19.5
1963-64		4.9	5.2	0.3	1.4	1.1	1.0	0.2		14.6
1964-65		4.4	3.2	0.8	1.2	0.5	0.7	0.1		10.9
1965-66		5.2	8.4	1.1	1.6	1.5	1.0	0.2		19.0
1966-67		7.1	7.2	1.0	1.1	1.2	1.0	0.1		18.7
1967-68		4.2	7.5	1.2	0.5	1.0	1.1	0.1		15.6
1968-69		4.7	5.5	0.9	0.5	1.5	0.9	0.3		14.3
1969-70		<u>5.9</u>	<u>4.7</u>	<u>0.7</u>	<u>0.8</u>	<u>1.1</u>	<u>1.2</u>	<u>0.1</u>		<u>14.5</u>
Average		5.87	5.89	0.98	1.03	1.14	0.98	0.16		16.05
Percent		36.6	36.7	6.1	6.4	7.1	6.1	1.0		100

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1961-1970. Dirección de Estadística y Censo.

bean production in Colón, Darién, and Bocas del Toro are very small, together accounting for less than two percent of the total.

C. Patterns in Grain Yields

Although there have been the normal variations from year to year due to weather conditions, attacks from plant disease and pests, etc., grain yields in Panama have shown a consistent upward trend. The upward trend is more pronounced for rice than for corn or edible beans. It is most pronounced in Chiriquí Province, where the large mechanized farms have been able to take fuller advantage of advancing production technology.

1. Rice

The yields of rice are somewhat higher for the first crop than for the second in most years, but usually by less than two quintals per hectare (Tables 2-10 and 2-11). Over the ten-year period yields have averaged 22.4 quintals per hectare for the first crop and 20.8 quintals per hectare for the second crop.² The difference has varied from -0.5 quintals per hectare in 1967-1968 to 4.0 quintals per hectare in 1965-1966. The same general pattern holds for the yields by province, but the year-to-year fluctuations are greater. For example, first-crop rice out-yielded second-crop rice in Chiriquí by -1.5 quintals in 1968-1969 and by 12.0 quintals in 1969-1970.

The variations in average yields of rice from province to province are more significant. Yields average far higher in Chiriquí and Darién than in the other provinces. The ten-year average yield index is 139 for Chiriquí and 136 for Darién. Furthermore, the rice yields are increasing faster in

²These figures and those in Tables 2-12 to 2-14 are simple averages of the yields for the nine provinces; they are not weighted by the relative production in each province.

TABLE 2-10. YIELD OF FIRST-CROP RICE BY PROVINCE IN PANAMA, 1960 - 1970
(Quintals per Hectare, Rough Rice)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	9.1	25.8	26.6	28.6	24.5	18.6	19.5	15.0	25.6	21.5
1961-62	8.0	20.0	18.2	19.5	18.8	14.8	16.7	16.9	24.1	17.4
1962-63	12.4	23.0	12.7	23.4	19.4	22.9	18.9	15.9	22.1	19.0
1963-64	8.3	31.1	20.1	28.9	23.0	18.2	21.9	18.2	33.0	22.5
1964-65	16.6	26.5	23.0	27.3	25.8	16.2	18.5	20.6	30.5	22.8
1965-66	15.8	33.3	25.6	29.7	17.7	21.9	19.8	19.3	31.1	23.8
1966-67	16.0	29.0	22.1	24.7	21.6	19.9	24.8	15.7	31.2	22.8
1967-68	15.6	36.2	23.3	24.4	23.0	20.9	19.6	17.0	31.1	23.5
1968-69	14.0	39.1	25.9	30.7	22.5	26.9	17.5	17.7	31.8	25.1
1969-70	<u>14.0</u>	<u>45.6</u>	<u>24.7</u>	<u>25.8</u>	<u>24.3</u>	<u>27.6</u>	<u>16.4</u>	<u>15.4</u>	<u>31.8</u>	<u>25.1</u>
Average	13.0	31.0	22.2	26.3	22.1	20.8	19.4	17.2	29.2	22.4
Index	58	138	99	117	99	93	87	77	130	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

TABLE 2-11. YIELD OF SECOND-CROP RICE BY PROVINCE IN PANAMA, 1960 - 1970
(Quintals per Hectare, Rough Rice)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	8.8	22.7	25.0	24.6	23.6	16.3	15.6	6.4	31.8	19.4
1961-62	15.5	19.0	16.4	23.0	16.8	13.8	12.0	12.5	16.1	16.1
1962-63	15.5	17.4	18.7	27.1	21.6	16.8	14.9	17.5	16.1	18.4
1963-64	14.5	29.7	20.0	19.0	22.3	18.7	22.1	17.0	25.0	20.9
1964-65	14.5	30.3	19.2	28.9	25.6	14.7	16.0	24.0	24.0	21.9
1965-66	14.0	28.6	13.3	14.4	18.1	16.5	22.1	24.0	27.0	19.8
1966-67	10.0	24.8	21.1	17.0	17.2	12.8	21.4	16.0	41.0	20.1
1967-68	12.0	44.2	34.0	22.0	15.4	18.9	19.1	12.0	38.0	24.0
1968-69	12.0	41.6	30.8	25.5	17.7	22.6	17.5	12.0	38.0	24.2
1969-70	<u>12.0</u>	<u>33.6</u>	<u>22.2</u>	<u>25.0</u>	<u>20.0</u>	<u>28.7</u>	<u>18.4</u>	<u>12.0</u>	<u>38.0</u>	<u>23.2</u>
Average	12.9	29.2	22.1	22.7	19.8	18.0	17.9	15.3	29.5	20.8
Index	62	140	106	109	95	87	86	74	142	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

these two provinces -- at the average rate of 3.9 quintals per hectare in Chiriquí and 2.1 quintals per hectare in Darién. Average yields are relatively good in Herrera (index of 112), but the annual increase is much less rapid (about 0.4 quintals per hectare). The annual increase in yield is fairly rapid in Coclé (1.7 quintals per hectare), but the average yield index is only 90.

The crop yield index for Veraguas Province is close to the average for the country as a whole, so this province may be thought of as representing average yields. The average rice yield index is 102, for example. Rice yields in Veraguas are increasing at the average rate of about 1.0 quintal per year -- also close to the country average.

The rice yield index for the remaining provinces is below average, ranging from 60 in Bocas del Toro to 97 in Los Santos. The average annual rate of increase in yields for these remaining provinces is about 0.2 quintals per hectare -- substantially below that for Panama as a whole. For the most part, rice yields are increasing fastest in those provinces where they already are highest and increasing slowest in those provinces where they are lowest.

2. Corn

The patterns in the yields of corn from the first to the second crop, from one province to another, and through time are somewhat different from those for rice yields (Tables 2-12 and 2-13). First-crop yields are slightly higher than second-crop yields in most years, but the magnitude of the difference is minimal -- only 0.3 quintals per hectare over the ten-year period. In contrast to the general pattern, second-crop yields average about 2.0 quintals per hectare higher than those for the first crop in the important corn-producing provinces of Los Santos and Herrera.

TABLE 2-12. YIELD OF FIRST-CROP CORN BY PROVINCE IN PANAMA, 1960 - 1970
(Quintals per Hectare, Shelled)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	14.0	17.2	16.8	24.9	19.9	14.8	14.0	8.1	15.3	16.1
1961-62	8.0	20.1	18.2	19.5	18.8	14.8	16.7	16.9	23.6	17.4
1962-63	19.1	23.1	12.7	23.4	19.4	22.9	18.9	15.9	22.1	19.7
1963-64	12.4	24.5	17.7	20.0	13.8	15.9	13.0	16.3	22.1	17.3
1964-65	16.0	18.1	19.2	20.0	20.9	12.9	13.8	19.3	20.9	17.9
1965-66	14.0	23.1	17.4	16.4	15.7	14.3	13.0	11.1	27.2	16.9
1966-67	12.3	20.5	14.6	21.0	18.5	10.7	12.8	11.2	21.5	15.9
1967-68	13.7	20.4	17.3	17.2	17.7	17.6	15.3	10.3	24.4	17.1
1968-69	13.4	20.6	15.7	25.2	19.2	17.1	18.8	17.3	21.9	18.8
1969-70	<u>13.4</u>	<u>24.0</u>	<u>19.0</u>	<u>22.5</u>	<u>20.6</u>	<u>14.4</u>	<u>13.2</u>	<u>12.6</u>	<u>21.9</u>	<u>18.0</u>
Average	13.6	21.2	16.9	21.0	18.5	15.5	15.0	13.9	22.1	17.5
Index	78	121	97	120	106	89	86	79	126	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol. 1961-1970. Dirección de Estadística y Censo.

TABLE 2-13. YIELD OF SECOND-CROP CORN BY PROVINCE IN PANAMA, 1960 - 1970
(Quintals per Hectare, Shelled)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	11.0	14.6	17.2	23.6	18.3	14.8	11.7	7.6	8.6	14.2
1961-62	15.5	19.0	16.4	23.0	16.8	13.8	12.0	13.8	16.1	16.3
1962-63	19.2	17.4	18.7	27.1	21.6	16.8	14.9	17.5	16.1	18.8
1963-64	13.0	21.3	14.5	18.3	22.3	10.4	11.6	16.1	16.1	16.0
1964-65	10.0	19.2	18.3	24.7	19.9	13.6	13.1	14.0	25.6	17.6
1965-66	13.0	18.3	16.6	24.3	22.2	16.5	12.2	14.0	19.1	17.4
1966-67	13.0	20.1	14.6	22.1	20.3	16.0	15.7	14.1	24.9	17.9
1967-68	14.5	18.5	13.9	19.2	19.7	12.5	14.5	11.6	29.4	17.1
1968-69	14.5	19.8	13.5	23.6	21.3	12.2	14.1	11.4	29.4	17.8
1969-70	<u>14.5</u>	<u>19.9</u>	<u>15.4</u>	<u>24.3</u>	<u>21.7</u>	<u>14.1</u>	<u>15.3</u>	<u>11.4</u>	<u>29.4</u>	<u>18.4</u>
Average	13.8	18.8	15.9	23.0	20.4	14.1	13.5	13.2	20.5	17.2
Index	80	109	92	134	119	82	78	77	119	100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol. 1961-1970. Dirección de Estadística y Censo.

The average corn yield indexes are high in Los Santos and Herrera (113 and 127), as well as in Chiriquí and Darién (115 and 123). Except for Herrera, yields in these provinces are increasing at an average annual rate of about 0.5 quintals per hectare, well above the country average. The yield trend in Herrera is slightly downward, primarily because yields in the early part of the period already were higher than in the rest of the country. The corn yield index is about average in Veraguas (95) and below average (78 to 86) in Bocas del Toro, Colón, Panamá, and Coclé. The yield trend varies from slightly downward to slightly upward in these four provinces.

Compared both to corn yields in other countries and to rice yields in Panama, the average corn yields of less than 20 quintals per hectare (less than 15 bushels per acre) are low in Panama. One reason is the dominant production of flint varieties because of the preference for them as human food. However, there appears to be great potential for increasing corn yields through the use of hybrid seed, increased fertilization, thicker planting, and other improved cultural practices.

3. Edible Beans

The patterns in average yields of frijoles for the two crops in all provinces except Bocas del Toro and Darién are shown in Table 2-14. The average yield of these edible beans has increased from 6.1 quintals per hectare during the first half of the period to 7.8 quintals during the last half of the period. However, the yields have varied considerably from year to year and from province to province within a given year.

The yield indexes for frijol are highest in the central provinces of Panamá (132), Los Santos (119), and Colón (114). They are lowest (81) in the major rice-producing provinces of Chiriquí and Coclé. Likewise, the average yield is increasing through time in the central provinces at an annual

TABLE 2-14. YIELD OF FRIJOLES BY PROVINCE IN PANAMA, 1960 - 1970
(Average of Both Crops, Quintals per Hectare, Shelled)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1960-61	Not	5.2	5.5	8.7	10.9	5.6	7.0	5.7	Not	6.9
1961-62	Reported	8.2	6.0	8.0	3.0	3.7	12.5	6.0	Reported	6.8
1962-63		3.7	4.8	4.8	4.0	7.4	8.2	4.9		5.4
1963-64		5.6	4.8	4.7	8.4	4.8	5.6	3.8		5.4
1964-65		5.2	6.8	6.5	5.8	4.1	7.7	6.0		6.0
1965-66		6.0	6.8	5.4	9.0	7.8	8.2	11.7		7.8
1966-67		6.0	7.3	4.9	9.0	6.4	16.4	11.5		8.8
1967-68		6.2	7.7	5.2	11.2	4.9	8.1	10.0		7.6
1968-69		4.8	7.5	4.5	12.3	6.2	7.7	7.5		7.2
1969-70		<u>5.0</u>	<u>6.7</u>	<u>5.4</u>	<u>8.0</u>	<u>5.2</u>	<u>9.2</u>	<u>12.0</u>		<u>7.4</u>
Average		5.6	6.4	5.8	8.2	5.6	9.1	7.9		6.9
Index		81	93	84	119	81	132	114		100

Estadística Panamena. Información Agropecuaria. Superficie, sembrada y producción de arroz, maíz y frijol.
1961-1970. Dirección de Estadística y Censo.

average rate of nearly 0.5 quintals per hectare but has exhibited little or no upward trend in Chiriquí and Coclé. In the case of frijol yields, too, Veraguas is the index province, with a yield index only slightly below average (93) and a slight upward trend over time which is near the country-wide average (0.26 quintals per hectare per year).

D. Patterns of Grain Utilization

The supply-utilization table for rice, corn, and frijoles by province in Panama for the 1969-1970 marketing year is shown in Table 2-15. The production, home utilization, and marketing figures are taken from the Bureau of Statistics and Census agricultural information reports for the three crops. The market demand figures represent the total demand for the province minus the reported volume of home consumption. The surplus or deficit for the province is obtained by subtracting the market demand from the marketings in that province.

The total demand for each province is estimated from the total demand for Panama. The total demand for the country represents total disappearance, e.g., production plus imports. This demand is prorated to the individual provinces on the basis of the relative total population (urban plus rural) as given in the preliminary report of the 1970 population census (see Table 3-2 in Chapter 3). In making the proration, no attempt has been made to reflect differences in average per-capita consumption levels by province, by rural and urban population, or by income level. No reliable statistics were available as basis for reflecting such factors in the proration of demand to the individual provinces.

TABLE 2-15. SUPPLY AND UTILIZATION OF RICE, CORN, AND BEANS BY PROVINCE IN PANAMA, 1969 - 1970
(1000 quintals)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total Without Imports	Imports	Total With Imports
<u>Rice (Rough)</u>												
Production	6.8	1,368.5	761.0	260.1	281.9	559.9	223.1	56.7	125.0	3,643.0		
Home Consumption	<u>1.4</u>	<u>275.0</u>	<u>525.0</u>	<u>225.0</u>	<u>250.0</u>	<u>200.0</u>	<u>175.0</u>	<u>45.0</u>	<u>35.0</u>	<u>1,731.4</u>		
Marketings	5.4	1,093.5	236.0	35.1	31.9	359.9	48.1	11.7	90.0	1,911.6		
Market Demand	<u>102.8</u>	<u>328.3</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>101.3</u>	<u>1,058.5</u>	<u>298.2</u>	<u>22.5</u>	<u>1,911.6</u>		
Surplus or Deficit	-97.4	765.2	236.0	35.1	31.9	258.6	-1,010.4	-286.5	67.5	0.0		
<u>Corn (Shelled)</u>												
Production	9.6	475.6	441.2	201.0	338.2	120.4	204.3	50.9	87.9	1,929.1		
Home Consumption	6.9	96.2	151.7	46.3	53.9	70.0	60.0	13.7	2.7	501.4		
Feed and Seed	<u>0.7</u>	<u>172.4</u>	<u>134.6</u>	<u>88.8</u>	<u>239.4</u>	<u>38.6</u>	<u>90.0</u>	<u>21.7</u>	<u>1.7</u>	<u>787.9</u>		
Marketings	2.0	207.0	154.9	65.9	44.9	11.8	54.3	15.5	83.5	639.8	50.0	689.8
Market Demand	<u>25.7</u>	<u>92.8</u>	<u>0.0</u>	<u>11.7</u>	<u>3.6</u>	<u>24.4</u>	<u>422.5</u>	<u>93.8</u>	<u>15.3</u>	<u>689.8</u>		<u>689.8</u>
Surplus or Deficit	-23.7	114.2	154.9	54.2	41.3	-12.6	-368.2	-78.3	68.2	-50.0	50.0	0.0
<u>Edible Beans (Shelled)</u>												
Production	0.05	31.0	38.6	6.5	7.2	7.3	11.9	2.4	4.3	109.25		
Home Consumption	<u>0.01</u>	<u>11.0</u>	<u>16.5</u>	<u>5.5</u>	<u>5.4</u>	<u>4.0</u>	<u>9.3</u>	<u>1.9</u>	<u>1.0</u>	<u>54.61</u>		
Marketings	0.04	20.0	22.1	1.0	1.8	3.3	2.6	0.5	3.3	54.64		
Market Demand	<u>3.04</u>	<u>6.8</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>4.9</u>	<u>30.9</u>	<u>8.3</u>	<u>0.7</u>	<u>54.64</u>		
Surplus or Deficit	-3.00	13.2	22.1	1.0	1.8	-1.6	-28.3	-7.8	2.6	0.00		

Estadística Panamena. Información Agropecuaria. Superficie, sembrada, y producción de arroz, maíz y frijol. 1970.
Preliminares del Censo de 1970. 23 Junio 1971.

1. Rice

It will be noted from the upper portion of Table 2-15 that 47.5 percent of the rice produced in Panama during 1969-1970 was used for home consumption.³ The fraction of total production consumed directly by the producer varies from 20 percent in Chiriquí to 88 percent in Los Santos. It is relatively high in all those provinces characterized by small producers, including Veraguas, Herrera, Los Santos, Panamá, and Colón. This means that the off-farm marketings are more concentrated than rice production. For example, Chiriquí and Coclé provinces together represent 76 percent of the total rice marketings but only 53 percent of total production in 1969-1970⁴.

The market demand for rice is heavily concentrated in Panamá and Colón, making these two provinces major deficit areas. In addition to the marketings from the area, the two provinces required the equivalent of nearly 1,300,000 quintals of rough rice from other areas in 1969-1970. The major surplus provinces supplying the rice to meet this deficit are Chiriquí, Veraguas, and Coclé. Bocas del Toro represents a deficit area, and Herrera, Los Santos, and Darién market only limited volumes beyond the local market demand. For the country as a whole, rice marketings and market demand for rice balance out at 1,911,600 quintals without imports or exports during 1969-1970.

2. Corn

The supply and utilization of corn by province for 1969-1970 are shown in the center section of Table 2-15. For the country as a whole, a total of 501,400 quintals (26 percent of production) was used for food by the producer and his family and a total of 787,900 quintals (41 percent of production)

³Utilization for seed is included in the volumes shown for home consumption.

was used by the farmer for poultry and livestock feed and for seed. The percentage used for home consumption is quite high in Bocas del Toro (72 percent) and Coclé (58 percent) and quite low in Darién (3 percent). The percentage used for feed and seed is high in Los Santos (71 percent) and low in Darién (2 percent) and Bocas del Toro (7 percent).

Of the 639,800 quintals of corn reaching the market in 1969-1970, 207,000 quintals (32 percent) came from Chiriquí, 154,900 quintals (24 percent) from Veraguas, and 83,500 quintals (13 percent) from Darién. These three provinces, plus Herrera and Los Santos, represented the corn surplus areas. Four provinces (Bocas del Toro, Coclé, Panamá, and Colón) were deficit areas, with 76 percent of the total corn deficit concentrated in Panamá. A total of 50,000 quintals of corn were imported to balance production and utilization during the period. Most of this was used by the poultry and livestock feed industry in the vicinity of Panamá.

3. Edible Beans

The patterns of utilization of edible beans in Panama during 1969-1970 are similar to those for corn (Table 2-15). Chiriquí and Veraguas represent the major surplus provinces while Panamá and Colón represent the major deficit provinces. Fifty percent of the beans are used for home consumption so only 54,650 quintals moved through market channels. Of this volume, over 56.5 percent (30,900 quintals) was consumed in Panamá Province and another 15 percent (8,300 quintals) was consumed in Colón.

E. Grain Distribution Patterns

The general net physical distribution patterns for grain in Panama during 1969-1970 can be constructed from the figures shown on the net surplus or deficit line for the three grains in Table 2-15. These patterns for rice

are shown in terms of rough rice equivalent in Figure 2-1. The general flow is in toward the population concentration in the center of the country, Panamá and Colón. A total volume of 1,471,000 quintals moved into Panamá, of which 396,000 quintals was diverted on to Colón (including the 97,000 quintals destined for Bocas del Toro). Over one-half the total volume moving into Panamá (765,000 quintals) comes from Chiriquí. This is supplemented by 236,000 quintals from Veraguas, 32,000 quintals from Los Santos, 35,000 quintals from Herrera, 259,000 quintals from Coclé, 68,000 quintals from Darién, and 76,000 quintals from local points in Panamá Province.

The larger arrows leaving each province in Figure 2-1 indicate the total volume marketed. Thus, a total of 1,093,000 quintals was marketed by farmers in Chiriquí Province. The balance of 328,000 quintals (1,093,000 minus 765,000) was utilized in David and other cities in Chiriquí (see Table 2-15).

The patterns shown in Figure 2-1 should not be interpreted to imply that the surplus rough rice moves to Panamá for processing. Actually, a large portion of the crop is milled in the province of production, so that the total tonnage which must be transported is minimized. Another portion moves as rough rice to intermediate milling points and from there is shipped to the final destination as milled rice. Thus, the major portion of Chiriquí rice is milled in the province, with a smaller portion moving to intermediate points in Veraguas and Coclé Provinces for milling. Figure 2-1 portrays only the ultimate distribution, not the intermediate shipment patterns. The figures could have been shown just as well in terms of milled rice equivalent,

It should be pointed out further that Figure 2-1 does not imply that the major movement of rice into Panamá is by sea. Actually, most all of the transport from Chiriquí, Veraguas, and other provinces to the north is

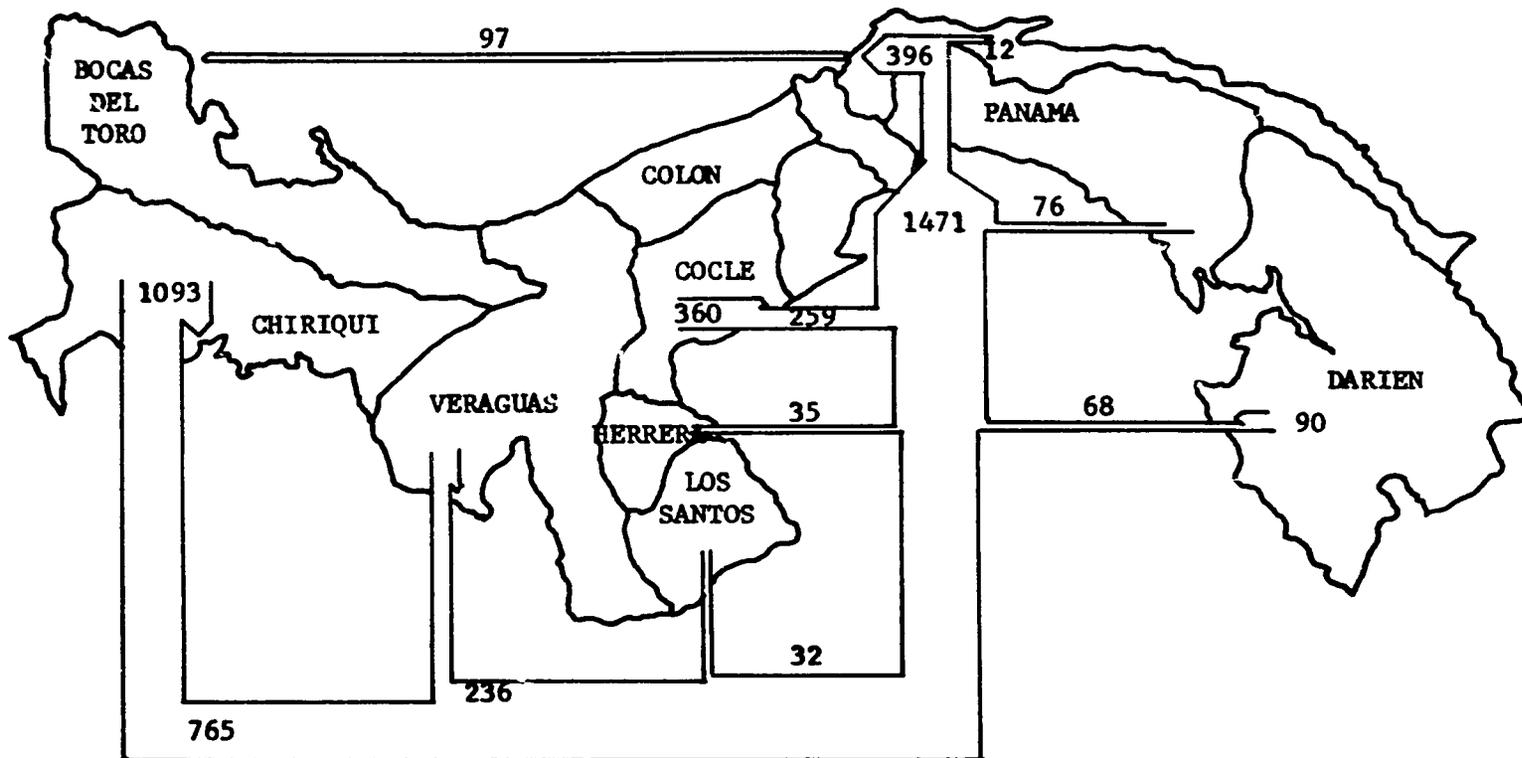


FIG. 2-1. ESTIMATED NET DISTRIBUTION OF MARKET RICE IN PANAMA, 1970.
 (1000 Quintals, Paddy Equivalent)

by truck over the highway network. The movement from Darién is by sea because the highway is not completed into this area. The shipments into Bocas del Toro are shown coming back from Colon rather than directly from points in Chiriquí because there are no highways across the mountains connecting production centers in Chiriquí Province with consumption points in Bocas del Toro Province. Figure 2-1 shows only the net distribution patterns between provinces, not the actual routing, product form, nor transport method for the shipments.

The comparable distribution pattern for corn in 1969-1970 is shown in Figure 2-2. The flow patterns follow the same general direction of those for rice. However, smaller volumes are involved and a smaller percentage of flow moves over long distances. For example, only 18.5 percent of the total volume of corn moving into Panamá comes from Chiriquí, whereas 52 percent of the total rice moves from this province. Los Santos, Herrera, and Panamá Provinces supply a much greater percentage of the flow of corn than is true for rice. Coclé Province does not provide a surplus supply of corn, however (see Table 2-15).

The net flow patterns for edible beans during 1969-1970 have not been charted. As can be seen from Table 2-15, these patterns follow closely those for corn, except on a much smaller scale. Such a chart would look much like Figure 2-2 except that the numbers and the width of the flows would be about one-twelfth the size of those shown in Figure 2-2.

F. Existing Marketing and Processing Facilities

In general, the improvement and expansion of grain marketing and processing facilities in Panama have kept pace with the expanding grain volumes. Total grain storage capacity at market points was reported at 1,876,700 quintals

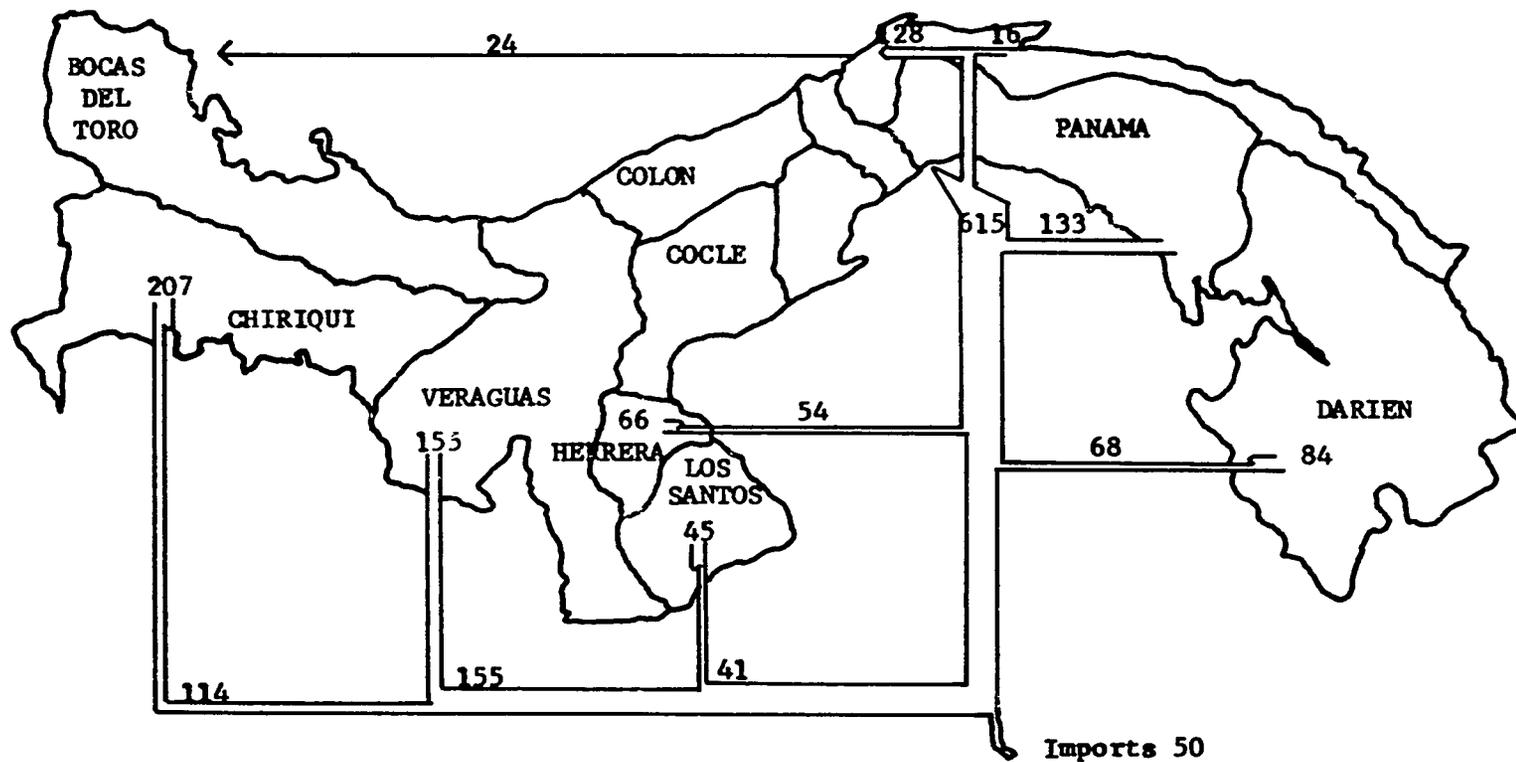


FIG. 2-2. ESTIMATED NET DISTRIBUTION OF MARKET CORN IN PANAMA, 1970
(1000 Quintals, Shelled)

in March of 1970⁴, or about 72 percent of the country's total marketings of rice, corn, and edible beans in 1969-1970. Panama has no long-term grain storage reserve; only normal seasonal supplies are carried over at the end of the year. Some of the total storage capacity undoubtedly is used for custom storage of grain reported for on-farm consumption and an additional amount undoubtedly is used for work space. Still, with staggered harvesting and two crops per year, efficient operators should be able to achieve an annual storage turnover of at least two. Thus, if the storage facilities were properly located and of proper design and condition for effective utilization, a total of 1.5 million quintals of capacity would be ample for present grain marketing volumes in Panama.

It likewise appears that Panama has ample total rice milling capacity to meet present requirements. Accurate figures on milling capacity by type and location are not available, but the milling industry is competitive and has continued to upgrade and expand capacity. Many of the mills operate on a 24-hour basis during the harvest season, but as a whole the capacity is substantially less than fully utilized on a year-round basis. As with the Government-owned and operated storage capacity, the rice mills of the Instituto de Fomento Economico (IFE) are largely maintained on a standby basis except when market prices drop to support levels and producers make delivery to the Government.

There are five locations which might be classified as terminal grain markets or grain market centers in Panama. They are Panamá, Penonomé in Coclé Province, Santiago and Soná in Veraguas Province, and David in Chiriquí Province. All of these locations have relatively large grain storage units

⁴Latinoconsult Argentina, S. A. Programa de Asistencia Technica al Departamento de Fomento. Toma 1, Aspectos Descriptivos, Cuadro 7.1.

and rice milling facilities, as well as facilities and services for cleaning, drying, sorting, packaging, and merchandising grain and grain products in wholesale quantities. Each is located strategically with respect to the flow of grain from producer to consumer.

Panamá is a major grain consumption center and this market serves primarily as a receiving and distribution point for the Panamá-Colón area. It also is the major grain importing point for the country. The other four terminal market points are located adjacent to centers of grain production and serve primarily as assembly, storage, and processing points. Distribution of the grain and grain products for local consumption represents a secondary function in these four markets.

The grain storage capacity by type and ownership at the five terminal markets is shown in Table 2-16. The capacity shown as Government storage represents the facilities operated by Instituto de Fomento Economico (IFE). The private storage capacity represents that operated by the millers and handlers in the private industry. The bulk capacity is of metal silo construction. The bag capacity is in flat warehouses, mostly of steel and masonry construction. About 40 percent of the total terminal grain storage capacity is located in David and another 23 percent in Penonomé. All of the capacity at David, Santiago, and Soná is bag storage. The major bulk storage is represented by the IFE distribution elevator in Panamá and the private rice mill holding bins at Penonomé. The total storage capacity at the five terminal points represents 86 percent of the bulk storage and about 86 percent of the total existing grain storage in Panama.

The existing grain storage capacity in March 1970 at country points in Panama is shown in Table 2-17. This capacity is located in smaller towns throughout the grain-producing regions and is used primarily for assembling,

TABLE 2-16. GRAIN STORAGE CAPACITY AT TERMINAL POINTS IN PANAMA
(1000 Quintals)

Type of Storage	Location					Total
	Panamá	Penonomé	Santiago	Sona	David	
<u>Government</u>						
Bulk	80.0	5.0				85.0
Bag	35.0	80.0	10.0	0.4	100.0	225.4
Total	<u>115.0</u>	<u>85.0</u>	<u>10.0</u>	<u>0.4</u>	<u>100.0</u>	<u>310.4</u>
<u>Private</u>						
Bulk		100.0				100.0
Bag	145.0	185.0	120.0	200.0	545.0	1,195.0
Total	<u>145.0</u>	<u>285.0</u>	<u>120.0</u>	<u>200.0</u>	<u>545.0</u>	<u>1,295.0</u>
<u>Combined</u>						
Bulk	80.0	105.0				185.0
Bag	180.0	265.0	130.0	200.4	645.0	1,420.4
Total	<u>260.0</u>	<u>370.0</u>	<u>130.0</u>	<u>200.4</u>	<u>645.0</u>	<u>1,605.4</u>

TABLE 2-17. GRAIN STORAGE CAPACITY AT COUNTRY POINTS IN PANAMA
(1000 Quintals)

Location	Government	Private	Combined
<u>Chiriquí Province</u>			
Alanje	5.0	20.0	25.0
Concepción		16.0	16.0
Volcán		5.0	5.0
San Juan		<u>24.8</u>	<u>24.8</u>
Total	— 5.0	65.8	70.8
<u>Veraguas Province</u>			
Montijo		60.0	60.0
<u>Herrera Province</u>			
Chitré		40.0*	40.0
Pesé		5.0	5.0
Ocu		<u>12.0</u>	<u>12.0</u>
Total		57.0	57.0
<u>Los Santos Province</u>			
Macaracas		8.0	8.0
Las Tablas		15.0	15.0
Tonosí		<u>3.0</u>	<u>3.0</u>
Total		26.0	26.0
<u>Coclé Province</u>			
Notá		5.0	5.0
Toabre		<u>3.0</u>	<u>3.0</u>
Total		8.0	8.0
<u>Panamá Province</u>			
Buena Vista		22.0	22.0
Chepo		5.0	5.0
Chorrera		<u>5.0</u>	<u>5.0</u>
Total		32.0	32.0
<u>Darién Province</u>			
La Palma, Darién	5.0	10.0	15.0
<u>Bocas del Toro Province</u>			
Bocas del Toro	<u>1.0</u>	<u>1.5</u>	<u>2.5</u>
COUNTRY TOTAL	11.0	260.3	271.3

*Includes 30,000 quintals bulk storage

conditioning, and holding grain as it moves from the farms. Most of these points also have rice mills and facilities for drying, cleaning, and bagging grain. Except for 30,000 quintals of silo storage at Chitré in Herrera Province, all of the grain storage capacity at country points in Panama is flat storage for bagged grain.

In addition to the terminal and country points where storage capacity is located, grain buying offices are maintained in the smaller towns and villages throughout the grain production areas. For example, IFE maintains 24 buying stations in addition to the points at which the Government storage facilities are located. The millers and private traders have representatives or buying agents throughout the country. Grain may be assembled into truck-load lots at these buying station points, or it may be transported directly from the farm to the nearest country or terminal point for conditioning, storage, and processing.

Reliable figures are not available on the total on-farm grain storage capacity in Panama. However, substantial quantities of grain are stored on the farm. In 1969-1970, for example, a total of 1,731,400 quintals of rough rice, 1,289,300 quintals of corn and 54,610 quintals of frijoles were maintained on farms for home consumption. Much of this grain is produced by small farmers who air-dry the grain in the sun or in open sheds before it is threshed or husked, store it in their homes or adjoining structures, and mill it by hand or at local custom mills as they need it. Few of these farmers have proper grain storage facilities and most incur substantial storage losses from rodents, insects, and mold. Some of the medium-sized farmers store their grain in facilities owned by local cooperatives. A few of the large commercial farms are installing their own mechanical drying and steel bin storage facilities and in two or three cases even rice milling machinery.

Such development still is very limited, however, even in the commercial rice growing areas.

G. Policies and Programs Affecting Grain Marketing

The major Government policies and programs affecting grain production and marketing in Panama include the following:

1. The grain price support and control program
2. Grain import policies
3. Research and educational programs
4. Producer loan programs
5. Market news and outlook information
6. Grain grading and inspection

1. Price Supports and Controls

Price supports to Panama's farm producers of rice, corn, and edible beans are maintained at levels above world market prices in order to support farm incomes and encourage increased production. At the same time, price controls are maintained at the retail level for milled rice, corn, and edible beans. The price supports and controls reflect differences for quality but none for the seasonality of production nor for the location of production with respect to the major demand areas. The price supports are maintained by the Departamento de Fomento c. IFE by accepting delivery of grain from producers at the announced price support levels. The retail price controls are enforced by the Oficina de Regulación de Precios and backed by marketings of grain delivered to and imported by the Departamento de Fomento.

The producer support price levels for 1970-1971 are shown on the following page:⁵

⁵ Source: Informe que Presenta el Instituto de Fomento Economico. Panama, Octubre de 1970; Escala para Descuentos por Humedad y Impurezas. Mimeo. Sept. 1965.

No. 1 rough rice ^a	\$ 6.00 per quintal
Yellow shelled corn ^b	4.25 per quintal
Frijoles ^c	8.00 per quintal
Porotos ^c	11.00 per quintal

^aBasis, maximum 14% moisture, 0% foreign material (see below for calculation of support price based on milling tests)

^bBasis, maximum 14% moisture, 0% foreign material, 5% red or white corn

^cBasis, maximum 12% moisture, 2% foreign material, 2% mixture of other beans

In determining the actual price paid to producers for a given lot of grain delivered to IFE, weight dockage scales are applied for moisture and foreign material in excess of the standards for rice and corn. The dockage scales used are adequate to cover the full shrinkage incurred in drying and cleaning the grain but do not cover the cost of mechanical drying and cleaning. In the case of edible beans, price discounts rather than dockage scales are used. The discounts are:

Moisture - 10 cents per one percent moisture over 12 percent, up to a maximum of 15 percent.

Foreign material - 25 cents per one percent foreign material over 2 percent, up to a maximum of 5 percent.

Admixture - 25 cents per one percent admixture of beans of other classes, up to a maximum of 5 percent.

Grain which contains moisture, foreign material or mixtures of other classes above the specified maximums is not accepted for delivery under the price support program.

In addition to the dockage, the actual price for rice paid by IFE when delivered under the price support program depends upon the class of rice and the percentages of whole kernels, broken kernels, and points as determined by laboratory milling tests. The price per quintal for each percent of the rice from the milling tests showing as whole kernels, broken kernels, and points is as follows:

<u>Class</u>	<u>Whole Kernels</u>	<u>Broken Kernels</u>	<u>Points</u>	<u>Average support price when laboratory not available</u>
(1) Extra long	\$0.13	\$0.05	\$0.03	\$4.75
(2) Long	0.105	0.05	0.03	5.50
(3) Medium	0.09	0.05	0.03	4.75
(4) Short	0.08	0.04	0.03	4.25

Thus, the actual price paid by IFE for long-grain rice with 14 percent moisture and no foreign material with 30 percent whole kernels, 30 percent broken kernels and 40 percent points would be \$5.85 per quintal ($30 \times .105 + 30 \times .05 + 40 \times .03$). However, the maximum support price is \$6.00 per quintal, even for lots which would have a higher value according to the above table.

During the past year, market prices for rice and edible beans have been above the support prices and farmers have delivered very little of these grains to IFE. Substantial quantities of corn were delivered under the price support program during 1970-1971, however. In the 1969-1970 crop year, deliveries to IFE totaled 91,478 quintals of rough rice (4.8 percent of total marketings), 69,029 quintals of corn (10.8 percent of total marketings), and 1,428 quintals of frijoles (2.6 percent of total marketings). Because the support prices are uniform from month to month and from province to province, deliveries to IFE tend to be highest in months when market prices are at their seasonal lows and in the more remote production areas, such as Darién Province.

2. Grain Import Policies

Grain imports are closely regulated by the Government in Panama. No imports are made by private handlers or processors -- all grain imports are made directly by IFE. Because domestic prices are substantially above world market prices, the import operation provides a major source of revenue to support the total price stabilization and marketing operations of the Government.

The policy of the Government has been to hold grain imports down to minimum levels. Rice is imported only when studies of rice stocks in all positions indicate definite approaching shortages. Corn is imported only to the extent essential to supply food and processing industry demands. This policy has served to ration available supplies of domestic grain and to hold retail prices close to the legal maximums. In the case of the poultry and livestock feed industry, it has caused maximum substitution of rice bran, wheat by-products, and other ingredients for corn in formula feeds.

3. Research and Educational Programs

There are a number of research and educational programs in Panama which affect grain production and marketing. Many of these are heavily oriented to rice rather than to corn or edible beans. Major programs affecting producers include crop breeding, fertilization, variety, pest control, and other production research at the agricultural experiment stations as well as agricultural extension work directly with crop producers. In addition, detailed cost of production studies are conducted on a continuing basis with selected sample producers of rice, corn, and beans over the country.

Research and educational work on the marketing side includes studies of milling performance and milling techniques for different rice varieties, educational activities with the industry on quality testing and grading, and other technical aspects of grain processing and marketing.

The total impact of the research and educational programs is difficult to measure, but it seems clear that they have been a major factor in achieving increased yields and production of rice and corn. These programs will need to be expanded in scope and in depth if the production and marketing potentials are to be achieved over the next decade.

4. Producer Loan Programs

Substantial volumes of agricultural production credit are essential for the purchase of improved seed, fertilizers, chemical pesticides, farm machinery, and other inputs needed to improve the volume and efficiency of grain production. Production credit to Panama's producers is provided through the private banks, the National Bank, and the Department of Credit and Development of IFE. Producer loans are made to finance both fixed assets and annual production expenses. Attempts have been made to tailor credit programs to the special requirements of small producers, medium-sized producers, and large producers. Relatively large international loans have been used to supplement domestic funds in providing capital for the agricultural credit programs.

Even though substantial progress has been made, it appears that there is still room for improvement in the agricultural credit programs in Panama if grain production potentials are to be met. The need for technical assistance and supervision in the use of credit is great, particularly in the case of loans to small producers. Supervised credit requires a large staff of well-trained people and supporting farm management and credit analysis. Progress has been made in these directions since early 1970 under the programs supported by the Interamerican Development Bank and the potentials for continued progress and development should be good.

5. Market News and Outlook Information

The importance of accurate and timely crop and market news as well as crop-to-crop outlook information to support efficient grain marketing cannot be over-emphasized. The need for such information will become more critical in Panama as the volume of grain moving through market channels continues to increase relative to that consumed by the farm family.

Panama has an excellent base in the Bureau of Statistics and Census upon which to build a complete crop and market news and outlook service. The Bureau has been assembling and preparing reliable grain production statistics for a number of years and has the basic core of qualified statisticians, methodology, and computer hardware needed. Market volume and movement data, price data, and related information could be provided within the same structure. The organization and procedures can be developed for timely and systematic preparation and release of the needed reports. It would seem that the development of complete crop and market news and outlook services should be given high priority in total agricultural sector development programs.

6. Grain Grading and Inspection

Under the incentive and leverage of the price support program, Panama is developing a reasonable grain grading and inspection system for conditions in the country. Laboratories are being established and inspectors trained by IFE. Inspection services and laboratory analyses are being provided to millers and private handlers who desire them. The private trade has been slow in shifting to the use of standard quality measurements when buying from producers but can be expected to do so in time.

The dockage system for excessive moisture and foreign material based on careful sample inspection of the grain is practical in most production areas of Panama. Because grain is sold by weight, producers and handlers alike readily understand dockage for extra water and extraneous material in grain. The dockage encourages producers to harvest and handle the grain properly and rewards them for doing so. However, the present dockage scales do not provide a margin to cover mechanical drying and cleaning costs. This matter is discussed in Chapter 7.

The purchase of rice on the basis of class and composition of whole kernels, broken kernels, and points as determined by laboratory milling tests should be encouraged by the millers as well as by IFE. This system rewards the individual producer for delivering the quality most in demand by Panama's consumers and permits him to make sound decisions on varieties which return the highest net income per hectare, considering both anticipated yield and anticipated price. As soon as a few millers start buying regularly on this basis, the larger producers will respond rapidly, and those buying in competition with these millers will be forced to follow suit. The laboratory tests may not be practical when buying in small lots from producers with limited acreage. In such case, price distinction based on the variety and the average milling performance of the variety may be the most practical solution.

As the volume of grain marketed increases, IFE will need to train additional grain inspectors and develop additional grain inspection laboratories. At some point in time, it may be advisable to establish official grain grade standards and require that all grain traded on a quality basis be inspected and bought and sold on the basis of the official standards. Official standards and grading procedures have been established in many Latin American countries.

CHAPTER III

PROJECTED PATTERNS OF GRAIN CONSUMPTION

The requirements for physical distribution of grain and grain products in the years ahead depend jointly upon future patterns of consumption and future patterns of production. Both the patterns of consumption and the patterns of production can be projected on the basis of the trends in the underlying factors affecting the patterns. Such projections serve as a basis for anticipating needed changes in the marketing system and advanced planning to bring about the changes by the time that they will be needed.

The major underlying factors affecting the patterns of demand for grains such as rice which are used almost entirely for human food are (1) population shifts and (2) changes in per-capita consumption. Additional underlying factors affect the demand for grains, such as corn, which also are used as industrial raw materials, feed for livestock, etc.

A. Key Factors Affecting Projected Grain Consumption in Panama

The key factors affecting the volume of demand for any food grain in a given province in a given year are the total population of the province and the average per-capita consumption. The average per-capita consumption is affected by eating habits and food preferences, by average income levels, and by the price of the grain relative to other prices. Frequently rural people have somewhat different eating habits than urban people so the average per-capita consumption is somewhat different among the two populations in the same province. Usually people with higher incomes will consume more of the food grain than those with lower incomes; the magnitude of the difference depends upon the income elasticity of demand for the particular food grain. The income elasticity measures the percentage increase in consumption

with a given percentage increase in income. Usually the income elasticity of demand for food grains in developing countries is less than one but greater than zero. The income elasticity of demand for preferred foods such as eggs and the better meat cuts may be greater than one, while that of less preferred foods such as cassava may be negative.

Normally, the price elasticity of demand for food grains is negative so a rise in the price of the grain relative to other prices is associated with a drop in the quantity consumed. The magnitude of this relationship depends upon the price elasticity of demand. The demand for most foods is relatively price inelastic, so the percentage change in quantity demanded is less than the percentage change in price.

The segment of the demand for multi-purpose grains such as corn by non-food uses is derived from the demand for the end products. Thus, the demand for corn as a poultry feed is dependent upon the consumer demand for poultry products. The nature of the dependence -- the coefficient relating the end-product demand and the derived demand -- depends upon (1) the technical conversion rate, (2) the degree to which available alternatives can be substituted for the grain in question, and (3) the price of the grain relative to the prices of the substitutes and to the price of the end product.

In making long-run projections of the volume of demand for grain, the price effects may be ignored if it is assumed that Government policy will be to maintain the price of the grain at existing levels relative to other prices. In such case, the volume of demand becomes a function of (1) the projected population times the base average per-capita consumption, (2) the growth in average per-capita income times the income elasticity coefficient, and (3) the volume of demand for end products for which the grain is used times the corresponding derived demand coefficients.

1. Projected Population

Population projections for Panama have been made through 1980 by the Bureau of Statistics and Census. Separate projections have been made for rural and urban populations and by province and county. The projections by province for 1975 and 1980 are shown in Table 3-1. They are based on an annual average population growth rate for the country as a whole of 3.04 percent but reflect differences in the rate of growth by province and among rural and urban populations. According to the projections, Panama's total population will increase from 1,431,400 in 1970 to 1,662,610 in 1975 and 1,931,160 in 1980.

The changes in the existing population patterns which will take place by 1975 and 1980 are apparent from the percentages shown in Table 3-2. The rural population represented 52.2 percent of the total in 1970; this percentage will be reduced to about 49.4 percent in 1975 and 46.5 percent in 1980. The percentage of the total population living in Panamá Province was 40.56 in 1970; this will be increased to 43.76 percent by 1975 and 46.98 percent by 1980. Meanwhile the percentages of the total population living in all other provinces will be reduced. The greatest declines relative to the total population will be in Veraguas, Chiriquí, and Los Santos Provinces. By 1980 the percentage of the country's total population living in Veraguas Province will decline by 1.64 percent; the percentage living in Chiriquí and Los Santos Provinces will decline by 1.26 percent. The urban population will continue to grow relative to the total in Veraguas and Chiriquí Provinces; the relative decline will come entirely in the rural populations. The urban population will decline relative to the country as a whole in Los Santos, Coclé, Colón, and Darién Provinces. All of these changing patterns of population distribution in Panama will be reflected directly in the patterns of consumption of rice, corn, and edible beans.

TABLE 3-1. ESTIMATED RURAL AND URBAN POPULATION BY PROVINCE IN PANAMA, 1970, 1975, and 1980
(Number of Persons)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
<u>1970</u>										
Urban	15,087	61,522	18,579	23,536	7,524	25,788	460,450	69,975	1,739	684,200
Rural	<u>25,821</u>	<u>175,508</u>	<u>133,580</u>	<u>49,122</u>	<u>64,702</u>	<u>92,566</u>	<u>120,170</u>	<u>64,811</u>	<u>20,920</u>	<u>747,200</u>
Total	40,908	237,030	152,159	72,658	72,226	118,354	580,620	134,786	22,659	1,431,400
<u>1975</u>										
Urban	18,737	74,375	23,415	27,401	8,010	29,617	581,604	67,046	1,668	840,873
Rural	<u>27,024</u>	<u>191,045</u>	<u>139,533</u>	<u>51,217</u>	<u>64,582</u>	<u>103,626</u>	<u>145,946</u>	<u>76,215</u>	<u>22,549</u>	<u>821,737</u>
Total	45,761	265,420	162,948	78,618	72,592	133,243	727,550	152,261	24,217	1,662,610
<u>1980</u>										
Urban	23,111	89,306	29,315	31,685	8,469	33,786	734,063	82,088	1,598	1,033,421
Rural	<u>27,739</u>	<u>206,190</u>	<u>144,367</u>	<u>52,983</u>	<u>64,449</u>	<u>115,515</u>	<u>173,127</u>	<u>89,106</u>	<u>24,163</u>	<u>897,739</u>
Total	50,950	295,496	173,682	84,668	72,918	149,301	907,190	171,194	25,761	1,931,160

Dirección de Estadística y Censo, Contraloría General de la República. Panamá. 23 Junio 1971.
Estimación en Base a las Preliminares del Censo de 1970.

TABLE 3-2. PERCENT OF TOTAL POPULATION BY PROVINCE IN PANAMA, 1970, 1975, and 1980
(Percent)

Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
<u>1970</u>										
Urban	1.05	4.30	1.30	1.65	0.52	1.80	32.17	4.89	0.12	47.80
Rural	<u>1.81</u>	<u>12.26</u>	<u>9.33</u>	<u>3.43</u>	<u>4.52</u>	<u>6.47</u>	<u>8.39</u>	<u>4.53</u>	<u>1.46</u>	<u>52.20</u>
Total	2.86	16.56	10.63	5.08	5.04	8.27	40.56	9.42	1.58	100.00
<u>1975</u>										
Urban	1.13	4.48	1.41	1.65	0.48	1.78	34.98	4.57	0.10	50.58
Rural	<u>1.62</u>	<u>11.49</u>	<u>8.39</u>	<u>3.08</u>	<u>3.89</u>	<u>6.23</u>	<u>8.78</u>	<u>4.59</u>	<u>1.35</u>	<u>49.42</u>
Total	2.75	15.97	9.80	4.73	4.37	8.01	43.76	9.16	1.45	100.00
<u>1980</u>										
Urban	1.20	4.62	1.52	1.64	0.44	1.75	38.01	4.25	0.08	53.51
Rural	<u>1.44</u>	<u>10.68</u>	<u>7.47</u>	<u>2.74</u>	<u>3.34</u>	<u>5.98</u>	<u>8.97</u>	<u>4.62</u>	<u>1.25</u>	<u>46.49</u>
Total	2.64	15.30	8.99	4.38	3.78	7.73	46.98	8.87	1.33	100.00

Based on Table 3-1.

2. Per-Capita Income

So long as the income elasticity of demand remains positive, the per-capita consumption of food grains will increase as average per-capita real income continues to increase. Furthermore, if incomes increase faster in some provinces than in others, the income effect will cause further changes in geographic patterns of consumption.

Average per-capita disposable incomes have been increasing each year with the progress of economic development in Panama. Unfortunately, however, data are not available on the distribution of income by province nor on the differential rates of growth in disposable income from one province to another. It is hoped that such data will be available when the detailed tabulations from the 1970 census are completed.

In the absence of the data, it has been necessary to reflect the income effects in the projections of demand for rice, corn, and edible beans on a national basis only and to ignore these effects in the changing geographic patterns of demand. To the extent that average per-capita disposable incomes may be increasing somewhat more rapidly in the capital city than in the provinces, the demand patterns may be shifting even more rapidly than shown by the demand projections in this study.

3. Feed and Industrial Uses

The end-product demand for poultry and livestock products and for industrial products made from corn will continue to increase rapidly in Panama. The effects of population will affect this demand directly (see Tables 3-1 and 3-2). Furthermore, the income effect on the demand for such products is greater than the income effect on the demand for the food grains because the income elasticity coefficients are higher. This means that the livestock

and industrial demand for corn and other feed grains in Panama will increase faster than the food demand for grain over the next ten years.

The growth in commercial feed and industrial demand for corn will be much greater in Panama Province than in other provinces because of the concentration of feed manufacturing and industrial processing. Even if the Government would undertake policies to decentralize feed and industrial processing, the present location of these industries plus the concentration of demand for the end products in and around the capital city means that the derived demand for corn and other feed grains will become more concentrated in the next ten years.

B. Projected Consumption of Rice

The projected total consumption of rice by province in Panama for 1975 and 1980 is shown in Section A of Table 3-3. In order that they may be related directly to the projected production potentials presented in Chapter 4, the projections are given in units of 1000 quintals, rough rice equivalent. The projections shown in the total column for the country as a whole were developed by Dr. Randall A. Hoffman of USAID/Panama in connection with the over-all agricultural sector plan. They reflect the population projections shown in Table 3-1 as well as the projected income effects at the income elasticity of demand for rice existing in Panama in recent years. These projections indicate that rice consumption will reach about 124 percent of the 1970 level in 1975 and 151 percent of that level in 1980.

The projections of total consumption of rice by province were developed from the projected consumption for the country as a whole and the percentage distribution of total population shown in Table 3-2. As has been pointed out, the income effect is not reflected in the projected distribution of grain consumption because basic data were not available at the time the

TABLE 3-3. ESTIMATED DEMAND FOR RICE, CORN, AND BEANS BY PROVINCE IN PANAMA, 1970, 1975, and 1980
(1000 quintals)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Additional Feed Demand	Total	Percent
A. <u>Rough Rice</u>												
1970	104.2	603.3	387.2	185.1	183.6	301.3	1,477.6	343.2	57.5		3,643.0	100.0
1975	124.1	721.0	442.4	213.5	197.3	361.6	1,975.5	413.5	65.5		4,514.4	123.9
1980	145.3	841.8	494.7	241.0	208.0	425.3	2,584.9	488.0	73.2		5,502.2	151.0
B. <u>Total Shelled Corn</u>												
1970	55.2	319.5	205.1	98.0	97.2	159.5	782.4	181.7	30.5	50.0	1,979.1	100.0
1975	66.0	383.3	235.2	113.5	104.9	192.2	1,050.3	219.8	34.8	297.2	2,697.2	136.3
1980	74.2	429.9	252.6	123.1	106.2	217.2	1,320.1	249.3	37.4	692.4	3,502.4	177.0
C. <u>Edible Beans</u>												
1970	3.1	17.8	16.5	5.5	5.4	8.9	40.2	10.2	1.7		109.3	100.0
1975	5.5	32.0	19.6	9.5	8.8	16.0	87.6	18.3	2.9		200.2	120.7
1980	6.3	36.3	21.4	10.4	8.9	18.4	111.6	21.1	3.2		237.6	147.2

projections were made. The projections indicate that total rice consumption will continue to increase in all provinces but at a much more rapid rate in some provinces than in others. In particular, the increase in volume of demand will be great in the deficit provinces of Panamá and Colón so that shipments into these provinces from major rice production areas will have to increase much more than the average rate of increase in production. By 1980 over 3 million quintals, or nearly 56 percent of the rice consumption for the country as a whole, will be used in Panamá and Colón Provinces.

C. Projected Consumption of Corn

The projected patterns of consumption of corn in Panama for 1975 and 1980 are shown in Section B of Table 3-3. Two sets of projections for the country as a whole were made by Dr. Hoffman in connection with the over-all agricultural sector study -- one set without major expansion in poultry and livestock feeding and one set to support expansion of the feed industry to meet full projected demand. The differences in the two sets of projections are shown in the column "Additional Feed Demand" in Table 3-3. This additional volume of demand has not been allocated to provinces, but most of it will be in Panamá Province where the feeding industry is concentrated.

The distribution of the total volume of demand for corn (without the additional feed demand) among the provinces was done on the basis of the projected population distribution from Table 3-2 in a manner similar to that for rice. However, because the on-farm utilization of corn for feed and seed is significant (see Table 2-15), this segment of total utilization was subtracted before prorating projected consumption among provinces. In other words, the population projections were used to distribute only the consumption of corn for human food among the provinces. The volume of consumption for human food distributed in this manner includes both on-farm consumption

for food and off-farm marketings destined for food uses. The on-farm use for feed and seed is prorated among the provinces on the basis of prevailing rates of utilization for this purpose in each province.

The projections of total volume of demand for corn indicate an increasing volume in all provinces but that the increase will be slight in some provinces, especially in Los Santos and Darién. The projected increase in total corn demand from 1970 to 1980 is only 6,900 quintals in Darién and 9,000 quintals in Los Santos -- less than 1,000 quintals per year in both cases. By contrast, the increase in Panamá Province will be 537,700 quintals over the ten-year period (about 54,000 quintals per year) without the additional feed demand, and 1,180,100 quintals over the ten-year period (about 118,000 quintals per year) with the additional feed demand. The only other province in which the average rate of increase in total volume of demand for corn will be in excess of 10,000 quintals is Chiriquí.

D. Projected Consumption of Edible Beans

The projected patterns of consumption of edible beans in Panama for 1975 and 1980 are shown in Section C of Table 3-3. The projected consumption for the country as a whole developed by Dr. Hoffman include porotos and other edible beans as well as frijoles, while the 1970 base figure includes frijoles only. The percentages shown in the last column of the table are derived from the 1970 total consumption of edible beans and may be compared directly with the percentages for consumption of rice and corn by 1975 and 1980.

The consumption of edible beans is concentrated in Panamá Province, but substantial quantities also are consumed in Chiriquí, Veraguas, and Colón Provinces. The projections indicate that consumption will become increasingly more concentrated. By 1980 consumption in Panamá Province alone will increase

nearly three-fold and represent 47 percent of the total consumption of edible beans in the country. As in the case of rice and corn, shipments into Panamá from other provinces must be increased much more rapidly than the average increase in demand in order to meet the increasing concentration of the demand in the central part of the country.

CHAPTER IV

PROJECTED PRODUCTION POTENTIALS

As discussed in Chapter 2, Panama has increased grain production substantially over the past ten years. The increase has been greatest for rice (an average of some 175,000 quintals per year), substantially less for corn (an average of about 58,000 quintals per year) and slightly negative for edible beans. The increased production of rice and corn has been made possible both by opportunities to increase yields per hectare and by the availability of additional land which could be brought into grain production. It has been supported by: (1) attractive domestic markets, (2) high guaranteed support prices, (3) expanded farm credit for crop production, (4) increasing supplies of improved seed, fertilizer, chemical pesticides, farm machinery, and other agricultural inputs, (5) expanded agricultural research on improved crop production, and (6) extension education programs to teach farmers the application of modern production practices.

What are the potentials for increasing grain production over the next ten years? The answer depends upon the availability of the same kinds of factors which have spurred the increases in the past. Basic to the potentials for increased production are the technical potentials for increasing yields and plantings. Given these potentials, the production increases which will be achieved depend upon continued economic incentives and the effectiveness of the needed supporting programs.

A. Economic Incentives for Increased Production

Every indication is that Panama's grain producers will continue to have the economic incentive for increasing production. The demand projections in Chapter 3 indicate that domestic markets will continue to be strong and

that substantial increases in production will be required to keep up with expanding consumption. Panama's producers have little need to worry about excess production and low world market prices for grain over the next ten years.

In addition, there is reason to believe that high producer price supports for grain will be maintained. The price supports are an established institution in Panama, accepted by consumers, marketing firms, Government officials and producers, alike. IFE has the necessary facilities and personnel to enforce the supports by accepting grain delivery from producers when necessary. Furthermore, the projected domestic supply-demand conditions indicate that resources required to maintain the support price levels will be minimal over the next ten years.

B. Supporting Programs for Increased Production

Most of the required programs to support increased grain production are a matter of policy and planning -- they can be accomplished within the resources available to Panama. Many of them are well underway and have been expanded and improved in recent years. The agricultural credit programs, the farm input distribution programs, and the agricultural experiment station research programs are cases in point. Others have an adequate base for expansion and tailoring to meet the changing needs. Examples include the agricultural extension programs, the crop and market reporting programs, and the grain inspection and grading programs. Still, other needed programs which have not yet been implemented can be developed before the needs become critical. Possible examples in this category include a public grain warehousing program, a more complete certified seed program, a commercial farm management association program, a tailored assistance and income support

program for small farmers, and a grain inventory financing program for both producers and the private marketing agencies.

Some of the specific changes and developments needed to support expanded production are discussed elsewhere in this report. Others are considered in related sections of the over-all agricultural sector study for Panama. The point to be made here is that the lack of adequate supporting programs need not be the limiting factor to expanded grain production over the next ten years.

C. Potentials for Increasing Plantings

Increases in the areas planted to rice and corn have accounted for a substantial portion of the increase in production of these two crops over the past ten years. As discussed in Chapter 2, during the past ten years rice plantings have increased by about 5,000 hectares per year, about 3,300 hectares of which have been relatively evenly divided among the three major rice-producing provinces of Chiriquí, Veraguas, and Coclé. The area planted to corn over the period has increased at the rate of about 2,900 hectares per year. The leading provinces in increased corn plantings also have been Veraguas, Chiriquí, and Coclé. Will these rates of increase in the areas planted to rice and corn be maintained over the next ten years? This question can be answered at least partially by examining the amount of suitable agricultural land in the different provinces which is still available for crop production.

The calculation of available land for additional plantings of grain by province in Panama as made in this study is summarized in Table 4-1. The number of hectares devoted to sugar cane, tobacco, and bananas for 1968-1969, the last year reported, is shown in the upper section of the table.

TABLE 4-1. ESTIMATION OF AVAILABLE LAND FOR INCREASED PLANTINGS OF GRAIN IN PANAMA
(Hectares)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
Permanent Land Use 1968-69^a										
Sugar Cane	100	2,250	4,400	3,820	1,320	7,450	450	40	100	19,930
Tobacco		390					160			630 ^c
Coffee	121	9,466	2,871	3,313	1,917	4,475	2,032	1,144	66	25,405
Bananas	7,500	20,000								27,500
Total (Excluding Coffee)	7,600	22,640	4,400	3,820	1,320	7,450	610	40	100	47,980
Total Classes A & M Rice Soil^b										
Balance	76,100	117,940	69,795	14,505	23,560	29,680	89,555	27,385	200,920	649,440
Available for Rice (@75%)	51,375	71,475	49,046	8,014	16,680	16,673	66,709	20,509	150,615	451,090
Additional A & M Soil for										
Corn and Beans	0	0	0	23,075	19,932	40,485	17,500	0	0	100,992
Additional @ 75%				17,306	14,949	30,364	13,125			75,744
Maximum Grain (per crop)	51,375	71,475	49,046	25,320	31,629	47,037	79,834	20,509	150,615	526,840
Plantings 1969-70 (1st crop)										
Rice	400	26,100	30,000	9,500	10,200	18,600	9,000	3,600	3,800	111,200
Corn	500	11,600	16,000	4,500	10,400	5,200	8,300	2,500	2,400	61,400
Beans		200	900	500	100	300	100	100		2,200
Total	900	37,900	46,900	14,500	20,700	24,100	17,400	6,200	7,200	174,800
Balance Available	50,475	33,575	2,146	10,820	10,929	22,937	62,434	14,309	144,415	352,040
Plantings to Grain 1969-70 (2nd Crop)										
Balance Available	3,500	21,000	14,500	5,400	8,300	5,900	11,600	2,000	1,400	73,600
Balance Available	47,875	50,475	34,546	19,920	23,329	41,137	68,234	18,509	149,215	453,240

^aEstadística Panameña Información Agropecuaria. Superficie sembrada y producción de Café, Tabaco y Cana de Azúcar: Año Agrícola 1968 a 1969. Dirección de Estadística y Censo.

^bSemi-Detailed Soil Survey for Panama with Suitability Classification by Crop.

^cIncludes 80 hectares not allocated to province.

It is assumed that these crops have superior claim on the land so that the 47,980 hectares occupied by them will not be planted to grain.

Next the total hectares of Alto (high) and Mediano (medium) suitability for rice production from the soil survey and classification for Panama are shown in Table 4-1. The hectares falling into poor suitability for rice production on the basis of soil and climate have been excluded entirely from the land available for expanded grain production. The total areas planted to sugar cane, tobacco, and bananas are subtracted from the available Classes A and M rice land to obtain the balance shown on the next line of the table. This balance then is multiplied by 75 percent to obtain the number of hectares shown as "Available for Rice" in Table 4-1. It is assumed that 25 percent of the available Class A and M land will be used for vegetable crops, forage crops, farmsteads, roads, etc., and will not be used for rice production.

The soil survey and classification shows additional areas to be of Classes A and M suitability for corn or beans in certain provinces (Herrera, Los Santos, Coclé, and Panamá). These areas have been discounted by 25 percent also and the remainder added to the area available for rice to obtain the areas shown as "Maximum Grain per Crop" in the table. This figure totals 526,840 hectares for the country as a whole.

The first-crop plantings of rice, corn, and beans in 1969-1970 are shown in the next section of Table 4-1 (see Tables 2-4, 2-6, and 2-8). The total area planted to the three crops is subtracted from the "Maximum Grain per Crop" to obtain the balance available for expanded grain production in each province. The balance available for the country as a whole is 352,040 hectares, of which 144,415 is in Darién Province and 50,475 is in Bocas del Toro Province. Balances are available in all provinces, but that in Veraguas is only 2,146 hectares. The balance is 10,820 hectares in Herrera and 22,937

hectares in Coclé, but there is no balance of available rice land in these two provinces because 1969-1970 rice plantings exceeded the total available A and M land for rice. As shown by the last line of Table 4-1, there are substantial balances for increasing second-crop plantings in all provinces.

From these estimates, it seems clear that there is available land which is suitable for continued expansion of plantings of corn in all provinces and for continued expansion of plantings of rice in all provinces except Veraguas, Herrera, and Coclé. The continued expansion of rice production in these three provinces will depend primarily upon the opportunity to increase yields without further expansion of rice plantings.

In addition to the availability of additional suitable land, the future rate of expansion in plantings of rice and corn depends upon farmers' willingness to clear and develop the new lands and bring them into production. This willingness is affected by several factors -- the cost of development, the availability of land clearing contractors, the availability of long-term credit for land development, expectations of the future markets and profitability of grain production, alternative uses for the land, etc. These factors all have been reflected in the rate of expansion of plantings in the past, so past trends are an important indicator of future trends.

In order to assess the past trends in plantings, computer analyses were made using an exponential function to determine the shape of the projection curve which best fits the past trends. The planting data used in the computer analyses are those shown in Tables 2-4 through 2-9 plus those for the combined hectares planted to both crops of rice, corn, and edible beans. The implications of the alternative exponential curves for projecting plantings of grain are illustrated by Figure 4-1. Plantings for the country as a whole since 1960 with projections through 1980 are plotted in units of

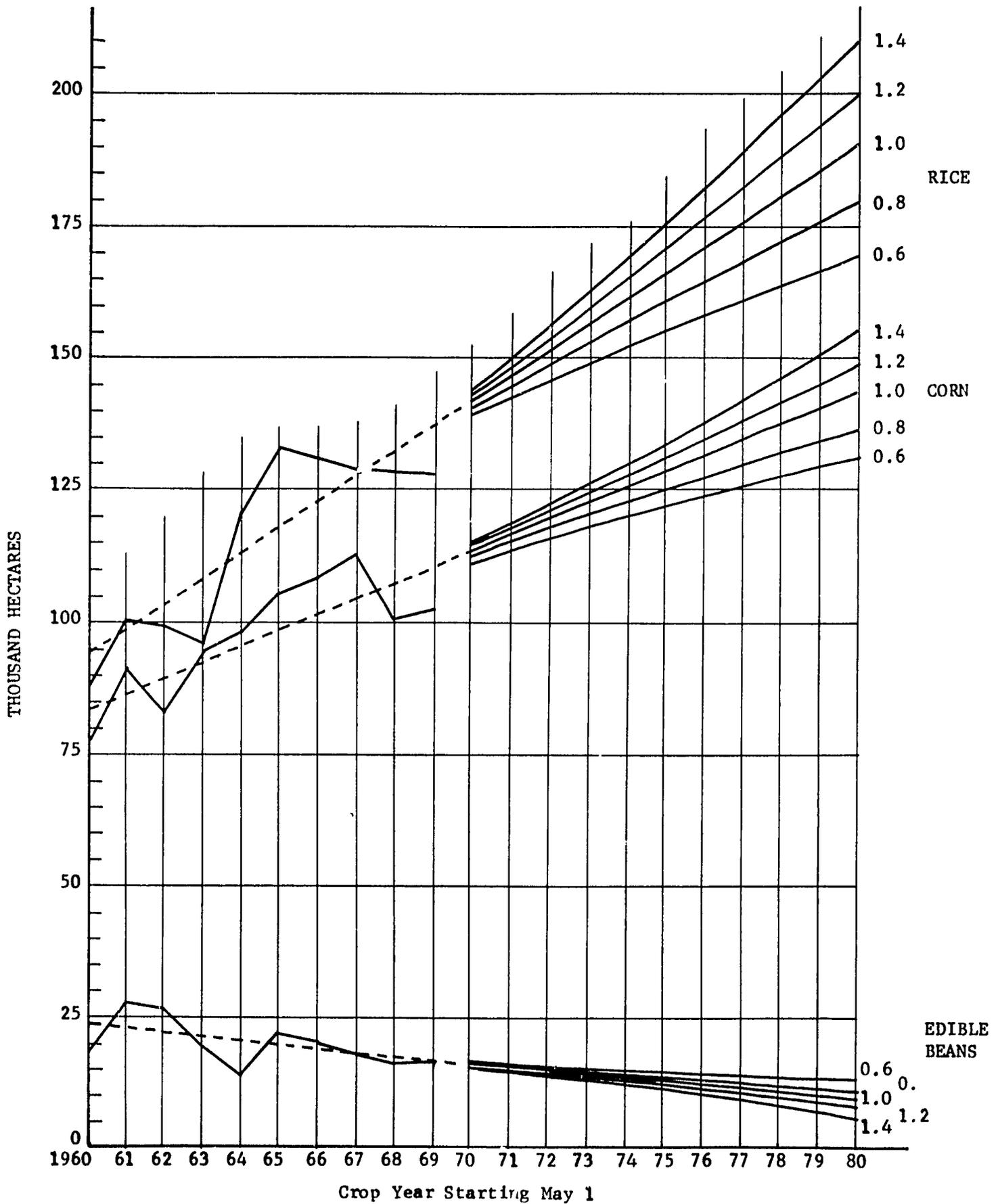


Fig. 4-1. PROJECTIONS OF PLANTINGS OF RICE, CORN, AND BEANS IN PANAMA AT ALTERNATIVE EXPONENTIAL GROWTH RATES

1,000 hectares. The computer projections of plantings of rice, corn, and edible beans with alternative exponents on the time variable from 0.6 to 1.4 fitted to the same historical data are shown by the different projection lines.

The exponent of 1.0 on the time variable provides the usual straight-line projection, regardless of whether the trend is upward, as in the case of rice and corn plantings, or downward, as in the case of plantings of edible beans. The exponential values greater than 1.0 provide curved projection lines which accentuate the trend -- that is, they provide an increasing rate each year to the upward or downward trend exhibited by the historical data. The greater the exponent, the greater the rate of increase in the trend. The exponential values less than 1.0 provide curved projection lines which temper the trend -- that is, they provide a decreasing rate each year to the upward or downward trend exhibited by the historical data.

It will be noted from the historical sections of the curves in Figure 4-1 that in all three cases the curves which temper the trend more closely fit the past trends in plantings than do either the straight line curves or the curves which accentuate the trend. This is born out by the R^2 values obtained from the computer runs. The highest R^2 values for the trends in plantings of all three crops were obtained with the projection exponent of 0.6. The same is generally true of the projections of plantings by province, as illustrated by the curves of R^2 values for plantings of rice and corn shown in Sections C of Figures 4-9 and 4-10. The projection model with the 0.6 exponent provides the highest R^2 values for plantings of rice in all provinces except Chiriquí and Veraguas, where exponents greater than 1.0 but less than 1.6 provide the best fit. The projection model with the 0.6 exponent provides the highest R^2 values for plantings of corn in all provinces except Coclé and Colón, where the 1.0 exponent provides the best fit.

This analysis makes it clear that judging from past trends, plantings of rice and corn in Panama may be expected to continue to increase but by a reduced number of hectares each year. This trend needs to be considered in assessing production potentials and developing production projections for the two kinds of grain. In the case of rice, this pattern will be reinforced by limitations on additional suitable rice land in Veraguas, Herrera, and Coclé Provinces.

D. Potentials for Increasing Yields

The yields of rice, corn, and edible beans have varied from year to year depending upon weather conditions and other factors beyond farmers' control but have shown a definite upward trend over the past ten years (Figure 4-2). Average yields per hectare for the country as a whole have increased at the average annual rate of about 30 pounds for rice, 17.5 pounds for edible beans, and 7.5 pounds for corn. The annual increase in average yields has varied considerably from province to province, however.

Assuming that the supporting programs are maintained, the past trends to higher yields should be continued in the next ten years as more farmers adopt the higher yielding varieties and improved cultural practices. The yields obtained by the better producers in all provinces indicate that there is still ample opportunity to increase average yields. Many such producers are obtaining yields three times the average for their province. Still, the diffusion of new ideas and practices among producers takes time and average yields will not jump up to substantially higher levels within a year or two. Rather, yield patterns may be expected to exhibit upward trends over time. The remaining question is what rate of increase can be expected in the yields of rice, corn, and edible beans over the next ten years.

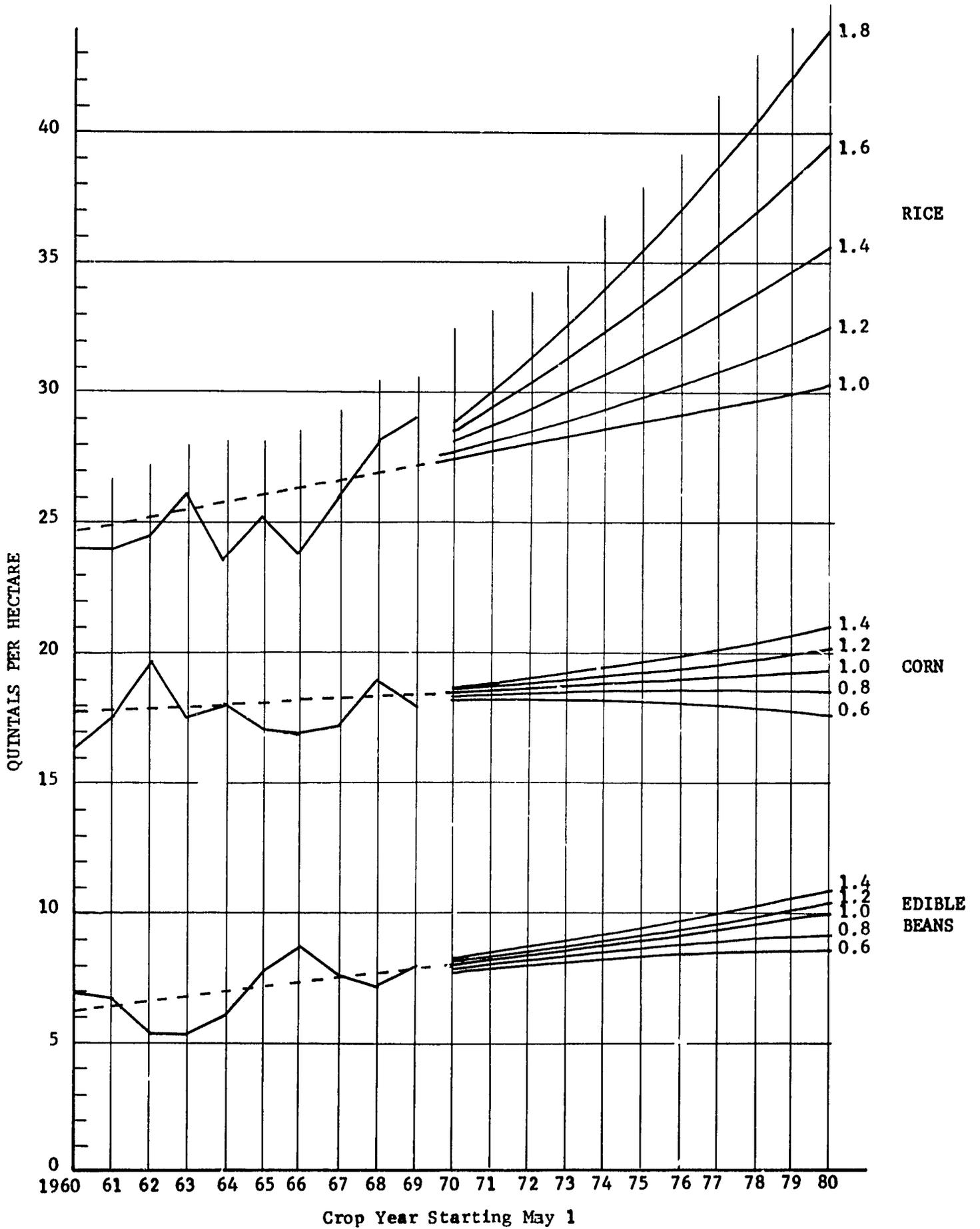


FIG. 4-2. PROJECTIONS OF YIELDS OF RICE, CORN, AND BEANS IN PANAMA AT ALTERNATIVE GROWTH RATES

The alternative exponential models shown by the curves in Figure 4-2 indicate the importance of selecting the most appropriate model for the projections of yield. The models with the higher exponents provide much higher projected yields beyond 1975, especially for rice. The curves of R^2 values for rice yield projections by province indicate that an exponent of 1.6 or 1.8 provides the best fit to the historical trends in most provinces (Figure 4-9). The major exceptions are Darién and Bocas del Toro where the exponent of 0.6 provides substantially better fit than the higher exponents. In the case of the three provinces for which additional land for rice planting is limited (Veraguas, Herrera, and Coclé), an average exponent of about 1.4 for rice yields is most realistic.

The curves of R^2 values for corn yield projections indicate that an exponent of 0.6 provides the best fit in all provinces except Los Santos, Coclé, Panamá, and Colón (Figure 4-10). The R^2 values indicate that corn yields in these provinces are increasing at an exponential rate more nearly 1.6 or 1.8. The R^2 values for edible beans yield projections indicate an average exponential rate of 1.0 or 1.2, although the best fits for yields in Chiriquí and Los Santos Provinces are with the 1.8 exponent.

Another basis for assessing the potential for further increased in grain yields in Panama over the next ten years is comparison with yields obtained elsewhere in the world under similar soil and climatic conditions. On this basis, Panama has done relatively well with rice. The country-wide average yields approaching 30 quintals per hectare and increasing at the rate of 0.3 quintals per year are relatively good compared to other Latin American countries and to other parts of the world producing rain-fed rice. The average yields of 40 quintals per hectare in Chiriquí Province are quite good.

By contrast, the average yields of corn of substantially less than 20 quintals per hectare are quite low even compared to other Latin American countries in subtropical climatic zones. With substantial areas of well-drained soils which are better suited to corn than to rice in Herrera, Los Santos, Coclé, and Panamá Provinces, the potentials for substantially increased corn yields should be good. More attention needs to be given to achieving this potential.

The average yields of edible beans in Panama are about normal compared to those in other countries with comparable soil and climatic conditions. The rate of increase in yields of edible beans at the exponential rate of 1.2 shown in Figure 4-2 appears to be reasonable, but about all that can be expected in Panama over the next ten years.

E. Production Potentials for Rice

The combined effects of increased plantings (Figure 4-1) and increased yields (Figure 4-2) have brought about sizable increases in rice production in Panama over the past ten years. Total rice production for the country has gone up steadily every year except for 1964-1965 (see Figure 4-3). Production has gone up in every province except Los Santos, where rice plantings have been reduced steadily from 17,200 hectares in 1963-1964 to 11,900 hectares in 1969-1970. Projections of rice production for 1979-1980 based on the trend over the past ten years for Panama as a whole vary from less than 4.75 million quintals at a projection exponent of 0.6 to over 7.6 million quintals at a projection exponent of 1.8 (Figure 4-3). Clearly, neither of these extreme projections is realistic. However, even the choice between the projection based on an exponent of 0.8 and that based on an exponent of 1.2 means the difference between a substantial rice deficit and a substantial rice surplus in Panama by 1980 (see Figure 4-4). The projection based

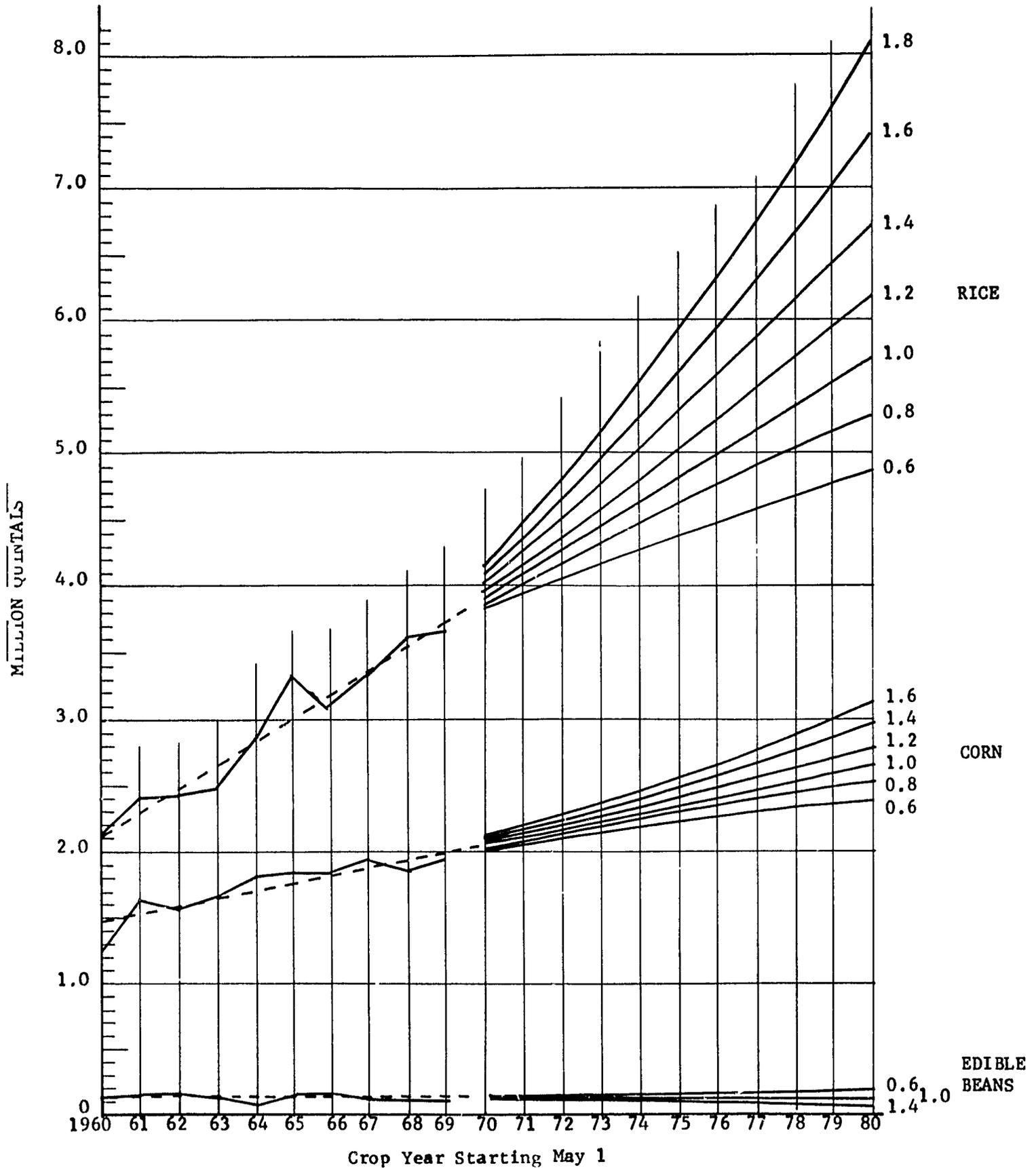


FIG. 4-3. PROJECTIONS OF PRODUCTION OF RICE, CORN AND BEANS IN PANAMA AT ALTERNATIVE EXPONENTIAL GROWTH RATES

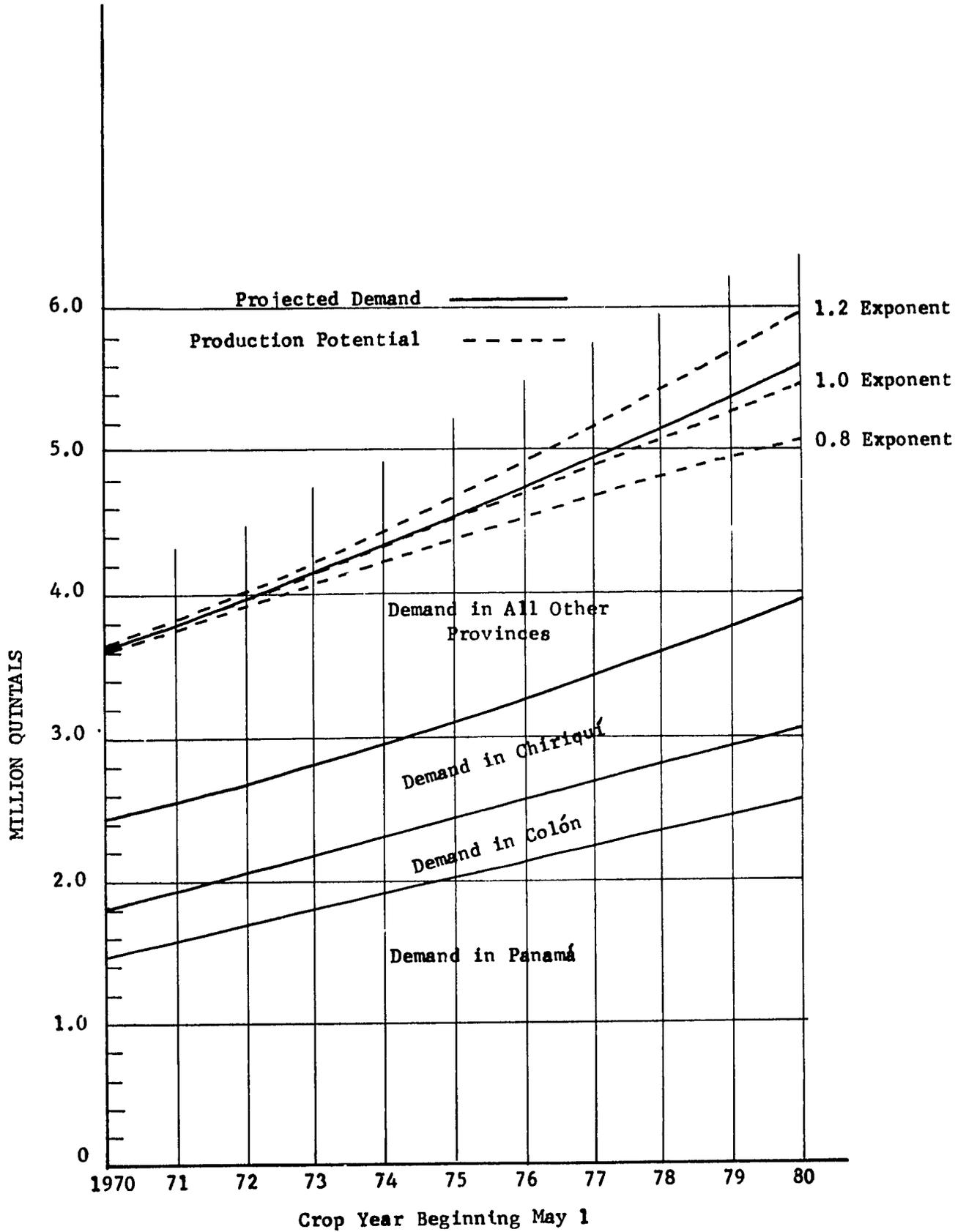


FIG. 4-4. COMPARISON OF PROJECTED RICE DEMAND AND PRODUCTION POTENTIALS IN PANAMA, 1970-1980.

on an exponent of 1.0 will maintain self-sufficiency in rice production through 1975, with a small but increasing need for rice imports starting in 1976.

The projection exponent providing the best fit to the historical rice production data varies considerably among the provinces (Figure 4-9, Section A). The higher exponents result in high R^2 values for Chiriquí, Coclé, Los Santos, and Bocas del Toro, but the lower exponents provide higher R^2 values in Darién, Herrera, Colón, and Panamá. A medium exponential value of 1.2 provides the most realistic projections of rice production potentials except in those provinces for which the opportunities for further expansion of rice plantings is limited.

The projected potentials for rice production in Panama which are believed to be realistic under the expected conditions are shown in Table 4-2. For those provinces where both areas planted to rice and rice yields can be expected to increase, the projections are based on the production trends by province at the exponent of 1.2. These provinces include Bocas del Toro, Chiriquí, Panamá, Colón, and Darién. For those provinces for which opportunity for further expansion of plantings on soils well-suited to rice is limited (Veraguas, Herrera, and Coclé), the projection is based on no expansion in plantings and yield increases at the historical trend in each province with the exponent of 1.4. In the case of Los Santos Province where reduced plantings have offset increased yields, production is projected at the 1969-1970 level. The resultant total projections for the country as a whole indicate volumes of rice production very close to the total projected demand through 1980 (see Figure 4-4).

The historical patterns and projections of rice production potentials by province are summarized in Figure 4-5. The chart is based on Table 2-1 and Table 4-2. The increasing dominance of Chiriquí Province in Panama's

TABLE 4-2. PROJECTED PRODUCTION POTENTIAL FOR RICE BY PROVINCE IN PANAMA, 1971 - 1980
(1000 Quintals, Rough Rice)

Crop Year	Bocas del Toro ^a	Chiriquí ^a	Veraguas ^b	Ferrera ^b	Los Santos ^c	Coclé ^b	Panamá ^a	Colón ^a	Darién ^a	Country Total
1970-71	8.8	1,315.4	809.6	281.8	281.9	549.4	324.9	76.4	167.9	3,684.4
1971-72	8.9	1,412.8	837.4	284.8	281.9	577.7	332.8	78.9	179.6	3,994.8
1972-73	9.0	1,511.9	862.1	288.9	281.9	610.0	340.8	81.2	191.5	4,177.3
1973-74	9.1	1,612.4	893.0	291.9	182.9	640.3	349.0	83.9	203.6	4,365.1
1974-75	9.2	1,714.5	920.8	295.9	281.9	674.7	357.2	86.0	215.9	4,556.1
1975-76	9.3	1,817.9	951.7	299.0	281.9	707.0	365.6	88.4	228.3	4,749.1
1976-77	9.4	1,922.6	982.6	303.0	281.9	741.3	374.1	90.9	240.9	4,946.7
1977-78	9.5	2,028.5	1,013.5	307.0	281.9	777.7	382.7	93.4	253.6	5,147.8
1978-79	9.6	2,135.7	1,044.4	311.1	281.9	814.1	391.4	96.0	266.5	5,350.7
1979-80	9.7	2,243.9	1,078.4	315.1	281.9	850.4	400.1	98.5	279.5	5,557.5

^aProjected production at T^{1.2}, based on the data in Table 2-1.

^b1969-70 planted area x projected yield (both crops) at T^{1.4}.

^cProduction trend downward slightly; projected at 1969-70 level.

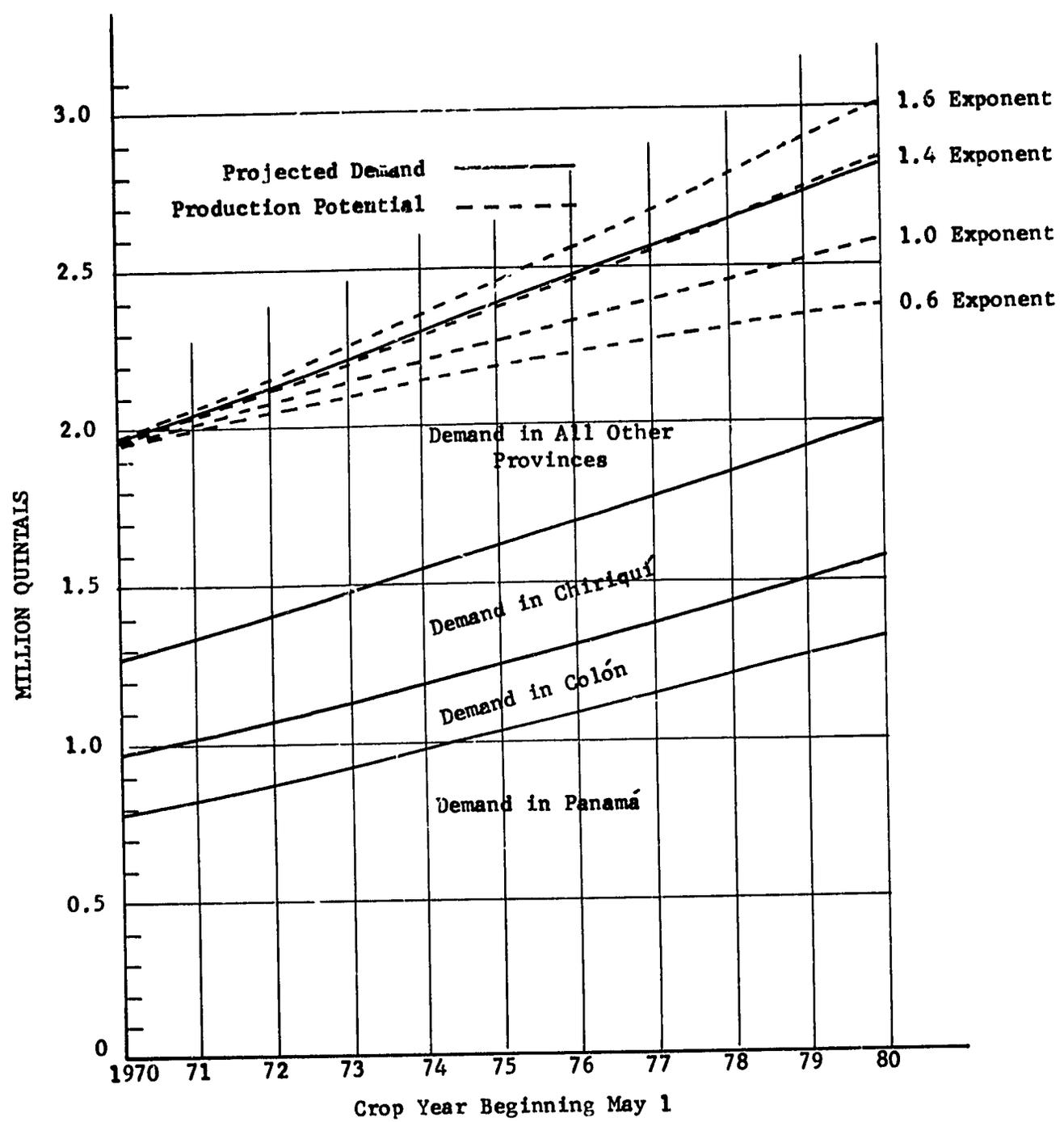


FIG. 4-5. COMPARISON OF PROJECTED CORN DEMAND AND PRODUCTION POTENTIALS IN PANAMA, 1970-1980.

total rice production is evident. Production in Veraguas and Coclé will continue to be substantial, with production increases at about the same rate as for the country as a whole. Production in Darién Province will continue to increase at a faster rate than for the country as a whole, but by 1980 still will be relatively small compared to that in Chiriquí, Veraguas, and Coclé.

F. Production Potentials for Corn

The increase in plantings and the moderate increase in average yields have resulted in an increase in the production of corn in Panama (see Figure 4-3). Production increased steadily through 1967-1968, fell off somewhat in 1968-1969, and recovered somewhat in 1969-1970. Over the ten-year period, corn production has increased significantly in all provinces and resulted in an annual average increase of about 58,000 quintals for the country as a whole. Projections for 1979-1980 corn production based on this historical trend vary from about 2.4 million quintals at an exponent of 0.6 to more than 3.0 million at an exponent of 1.6 (Figure 4-3). A projection exponent of 1.4 is required in order for production to keep up with minimum projected demand, without the additional demand for poultry and livestock feed (Figure 4-6). At a projection exponent of 1.0, the corn deficit will continue to increase reaching about 125,000 quintals by 1975 and 250,000 quintals by 1980.

The past trends in corn production do not justify a projection exponent greater than 1.0 (Figure 4-10, Section A). For most provinces, the highest R^2 values are provided by the exponent of 0.6, and in no province is the R^2 value increased by moving to an exponent greater than 1.2. It seems clear that Panama will not be able to keep up with the projected domestic

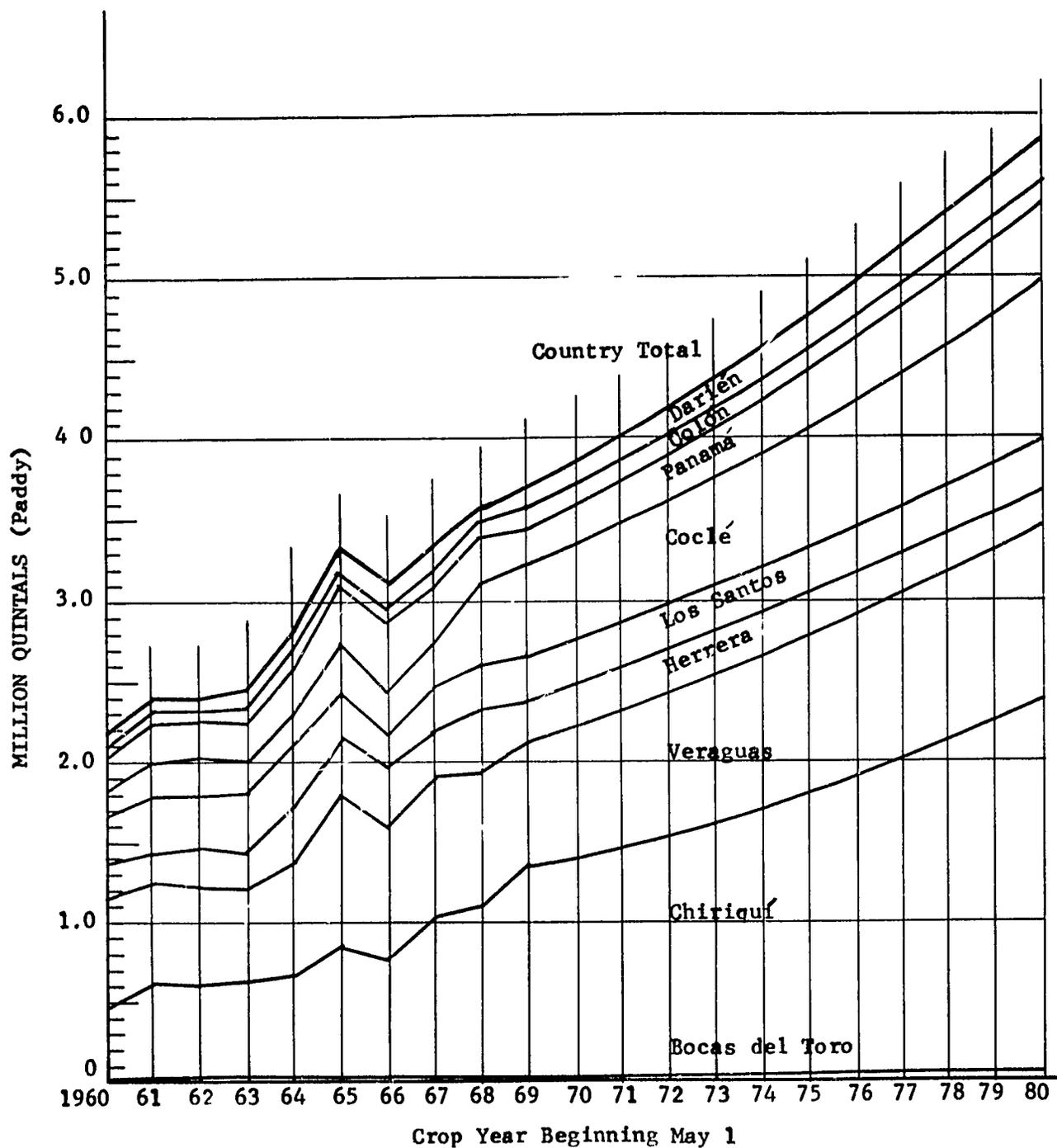


FIG. 4-6. PROJECTED PRODUCTION POTENTIAL FOR RICE BY PROVINCE IN PANAMA

demand for corn unless something is done to speed up the historical trend toward increased production.

Corn plantings have been increasing faster than corn yields (see Figures 4-1 and 4-2) but not primarily in those provinces with large areas of land which are better suited to corn than to rice (see Tables 2-6, 2-7, and 4-1). If supporting programs for increasing corn production are concentrated in those provinces with the greatest potential and in which corn has the greatest comparative advantage relative to rice, it should be possible to increase average yields substantially. Research needs to be directed to selecting higher yielding hybrids for these provinces and for identifying the most effective fertilization programs, plantings rates, and other cultural practices. Extension education, farm credit, and farm input distribution programs need to be reoriented to increasing corn production and concentrated in those provinces where they can be expected to have the greatest pay-off. The support prices for corn are high enough to stimulate production if the proper supporting programs are developed.

Those provinces with the greatest potential for substantial increases in corn production over the next ten years are Los Santos, Herrera, Coclé, and Panamá (see Table 4-1). In the four provinces, there are over 100,000 hectares of land which is better suited for corn than for rice. These are relatively close to the concentration of projected corn demand, so the prices received by corn farmers should be relatively high. If proper cultural practices are followed, corn can be a more profitable crop than rice even for the larger and more progressive mechanized farms in these areas. It is believed that total corn production in the four provinces can be increased from present levels at the rate of the 1.6 exponent over the next ten years. It is doubtful if corn production in the remaining provinces will be increased at a

rate more than indicated by the exponent of 1.0 because rice will continue to return higher net earnings per hectare where the soil and climate are best suited to rice.

Based on this assessment of the potentials, the projections of possible corn production by province in Panama over the next ten years are shown in Table 4-3. These projections indicate a corn production potential for the country as a whole slightly less than indicated by the 1.4 exponential curve in Figure 4-6 but well above that indicated by the 1.0 exponential curve. Total production will remain just short of the projected demand (roughly by 50,000 quintals) without the increased demand for poultry and livestock feed. This latter need will have to be met by feed grain imports, unless grain sorghum production can be stimulated on a significant scale in Panama.

There appears to be a potential for grain sorghum, especially on the lighter, more rolling soils in the commercial farming areas such as in Chiriquí Province. Grain sorghum can be complementary with rice production in the use of labor, tillage machinery, and harvesting machinery. However, much research and demonstration work on production must be done before the grain sorghum production potentials can be assured. Provision has not been made in this study for any substantial volume of grain sorghum in assessing the requirements for marketing facilities and programs over the next ten years. The marketing needs for grain sorghum can be appraised when the time comes if this crop does develop in Panama.

The historical patterns and projections of corn production potentials by province are summarized graphically in Figure 4-7 from the data in Table 4-7 from the data in Tables 2-2 and 4-3. Chiriquí and Veraguas provinces will continue to provide a large portion of the country's total production through 1980, but the production potential in Los Santos, Coclé, Panamá,

TABLE 4-3. PROJECTED PRODUCTION POTENTIAL FOR CORN BY PROVINCE IN PANAMA, 1971 - 1980
(1000 Quintals, Shelled)

Crop Year	Bocas del Toro ^a	Chiriquí ^a	Veraguas ^a	Herrera ^b	Los Santos ^b	Coclé ^b	Panamá ^b	Colón ^a	Darién ^a	Country Total
1970-71	10.2	518.3	439.9	194.2	363.5	138.7	244.7	54.1	114.5	2,078.1
1971-72	10.5	535.8	455.4	196.2	370.0	146.2	254.5	55.3	121.0	2,144.9
1972-73	10.8	553.3	470.9	198.4	376.8	154.2	264.7	56.6	127.4	2,213.1
1973-74	11.0	570.8	486.3	200.7	384.0	162.6	275.5	57.8	133.9	2,282.6
1974-75	11.3	588.4	501.8	203.0	391.4	171.3	286.7	59.1	140.3	2,353.3
1975-76	11.6	605.9	517.3	205.5	399.2	180.4	298.4	60.3	146.8	2,425.4
1976-77	11.9	623.4	532.7	208.1	407.3	189.8	310.6	61.6	153.2	2,498.6
1977-78	12.2	641.0	548.2	210.7	415.6	199.5	323.1	62.9	159.7	2,572.9
1978-79	12.4	658.5	563.7	213.4	424.3	209.6	336.2	64.1	166.1	2,648.3
1979-80	12.7	676.0	579.2	216.3	433.2	220.0	349.6	65.4	172.6	2,725.0

^aProjected production at T^{1.0}, based on the data in Table 2-2.

^bProjected production at T^{1.6}, based on the data in Table 2-2.

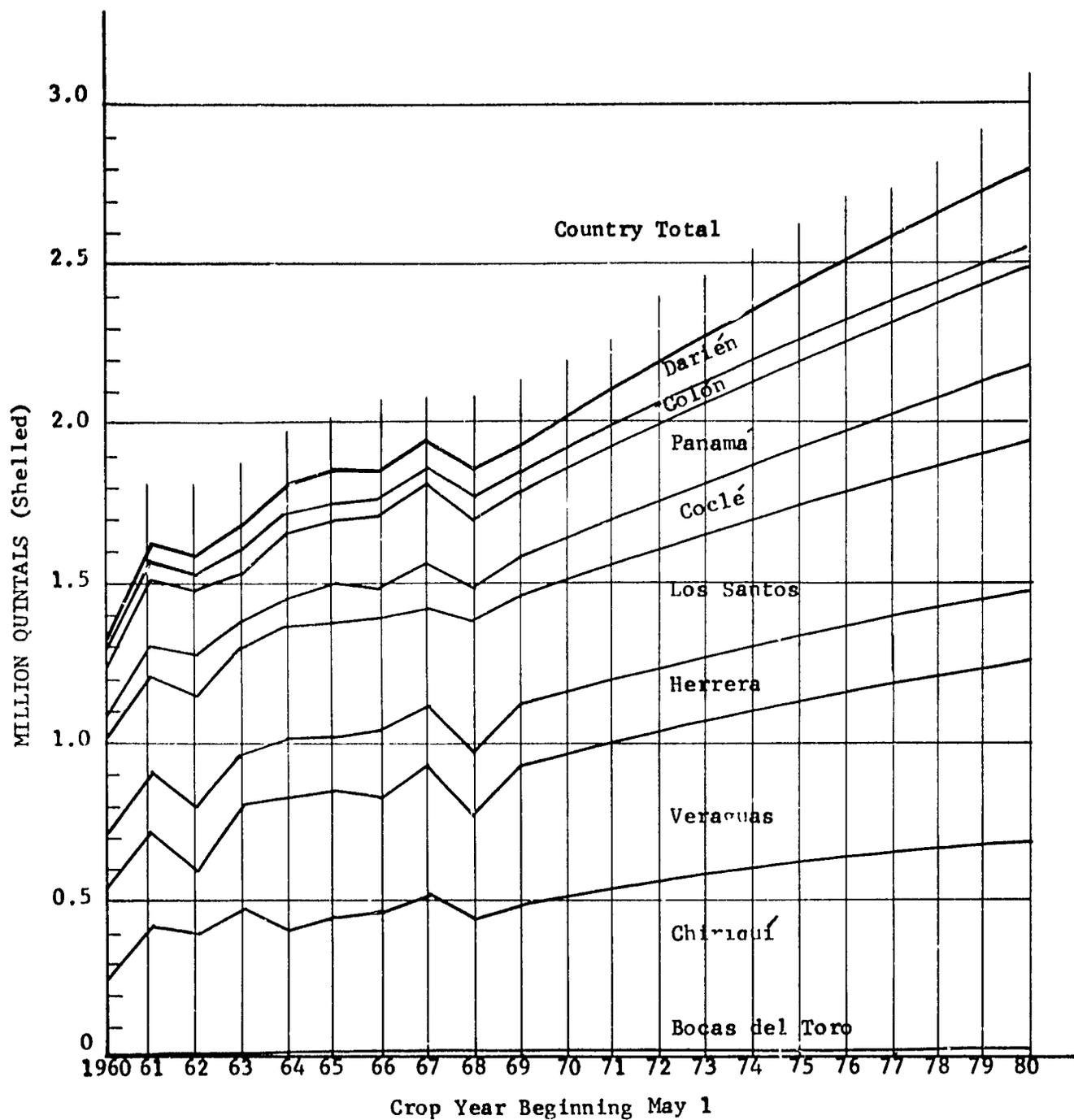


FIG. 4-1. PROJECTED PRODUCTION POTENTIAL FOR CORN BY PROVINCE IN PANAMA

and Darién Provinces will become increasingly significant through time. The latter trend will help to ease the rapidly increasing requirement for long-distance grain transportation from the northern provinces into the central part of the country.

G. Production Potentials for Edible Beans

Since 1960 the increasing average yields obtained for edible beans have been offset by reduced plantings. Production of frijoles for the country as a whole shows a slight downward trend (Figure 4-3). Because the trend line is very flat and the year-to-year fluctuations around the trend quite wide, the exponent used in fitting the trend makes relatively little difference in the projected production for 1975 and 1980. The 1979-1980 projections vary from about 116,500 quintals with the 0.6 exponent to about 110,000 quintals with the 1.4 exponent.

The projected frijol production potentials by province through 1979-1980 as developed in this study are shown in Table 4-4. The projections in those provinces having significant trends are based on the computer projections fitted to the data in Table 2-3 with the exponential function of 0.6. These provinces include Chiriquí, Veraguas, Coclé, Panamá, and Colón and represent about 85 percent of total production for the country. Frijol production potentials for the remaining provinces are projected at the 1969-1970 levels of production. The resulting total projections are virtually constant over time, decreasing only from 124,800 quintals for 1970-1971 to 124,500 quintals for 1979-1980.

The historical and projected patterns of frijol production in Panama are summarized graphically in Figure 4-8. The historical production is characterized by wide and almost cyclic variation over time. There is not strong

evidence that such a cycle will be repeated in the future, however, and the projections of average production are made on the basis of smooth curves. The projections reflect declining production potentials in Chiriquí Province and an increasing relative importance of Veraguas Province in the country's total production. However, even in Veraguas Province, frijol production is projected to continually decline relative to rice and corn production over the next ten years.

TABLE 4-4. PROJECTED FRIJOL PRODUCTION POTENTIAL BY PROVINCE IN PANAMA, 1971 - 1980
(1000 Quintals, Shelled)

Crop Year	Bocas del Toro ^a	Chiriquí ^b	Veraguas ^b	Herrera ^a	Los Santos ^a	Coclé ^b	Panamá ^b	Colón ^b	Darién ^a	Country Total
1970-71	0.5	29.3	53.6	6.5	7.2	9.2	11.6	2.6	4.3	124.8
1971-72	0.5	28.1	54.4	6.5	7.2	9.4	11.7	2.6	4.3	124.7
1972-73	0.5	27.0	55.2	6.5	7.2	9.5	11.8	2.7	4.3	124.7
1973-74	0.5	25.9	56.0	6.5	7.2	9.7	11.9	2.7	4.3	124.7
1974-75	0.5	24.9	56.7	6.5	7.2	9.8	12.0	2.8	4.3	124.7
1975-76	0.5	23.9	57.4	6.5	7.2	9.9	12.1	2.9	4.3	124.7
1976-77	0.5	22.9	58.1	6.5	7.2	10.1	12.2	2.9	4.3	124.7
1977-78	0.5	21.9	58.8	6.5	7.2	10.2	12.2	3.0	4.3	124.6
1978-79	0.5	20.9	59.5	6.5	7.2	10.3	12.3	3.0	4.3	124.5
1979-80	0.5	20.0	60.1	6.5	7.2	10.4	12.4	3.1	4.3	124.5

^aProjected production at 1969-70 level.

^bProjected production at $T^{0.6}$, based on the data in Table 2-3.

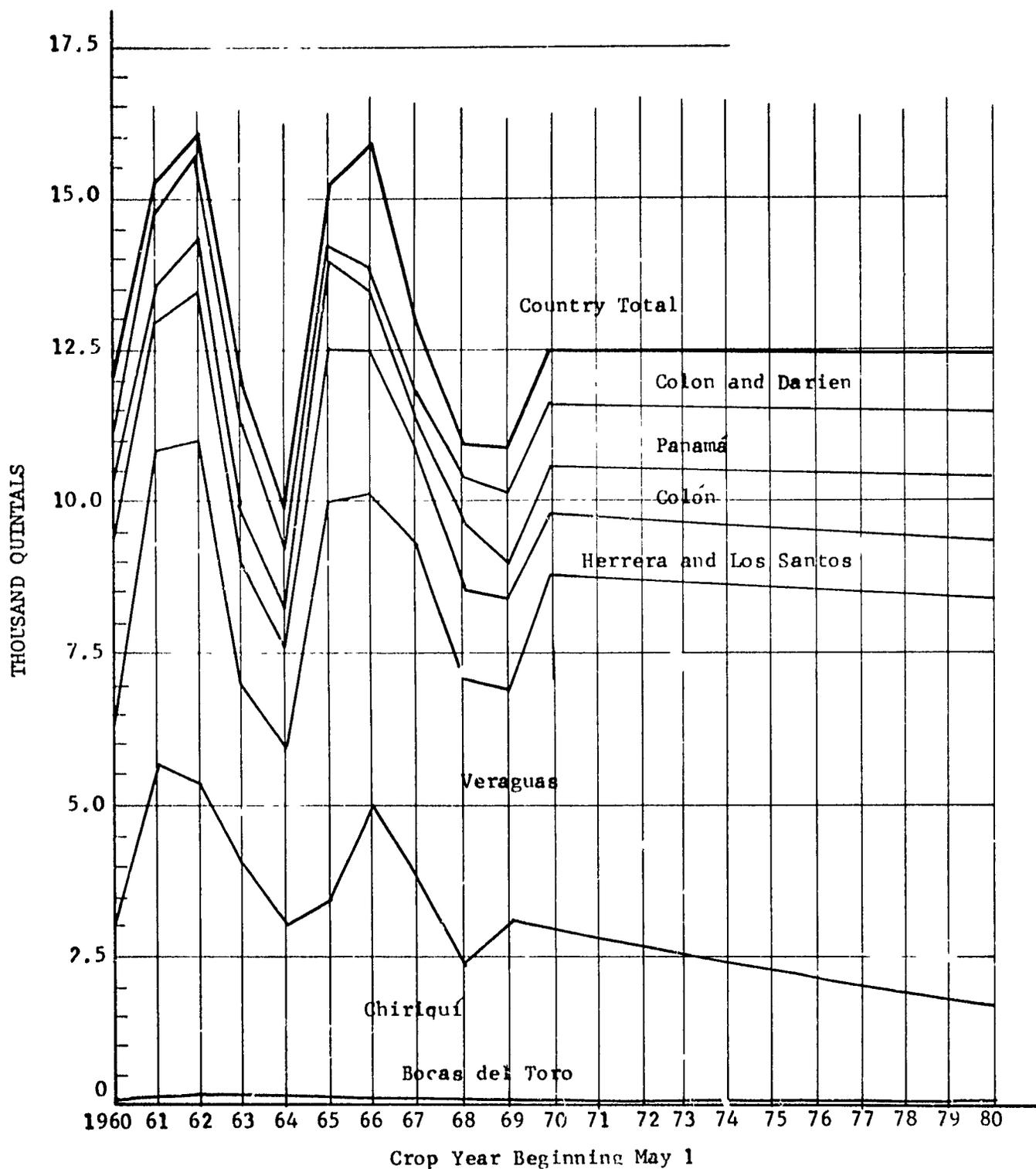


FIG. 4-8. PROJECTED PRODUCTION POTENTIAL FOR EDIBLE BEANS BY PROVINCE IN PANAMA.

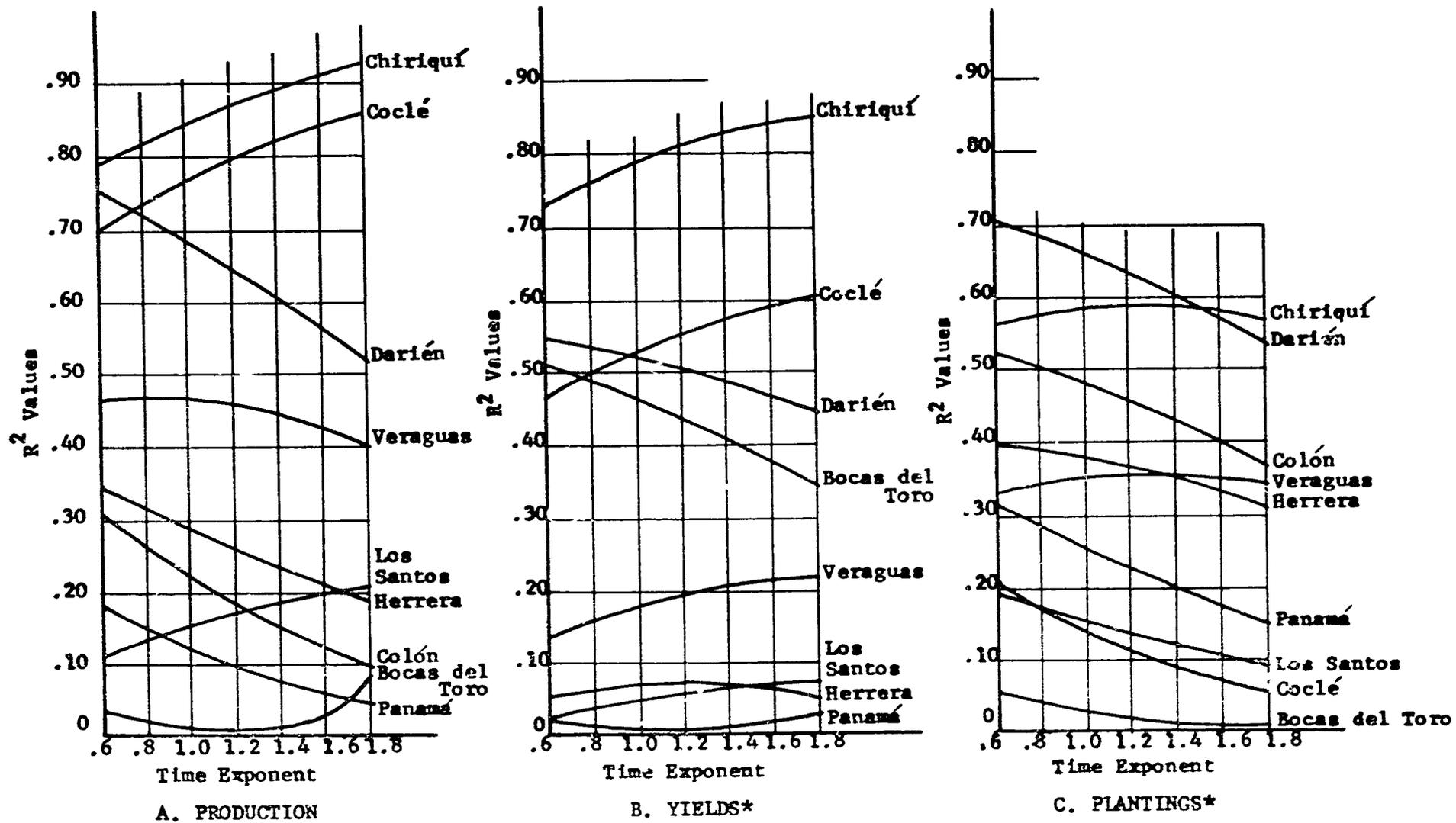


FIG. 4-9. RELATIONSHIP BETWEEN R^2 VALUES AND TIME EXPONENT IN FITTING TRENDS TO PROVINCIAL PRODUCTION, YIELDS AND PLANTINGS OF RICE IN PANAMA, 1960-61 to 1969-70.

* First Crop Only

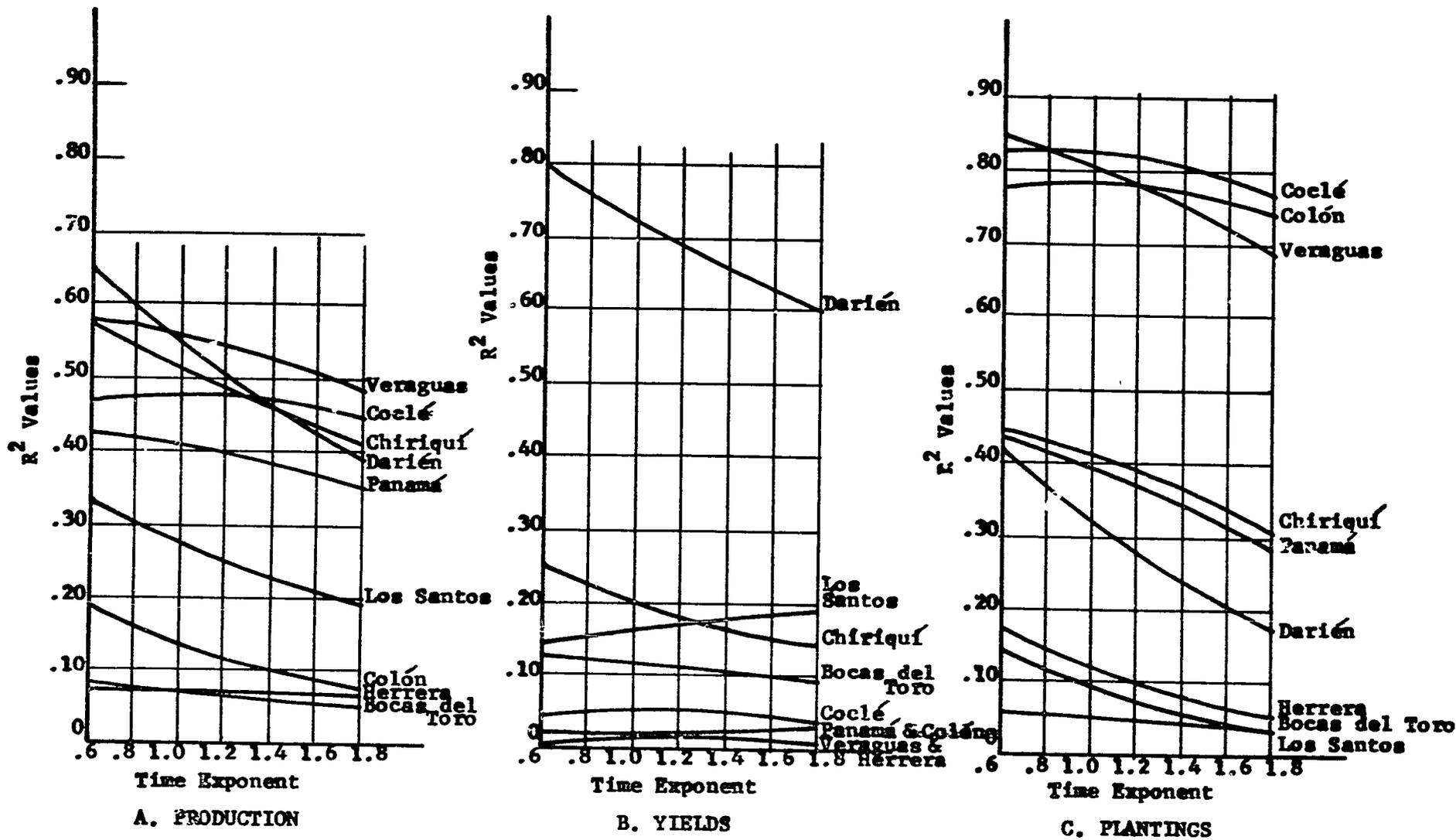


FIG. 4-10. RELATIONSHIP BETWEEN R² VALUES AND TIME EXPONENT IN FITTING TRENDS TO PROVINCIAL PRODUCTION, YIELDS AND PLANTINGS OF CORN IN PANAMA, 1960-61 to 1969-70.

CHAPTER V
PROJECTED GRAIN DISTRIBUTION PATTERNS

The projected volumes of grain production and consumption by province provide the basis for determining the nature and magnitude of requirements for grain marketing and physical distribution in Panama during the next ten years. At present, only about 52.5 percent of the rice, 33 percent of the corn, and 50 percent of the edible beans enter marketing channels. The remainder is used by the producer. Furthermore, a substantial portion of the grain entering market channels is consumed in the province of production. In 1969-1970, for example, the net out-of-province marketings totaled the equivalent of 906,295 quintals of milled rice, 432,800 quintals of corn, and about 40,000 quintals of edible beans (Table 2-15). At an average of 5 metric tons per load, this corresponds to 12,537 truck loads of over-the-road grain shipments.

These patterns are changing rapidly and will continue to change at an increasing rate as demand becomes more centralized and production more specialized in the years ahead. By 1979-1980 an estimated 66 percent of the rice, 55 percent of the corn, and 56 percent of the edible beans produced in Panama will enter market channels. In that year net out-of-province marketings will total the equivalent of more than 1,750,000 quintals of milled rice, about 790,000 quintals of corn, and 47,000 quintals of edible beans -- some 23,518 truck loads. The marketing system must be prepared to cope with these changing marketing and distribution patterns.

A. Summary of Projected Changes in Grain Marketing Patterns

The changing over-all patterns of grain marketing and distribution for Panama as a whole are summarized in Table 5-i. From 1970 to 1980 total demand

TABLE 5-1. SUMMARY OF PROJECTED CHANGES IN VOLUME OF GRAIN DEMAND, PRODUCTION AND MARKETING IN PANAMA, 1970-1980.

	Rice		Corn		Edible Beans (Frijol) ^b	
	1000 Quintals	Percent	1000 Quintals	Percent	1000 Quintals	Percent
Demand						
1970	3,643.0	100.0	1,929.1	100.0	109.2	100.0
1975	4,514.4	123.9	2,400.0	124.4	131.7	120.6
1980	5,502.2	151.0	2,810.0	145.7	160.6	147.0
Production						
1970	3,643.0	100.0	1,929.1	100.0	109.2	100.0
1975	4,556.1	125.0	2,353.2	122.0	124.7	114.2
1980	5,557.5	152.6	2,725.0	141.3	124.5	114.0
Home Use						
1970	1,731.4	100.0	1,289.3	100.0	54.6	100.0
1975	1,809.5	104.5	1,249.9	96.9	54.3	99.5
1980	1,889.0	109.1	1,229.8	95.4	54.4	99.6
Marketings						
1970	1,911.6	100.0	639.8	100.0	54.6	100.0
1975	2,746.6	143.7	1,103.3	172.4	70.4	128.9
1980	3,668.5	191.9	1,495.2	233.7	70.1	128.4
Imports						
1970	None		50.0	100.0	1.5	100.0
1975			46.8	93.6	7.0	466.7
1980			85.0	170.0	36.1	2,406.6
Total Imports^a						
1970	None		50.0	100.0	45.5	100.0
1975			344.0	688.0	75.5	166.3
1980			777.4	1,554.8	113.1	293.2

^ain the case of corn, includes sufficient imports to fully support demand for feed by the expanding poultry and livestock industries.

^bIn the case of edible beans, includes beans other than frijoles, some of which are produced domestically.

is projected to increase by 1,859,000 quintals (51 percent) for rice, by 881,900 quintals (45.7 percent) for corn, and by 51,400 quintals (47 percent) for frijoles. The projected production potentials indicate that rice production will keep pace with demand, but that corn production can be expanded by only 41.3 percent and frijol production by only 14 percent over the ten years.

The home consumption of rice is projected to expand by only 157,600 quintals (9.1 percent) by 1980, while home use of corn is expected to diminish and home use of frijoles to remain virtually constant. Total home use of corn is projected to decrease by 59,500 quintals by 1980. The reduction will come in the amounts fed to poultry and livestock on the farm -- a trend which has been clearly evident over the past five years. Home consumption of corn for food is expected to increase slightly (by about one percent) over the period.

If the projections of demand, production, and home use are accurate, the off-farm marketings will increase at roughly twice the rate of expansion in production. By 1980 domestic rice marketings are projected to increase by 1,756,900 quintals (91.9 percent), corn marketings by 855,400 quintals (133.7 percent), and frijol marketings by 15,500 quintals (28.4 percent). In addition, corn imports will need to be increased by a minimum of 35,000 quintals and by as much as 727,400 quintals to fully support the potential demand of poultry and livestock feeding. Frijol imports will need to be increased by 34,600 quintals and the total consumption of other edible beans will increase by 67,700 quintals over the next ten years.

B. Projected Rice Marketing and Distribution Patterns by Province

The projected rice marketing and distribution patterns are shown by the projected supply and utilization balances by province for 1975 and 1980

in Table 5-2. The balances have been prepared from the projected production patterns from Table 4-2, the projected rice demand patterns from Table 3-3, and projected patterns in home consumption of rice. The off-farm marketings in each province are obtained by subtracting the volume of home consumption from the volume of production. The market demand in each province is the projected total demand minus the amount used for home consumption. The surplus or deficit is the difference between off-farm marketings and market demand in each province. The projected supply and utilization in Table 5-2 may be compared to the supply and utilization of rice in 1970 shown in Table 2-15.

The incremental increases in rice marketings by province compared to the 1970 levels are as follows:

<u>Province</u>	<u>1975</u>		<u>1980</u>	
	<u>1000 Quintals</u>	<u>Percent</u>	<u>1000 Quintals</u>	<u>Percent</u>
Bocas del Toro	2.3	42.6	2.3	42.6
Chiriquí	321.0	29.4	825.4	75.5
Veraguas	159.8	67.7	317.4	174.5
Herrera	35.8	102.0	55.0	156.7
Los Santos	0.0	0.0	0.0	0.0
Coclé	89.8	25.0	240.5	66.8
Panamá	109.1	226.8	127.0	264.0
Colón	26.3	224.8	34.8	297.4
Darién	90.9	101.0	154.5	171.6

Thus, the greatest absolute increases in rice marketings will be in Chiriquí, Veraguas, and Coclé, but the greatest percentage increases will be in Colón, Panamá, Darién, and Herrera. The absolute increases indicate how much additional volume the marketing system in each province must be prepared to handle. The percentage increases provide some idea of the relative improvement to the existing marketing facilities that will be needed.

TABLE 5-2. PROJECTED SUPPLY AND UTILIZATION OF RICE BY PROVINCE IN PANAMA, 1975 and 1980
(1000 Quintals, Rough Rice)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
1975										
Production	9.2	1,714.5	920.8	295.9	281.9	674.7	357.2	86.0	215.9	4,556.1
Home Consumption	<u>1.5</u>	<u>300.0</u>	<u>525.0</u>	<u>225.0</u>	<u>250.0</u>	<u>225.0</u>	<u>200.0</u>	<u>48.0</u>	<u>35.0</u>	<u>1,809.5</u>
Marketings	7.7	1,414.5	395.8	70.9	31.9	449.7	157.2	38.0	180.9	2,746.6
Market Demand	<u>122.6</u>	<u>421.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>136.6</u>	<u>1,670.4</u>	<u>365.5</u>	<u>30.5</u>	<u>2,746.6</u>
Surplus or Deficit	-114.9	993.5	395.8	70.9	31.9	313.1	-1,513.2	-327.5	150.4	0.0
1980										
Production	9.7	2,243.9	1,078.4	315.1	281.9	850.4	400.1	98.5	279.5	5,557.5
Home Consumption	<u>2.0</u>	<u>325.0</u>	<u>525.0</u>	<u>225.0</u>	<u>250.0</u>	<u>250.0</u>	<u>225.0</u>	<u>52.0</u>	<u>35.0</u>	<u>1,889.0</u>
Marketings	7.7	1,918.9	553.4	90.1	31.9	600.4	175.1	46.5	244.5	3,668.5
Market Demand	<u>143.3</u>	<u>516.8</u>	<u>0.0</u>	<u>16.0</u>	<u>0.0</u>	<u>175.3</u>	<u>2,342.9</u>	<u>436.0</u>	<u>38.2</u>	<u>3,668.5</u>
Surplus or Deficit	-135.6	1,402.1	553.4	74.1	31.9	425.1	-2,167.8	-389.5	206.3	0.0

Projected production from Table 4-2.

Projected demand from Table 3-3.

Home consumption based on 1970 patterns from Table 2-15.

The projected net surplus or deficit in the different provinces indicates the pattern of net shipments which will be required to obtain geographic balance between production and consumption. For example, shipments into Panamá and Colón will need to increase by a total of 543,800 quintals (41.9 percent) by 1975 and 1,260,400 quintals (97.2 percent) by 1980. The increased rice shipments will have to come over relatively long distances primarily from Chiriquí, Veraguas, Coclé, and Darién Provinces.

The projected net shipment patterns to balance rice supply and demand in Panama are shown graphically in Figure 5-1. The flows on the chart are drawn to scale for the 1980 shipments and may be compared to those for the existing net rice shipments (Figure 2-1). The first number in each set on the chart represents the net shipments for 1975 and the second in the set, the net shipments for 1980. Both are in units of 1000 quintals, rough rice equivalent. The diagram of projected flows serves to emphasize the magnitude of projected total shipment volume compared to that at the present and to highlight the major origins of these increased shipments. It is clear that key points requiring expansion of the existing physical distribution system will include the Panamá and Colón receiving points and the shipments points in Chiriquí, Veraguas, Coclé and Darién Provinces.

C. Projected Corn Marketing and Distribution Patterns by Province

The projected supply and utilization illustrating the 1975 and 1980 marketing and distribution patterns for corn by province are shown in Table 5-3. The figures shown reflect the projected production potentials from Table 4-3 and the projected corn demand from Table 3-3. The remainder of the table is computed in the same manner as Table 5-2 for rice, except that separate projections are made for home consumption and for on-farm utilization for feed and seed and the needed corn imports to balance projected

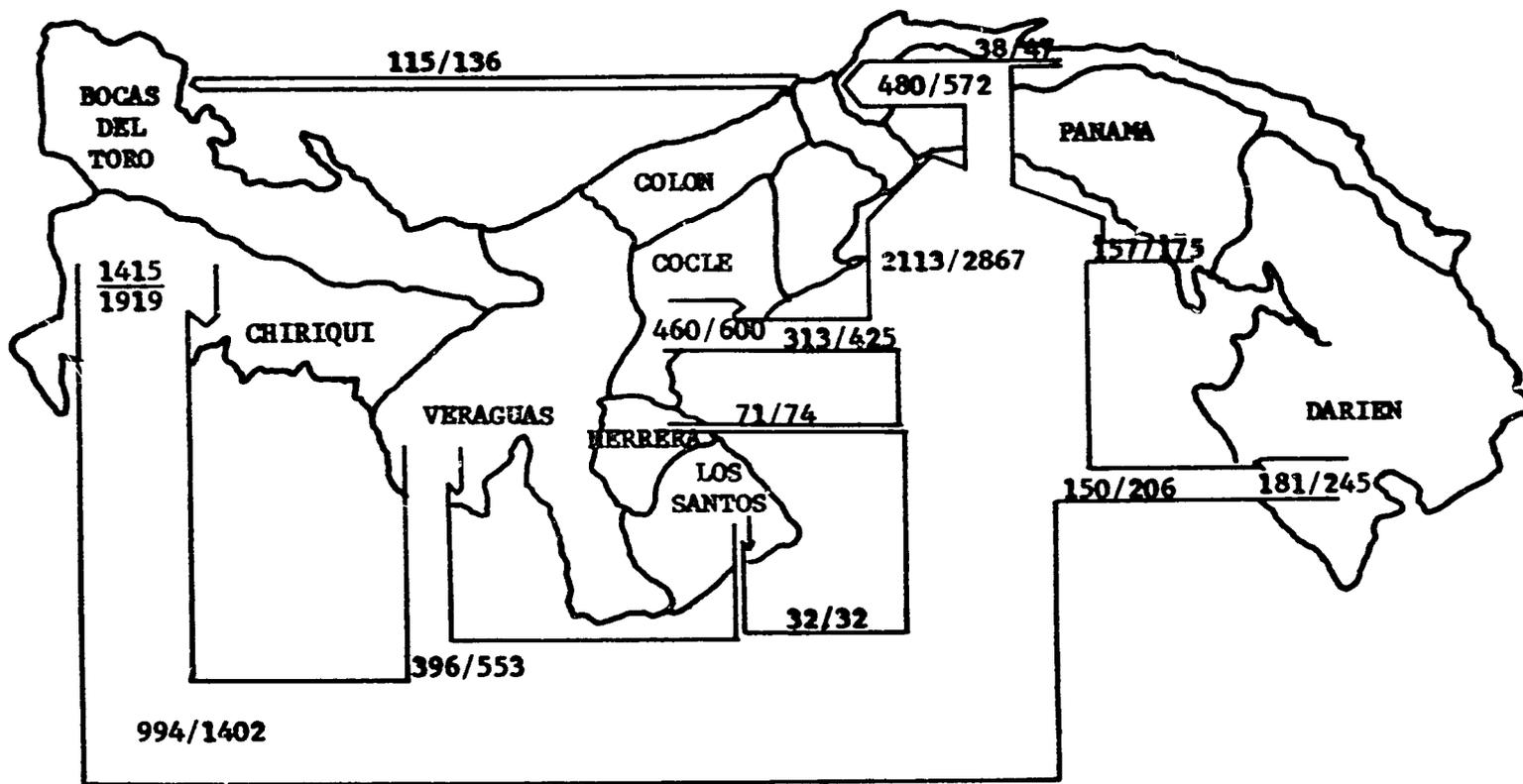


FIG. 5-1. PROJECTED NET DISTRIBUTION OF MARKET RICE IN PANAMA, 1975 and 1980.
(1000 Quintals, Paddy Equivalent)

TABLE 5-3. PROJECTED SUPPLY AND UTILIZATION OF CORN BY PROVINCE IN PANAMA, 1975 and 1980
(1000 Quintals, Shelled)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total Without Imports	Imports	Total With Imports	Imports for Poultry Feeds
1975													
Production	11.3	588.4	501.8	203.0	391.4	171.2	286.7	59.1	140.3	2,353.2			
Home Consumption	6.9	90.0	150.0	50.0	55.0	70.0	65.0	13.0	2.7	502.6			
Feed and Seed	<u>0.7</u>	<u>160.0</u>	<u>130.0</u>	<u>85.0</u>	<u>240.0</u>	<u>35.0</u>	<u>75.0</u>	<u>20.0</u>	<u>1.6</u>	<u>747.3</u>			
Marketings	3.7	338.4	221.8	68.0	96.4	66.2	146.7	26.1	136.0	1,103.3	46.8	1,150.1	297.2
Market Demand	<u>38.5</u>	<u>173.9</u>	<u>12.0</u>	<u>28.2</u>	<u>17.2</u>	<u>62.4</u>	<u>658.2</u>	<u>138.4</u>	<u>21.3</u>	<u>1,150.1</u>		<u>1,150.1</u>	
Surplus or Deficit	-34.8	164.5	209.8	39.8	79.2	3.8	-511.5	-112.3	114.7	-46.8	46.8	0.0	
1980													
Production	12.7	676.0	579.2	216.3	433.2	220.0	349.6	65.4	172.6	2,725.0			
Home Consumption	6.9	90.0	150.0	50.0	55.0	70.0	70.0	13.0	2.7	507.6			
Feed and Seed	<u>0.7</u>	<u>150.0</u>	<u>130.0</u>	<u>85.0</u>	<u>240.0</u>	<u>35.0</u>	<u>60.0</u>	<u>20.0</u>	<u>1.5</u>	<u>722.2</u>			
Marketings	5.1	436.0	299.2	81.3	138.2	115.0	219.6	32.4	168.4	1,495.2	85.0	1,580.2	692.4
Market Demand	<u>48.2</u>	<u>229.4</u>	<u>37.7</u>	<u>41.4</u>	<u>23.9</u>	<u>91.4</u>	<u>910.9</u>	<u>172.2</u>	<u>25.1</u>	<u>1,580.2</u>		<u>1,580.2</u>	
Surplus or Deficit	-43.1	206.6	261.5	39.9	114.3	23.6	-691.3	-139.8	143.3	-85.0	85.0	0.0	

Projected production from Table 4-3.

Projected demand from Table 3-3.

On-farm uses for family consumption and feed and seed based on 1970 patterns from Table 2-15.

production and consumption also are included. The projected patterns for 1975 and 1980 may be compared to the 1970 patterns for corn shown in Table 2-15.

The incremental increases in projected corn marketings compared to the 1970 levels are as follows:

<u>Province</u>	<u>1975</u>		<u>1980</u>	
	<u>1000 Quintals</u>	<u>Percent</u>	<u>1000 Quintals</u>	<u>Percent</u>
Bocas del Toro	1.7	85.0	3.1	155.0
Chiriquí	131.4	63.5	229.0	110.6
Veraguas	66.9	43.2	144.3	93.2
Herrera	2.1	3.2	15.4	23.4
Los Santos	51.5	114.7	93.3	207.8
Coclé	54.4	461.0	103.2	874.6
Panamá	92.4	170.2	165.3	304.4
Colón	10.6	68.4	16.9	109.0
Darién	52.5	62.9	84.9	101.7
Minimum Imports	-3.2	-6.4	35.0	70.0
Total Imports	294.0	588.0	727.4	1,454.8

Significant increases in corn marketings are projected to occur in all provinces except Bocas del Toro, Herrera, and Colón. The largest absolute increase will be in Chiriquí, but the largest percentage increases will be in the central provinces of Coclé, Panamá, and Los Santos where the greatest potential exists for increased plantings of corn.

The projected provincial net surplus or deficits for corn indicate that the total deficit in Panamá and Colón will increase over the 1970 level by 177,300 quintals (39.7 percent) in 1975 and by 384,600 quintals (86.1 percent) in 1980. If the full potential demand by poultry and livestock feeding is included, the total increase in deficit in these provinces rises to 474,500 quintals in 1975 and 1,077,000 quintals in 1980. The major domestic sources of additional surplus corn to supply the increasing deficits are Veraguas,

Chiriquí, and Darién Provinces. However, if the corn production potentials are realized, the closer provinces of Coclé and Los Santos will have increasing corn surpluses for shipment to the deficit areas in the center of the country.

The projected net shipment patterns to obtain geographic supply-demand balance of corn for 1975 and 1980 are shown graphically in Figure 5-2. The flows are drawn to scale for the projected 1980 shipments and may be compared directly with those for 1970 shown in Figure 2-2. Both 1975 and 1980 flows are indicated by the pairs of numbers on the chart. The import figures shown include imports to supply the total potential demand for poultry and live-stock feeding (see Table 5-3). The flows indicate increasing stress on the receiving facilities in the Panamá area but relatively even distribution of the increased out-shipments among the facilities in other provinces.

D. Projected Frijol Marketing and Distribution Patterns by Province

The projected supply and utilization of frijoles illustrating the 1975 and 1980 marketing and distribution patterns for these edible beans by province are shown in Table 5-4. The balances by province do not reflect production or demand for porotos and other edible beans for which basic figures are not reported. The total projected demand for all edible beans other than frijoles is shown by the figures in the last column of the table. Otherwise, the construction of Table 5-4 is the same as that of Table 5-2.

The incremental increases in frijol marketings compared to the 1970 levels are as shown in the table on Page 100. The major shifts of importance in the projected marketings of frijoles are the declining marketings in Chiriquí Province as farmers there continue to reduce plantings and the increased marketings in Veraguas and Coclé Province.

<u>Province</u>	<u>1975</u>		<u>1980</u>	
	<u>1000 Quintals</u>	<u>Percent</u>	<u>1000 Quintals</u>	<u>Percent</u>
Bocas del Toro	0.0	0.0	0.0	0.0
Chiriquí	- 5.1	-25.5	-9.5	-47.5
Veraguas	18.1	81.9	21.5	97.3
Herrera	0.0	0.0	0.0	0.0
Los Santos	0.0	0.0	0.0	0.0
Coclé	2.0	60.6	2.1	63.6
Panamá	0.1	3.8	0.5	19.2
Colón	0.3	60.0	0.5	100.0
Darién	0.0	0.0	0.0	0.0

The projected surplus or deficit balances indicate that Panamá and Colón will continue to represent the major deficit areas for edible beans and will require foreign imports in order to meet market demands. Chiriquí and Herrera Provinces will still have small market surpluses in 1975 but will incur small market deficits by 1980. The total changes in net shipment patterns for edible beans involve relatively small volumes and should cause little or no stress to the existing marketing system. If improvements are needed at any point in the marketing system to meet the changing patterns, it will be at distribution points in the Panamá area and perhaps at shipping points in Veraguas Province.

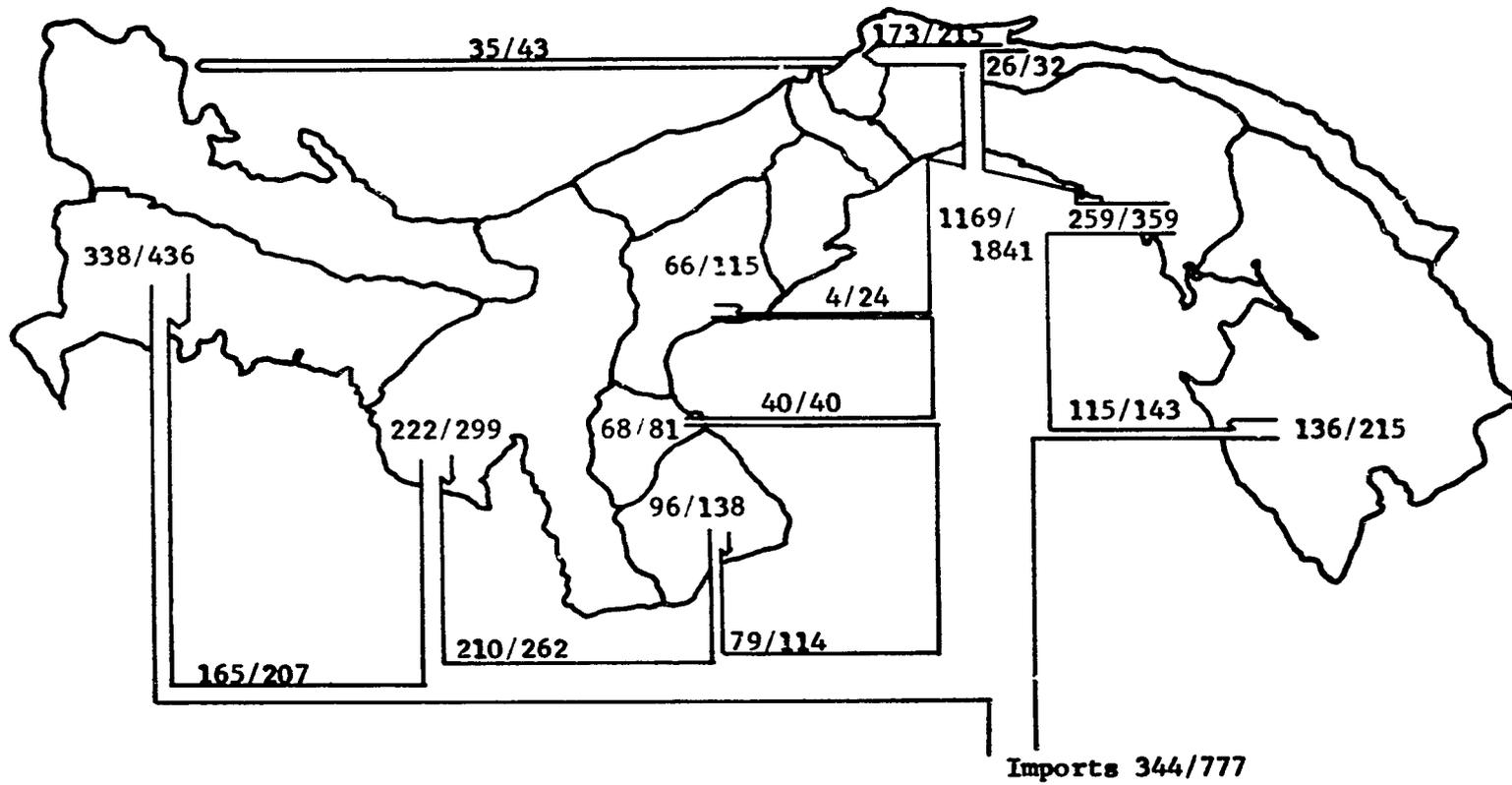


FIG. 5-2. PROJECTED NET DISTRIBUTION OF CORN IN PANAMA, 1975 and 1980.
(1000 Quintals, Shelled)

TABLE 5-4. PROJECTED SUPPLY AND UTILIZATION OF EDIBLE BEANS (FRIJOLES) BY PROVINCE IN PANAMA, 1975 and 1980
(1000 Quintals)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total Without Imports	Imports	Total With Imports	Other Edible Beans
<u>1975</u>													
Production	0.5	24.9	56.7	6.5	7.2	9.8	12.0	2.8	4.3	124.7			
Home Consumption	<u>0.1</u>	<u>10.0</u>	<u>16.5</u>	<u>5.5</u>	<u>5.4</u>	<u>4.5</u>	<u>9.3</u>	<u>2.0</u>	<u>1.0</u>	<u>54.3</u>			
Marketings	0.4	14.9	40.2	1.0	1.8	5.3	2.7	0.8	3.3	70.4	7.0	77.4	
Market Demand	<u>3.5</u>	<u>11.0</u>	<u>0.0</u>	<u>0.7</u>	<u>0.4</u>	<u>6.1</u>	<u>44.7</u>	<u>10.1</u>	<u>0.9</u>	<u>77.4</u>		<u>77.4</u>	<u>68.5</u>
Surplus or Deficit													
Deficit	-3.1	3.9	40.2	0.3	1.4	-0.8	-42.0	-9.3	2.4	-7.0	7.0	0.0	
<u>1980</u>													
Production	0.5	20.0	60.1	6.5	7.2	10.4	12.4	3.1	4.3	124.5			
Home Consumption	<u>0.1</u>	<u>9.5</u>	<u>16.5</u>	<u>5.5</u>	<u>5.4</u>	<u>5.0</u>	<u>9.3</u>	<u>2.1</u>	<u>1.0</u>	<u>54.4</u>			
Marketings	0.4	10.5	43.6	1.0	1.8	5.4	3.1	1.0	3.3	70.1	36.1	106.2	77.0
Market Demand	<u>4.1</u>	<u>15.1</u>	<u>0.0</u>	<u>1.5</u>	<u>0.7</u>	<u>7.4</u>	<u>64.1</u>	<u>12.2</u>	<u>1.1</u>	<u>106.2</u>		<u>106.2</u>	
Surplus or													
Deficit	-3.7	-4.6	43.6	-0.5	1.1	-2.0	-61.0	-11.2	2.2	-36.1	36.1	0.0	

Projected production from Table 4-4.

Projected demand from Table 3-3, except includes frijoles only -- not porotos and other edible beans

Home consumption based on 1970 patterns from Table 2-15.

CHAPTER VI

NEEDS FOR EXPANDED MARKETING FACILITIES

The needs for expanded marketing facilities in Panama over the next ten years are the direct outgrowth of the projected increases in the volumes of production and consumption. Some of the existing facilities need to be remodeled and up-dated, but much of this can be accomplished in the process of adding to the existing capacity. The needs for expansion and up-dating of the grain marketing facilities vary considerably from one province to another, both in terms of magnitude and in terms of the kinds of facilities needed for meeting the projected requirements.

The basis for projecting the requirements for marketing facilities is indicated by the summary of projected grain marketings and shipments by province shown in Table 6-1. The figures in the table are taken from Tables 2-15, 5-2, 5-3 and 5-4. They show the indicated total marketings and shipments of all three grains for 1970, 1975, and 1980. The marketings and shipments of rice are in rough rice equivalent; those of corn and edible beans are on a shelled basis.

The indicated marketing volumes in Section A of the table represent the projected total off-farm sales of grain produced in each province. For the country as a whole, marketings of the three grains are projected to reach 3,920,300 quintals (an increase of 50 percent) by 1975 and to reach 5,233,800 quintals (an increase of 100 percent) by 1980. Most of the increase in marketings over the ten-year period will occur in Chiriquí (1,044,900 quintals), Veraguas (483,200 quintals), Coclé (345,800 quintals), Panamá (292,800 quintals) and Darien (239,400 quintals).

The indicated shipments in Section B of Table 6-1 represent the projected net total annual volume of grain to be transported from the province to other

TABLE 6-1. SUMMARY OF PROJECTED GRAIN MARKETINGS AND SHIPMENTS BY PROVINCE IN PANAMA, 1970, 1975, and 1980.
(1000 Quintals)

	Focas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
A. Marketings										
1. 1970										
a. Rice	5.4	1,093.5	236.0	35.1	31.9	359.9	48.1	11.7	90.0	1,911.6
b. Corn	2.0	207.0	154.9	65.9	44.9	11.8	54.3	15.5	83.5	639.8
c. Beans	0.3	20.0	22.1	1.0	1.8	3.3	2.6	0.5	3.3	54.9
d. Total	7.7	1,320.5	413.0	102.0	78.6	375.0	105.0	27.7	176.8	2,606.3
2. 1975										
a. Rice	7.7	1,414.5	395.8	70.9	31.9	449.7	157.2	38.0	180.9	2,746.6
b. Corn	3.7	338.4	221.8	68.0	96.4	66.2	146.7	26.1	136.0	1,103.3
c. Beans	0.4	14.9	40.2	1.0	1.8	5.3	2.7	0.8	3.3	70.4
d. Total	11.8	1,767.8	657.8	139.9	130.1	521.2	306.6	64.9	320.2	3,920.3
3. 1980										
a. Rice	7.7	1,918.9	553.4	90.1	31.9	600.4	175.1	46.5	244.5	3,668.5
b. Corn	5.1	436.0	299.2	81.3	138.2	115.0	219.6	32.4	168.4	1,495.2
c. Beans	0.4	10.5	43.6	1.0	1.8	5.4	3.1	1.0	3.3	70.1
d. Total	13.2	2,365.4	896.2	172.4	171.9	720.8	397.8	79.9	416.2	5,233.8
B. Shipments										
1. 1970										
a. Rice	-97.4	765.2	236.0	35.1	31.9	258.6	-1,010.4	-286.5	67.5	0.0
b. Corn	-23.7	114.2	154.9	54.2	41.3	-12.6	- 368.2	- 78.3	68.2	-50.0
c. Beans	- 3.0	13.2	22.1	1.0	1.8	- 1.6	- 28.3	- 7.8	2.6	0.0
d. Total	-124.1	892.6	413.0	90.3	75.0	258.6/-14.2	-1,406.9	-372.6	138.3	-50.0
2. 1975										
a. Rice	-114.9	993.5	395.8	70.9	31.9	313.1	-1,513.2	-327.5	150.4	0.0
b. Corn	- 34.8	164.5	209.8	39.8	79.2	3.8	- 511.5	-112.3	114.7	-46.8
c. Beans	- 3.1	3.9	40.2	0.3	1.4	- 0.8	- 42.0	- 9.3	2.4	- 7.0
d. Total	-152.8	1,161.9	645.8	111.0	112.5	316.9/-0.8	-2,066.7	-449.1	267.5	-53.8
3. 1980										
a. Rice	-135.6	1,402.1	553.4	74.1	31.9	425.1	-2,167.8	-389.5	206.3	0.0
b. Corn	- 43.1	206.6	261.5	39.9	114.3	23.6	- 691.3	-139.8	143.3	-85.0
c. Beans	- 3.7	-4.6	43.6	-0.5	1.1	-2.0	- 61.0	- 11.2	2.2	-36.1
d. Total	-182.4	1,608.7/-4.6	858.5	114.0/-0.5	147.3	448.7/-2.0	-2,920.1	-540.5	351.8	-121.1

areas or from other areas to the province. Except for imports, the total provincial out-shipments and in-shipments cancel out for the country as a whole, so the totals are zero. Provinces with major increases in projected out-bound shipments over the next ten years include Chiriquí (716,100 quintals), Veraguas (445,500 quintals), Darién (213,500 quintals) and Coclé (190,100 quintals). Those with major increases in projected in-bound shipments include Panamá (1,513,200 quintals), Colón (167,900 quintals), and Bocas del Toro (58,300 quintals).

A. Need for Additional Storage Facilities

The need for additional grain storage capacity depends to a large degree upon the average total storage turnover rate that can be expected in the future. The total turnover depends upon harvesting patterns, the year-end carryover, and the number of different facilities within the total system through which the same grain moves on its way to the ultimate consumer. It also depends upon the effectiveness with which the various storage facilities in the system can be utilized. For example, if Government storage facilities are utilized only for grain delivered under the price support program, the average total utilization will be relatively low in years when market prices to farmers remain above support prices. However, if the Government facilities can be leased to private handlers when not needed for receiving grain delivered under the support program, the average total utilization of storage capacity will be relatively high.

1. Existing and Projected Turnover Rates

The total grain storage capacity and the average total storage turnover by province in 1969-1970 are summarized in Table 6-2. The existing storage capacities are taken from Tables 2-16 and 2-17, except that in Bocas del Toro

TABLE 6-2. GRAIN STORAGE CAPACITY AND TURNOVER BY PROVINCE IN PANAMA, 1969-1970

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Country Total
A. Storage Capacity (i000 Quintals)										
1. Private										
a. Country		65.8	60.0	57.0	26.0	8.0	32.0		10.0	258.8
b. Terminal		545.0	320.0			285.0	100.0			1,250.0
c. Distribution	1.5						45.0			46.5
d. Total	1.5	610.8	380.0	57.0	26.0	293.0	177.0		10.0	1,555.3
2. Government										
a. Country		5.0							5.0	10.0
b. Terminal		100.0	10.4			85.0	30.0			225.4
c. Distribution	1.0						85.0			86.0
d. Total	1.0	105.0	10.4			85.0	115.0		5.0	321.4
3. Combined										
a. Country		70.8	60.0	57.0	26.0	8.0	32.0		15.0	268.8
b. Terminal		645.0	330.4			370.0	130.0			1,475.4
c. Distribution	2.5						130.0			132.5
d. Total	2.5	715.8	390.4	57.0	26.0	378.0	292.0		15.0	1,876.7
B. Storage Turnover 1969-1970										
1. Private										
a. Country plus terminal		2.16	1.09	1.79	3.02	1.28	2.05		3.85	1.73
b. Distribution	60.0						29.46			30.44
2. Combined										
a. Country plus terminal		1.84	1.06	1.79	3.02	0.99	1.67		2.69	1.49
b. Distribution	36.0						10.20			10.68

Volume base used to compute turnover in Panamá includes marketings in Colón plus out-shipments from Darién.
Volume base used to compute turnover in Darién includes marketings for local consumption only.

and Panamá some of the storage structures are classified as distribution facilities rather than as country or terminal facilities. These are facilities used for distribution of milled rice and other grain products to wholesalers and retailers in consumption areas. All of the storage capacity in Bocas del Toro is listed in this classification. A total of 45,000 quintals of private storage and 85,000 quintals of Government storage in Panamá is included in the classification of distribution facilities.

The turnover figures shown in Section B of Table 6-2 are computed on two bases. The first is computed on the basis of the private storage capacity only, assuming that all Government storage is held in standby. The second is on the basis of private plus Government storage capacity, assuming that both are fully utilized. The actual turnover in 1969-1970 is somewhere between these two sets of figures because some of the Government capacity was almost fully utilized and some was used very little because little or no grain in the area was delivered under the price support program.

The average storage turnover of private country and terminal storage capacity for the country as a whole in 1969-1970 was 1.73 (2,606,300 quintals marketed from Table 6-1 divided by 1,508,800 quintals of capacity from Table 6-2). The average total turnover of the combined country and terminal storage capacity, including Government facilities, was 1.49 (2,606,300 quintals marketed divided by 1,744,200 quintals capacity). The average total turnover of the storage capacity in distribution facilities was much higher -- 30.44 for the private storage and 10.68 for the combined facilities.¹ These differences in turnover rate are understandable because the function of distribution

¹Inshipments for distribution equal milled rice $\sqrt{(97,400 + 1,010,400 + 286,500)} \times .65 = 906,300$ quintals plus corn $(23,700 + 368,200 + 78,300 = 470,200$ quintals) plus beans $(3,000 + 28,300 + 7,800 = 39,100$ quintals) for a total of 1,415,600 quintals (Table 6-1). Inshipments divided by distribution capacity equal $1,415,600 \div 46,500 = 30.44$ and $7,415,600 \div 132,500 = 10.68$.

facilities is quite different from that of country and terminal facilities. The latter must receive grain as it is marketed seasonally and hold it for processing and marketing throughout the year. The distribution facilities receive grain from the terminal facilities (or from import) throughout the year and market to channels serving final consumers. Capacity is required only for a specified number of days' supply of the grain. The annual turnover of 30.44 corresponds to about 12 days' supply ($365 \div 30.44$) and that of 10.68 to about 34 days' supply ($365 \div 10.68$).

It is believed that if the storage facilities are properly located and effectively utilized, turnover rates with the increased marketing volumes of the future can be slightly higher than those achieved in 1969-1970. In the case of the distribution facilities, it is believed that 30 days' supply in the consumption centers is adequate to insure orderly marketings; therefore, an annual turnover of 12.0 is used as the standard. In the case of grain storage facilities at processing and shipment points, including both country and terminal facilities, an average total annual turnover of about 2.0 is indicated for an orderly marketing system. Individual marketing units should be able to achieve a turnover of 2.5 for rice storage and 4.0 for corn storage (see Tables 6-8 and 6-9). However, the aggregate annual average turnover as calculated in Section B of Table 6-2 will not be as high as the turnover for individual units because some of the grain will move through two or more facilities within the marketing system (e.g., from a country storage unit to a terminal storage unit).

2. Additional Storage Capacity Needed

The projected grain storage capacity requirements for 1975 and 1980 are shown in Table 6-3. The requirements for country and terminal storage capacity shown in Section A are based on an aggregate annual turnover of

TABLE 6-3. PROJECTED GRAIN STORAGE CAPACITY REQUIREMENTS BY PROVINCE IN PANAMA, 1975 and 1980
(1000 Quintals)

Category and Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. Country and Terminal Capacity (Annual Turnover of 2.0)										
1. 1975										
a. Rice Capacity	3.9	707.3	197.9	35.5	16.0	224.9	78.6	19.0	90.5	
b. Corn Capacity	1.8	169.2	110.9	34.0	48.2	33.1	73.4	13.2	68.0	
c. Bean Capacity	0.2	7.4	20.1	0.5	0.9	2.6	1.3	0.4	1.6	
d. Total Capacity	5.9	883.9	328.9	70.0	65.1	260.6	153.3	32.6	160.1	1,960.4
e. Additional Capacity	5.9	273.1	0.0	13.0	39.1	0.0	21.3	32.6	150.1	535.1
f. Additional with IFE @80%	5.9	189.1	0.0	13.0	39.1	0.0	0.0	32.6	146.1	425.8
2. 1980										
a. Rice Capacity	3.9	959.5	276.7	45.1	16.0	300.2	87.6	23.3	122.3	
b. Corn Capacity	2.5	218.0	149.6	40.6	69.1	57.5	109.8	16.2	84.2	
c. Bean Capacity	0.2	5.2	21.8	0.5	0.9	2.7	1.5	0.5	1.6	
d. Total Capacity	6.6	1,182.7	448.1	86.2	86.0	360.4	198.9	40.0	208.1	2,617.0
e. Additional Capacity	6.6	571.9	68.1	29.2	60.0	67.4	66.9	40.0	198.1	1,108.2
f. Additional with IFE @80%	6.6	487.9	59.8	29.2	60.0	0.0	42.9	40.0	194.1	920.5
B. Distribution Capacity (Annual Turnover of 12.0)										
1. 1975										
a. Rice Capacity	6.3						82.0	17.7		
b. Corn Capacity	3.0						42.6	9.3		
c. Bean Capacity	0.3						3.5	0.8		
d. Total Capacity	9.6						128.1	27.8		165.5
e. Additional Capacity	8.1						83.1	27.8		119.0
f. Additional with IFE @80%	7.1						32.1 ^a	27.8		67.0
2. 1980										
a. Rice Capacity	7.3						117.5	21.2		
b. Corn Capacity	3.6						57.6	11.7		
c. Bean Capacity	0.3						5.1	0.9		
d. Total Capacity	11.2						180.2	33.8		225.2
e. Additional Capacity	9.7						135.2	33.8		178.7
f. Additional with IFE @80%	8.7						84.2 ^a	33.8		126.7

^a IFE Capacity @60%

2.0. The requirements for distribution capacity shown in Section B are based on an aggregate annual turnover of 12.0. Using these rates of turnover, the requirements for country and terminal storage are based upon the projected marketing volumes from Section A of Table 6-1 and the requirements for distribution capacity are based upon the projected inbound shipments from Section B of Table 6-1. Separate storage capacities are shown for rice, corn, and edible beans, and these are added for the total requirements shown on lines "d" of Table 6-3. The additional capacity shown on lines "e" is obtained by subtracting the existing private storage capacity (Section A-1 of Table 6-2). The additional requirement assuming that 80 percent of the existing storage capacity operated by IFE will be available is shown on lines "f" of Table 6-3. The rice storage capacity in Section A of the table is based on rough rice; that in Section B is based on milled rice.

The additional storage capacity requirements shown on lines "f" are realistic if plans are developed to separate the utilization of the Government-owned facilities from the volume of grain delivered under the price support program. This could be done by leasing 80 percent of the capacity of given Government-owned facilities to private millers or handlers in years when it is not needed for handling grain delivered under the price support program.² It is believed that 80 percent rather than 100 percent of the capacity should be leased in this way in order to save some standby capacity should market prices drop to support levels later in the season. The leasing of the Government-owned facilities would be on a year-to-year basis, so that only capacity not needed for the Government price support program would be

²The reverse also is practical. IFE could lease privately owned facilities in years when a large volume of delivery under the price support program requires capacity beyond that of the Government-owned facilities.

leased in a given year. The entire available space and related milling, cleaning, and drying facilities might be leased to a given private organization, or sections of the available capacity in a given Government facility might be leased to two or more competing private millers and handlers.

The net result of such a program will be to increase the utilization of total storage capacity in the country and reduce the required investment in additional storage facilities to meet expanding requirements. For example, without such a program another 273,100 quintals of storage capacity will be needed in Chiriquí for use in 1975; with such a program the additional capacity needed is only 189,100 quintals. In Coclé Province no additional capacity will be needed if the leasing program is put into effect, but 67,400 quintals of capacity will be required by 1980 in the absence of such a program. These differences will mean substantial savings in capital cost and increased operating efficiency for the marketing system as a whole without sacrifice of the production incentive and price floor benefits of the price support program.

The total additional country and terminal grain storage capacity needed by 1975 is 535,100 quintals without the leasing program and 425,800 quintals with the leasing program. Most of the added storage for 1975 is in Chiriquí and Darién Provinces; no additional capacity will be needed by that date in Veraguas, Coclé, nor Panamá; less than 50,000 quintals will be needed in Bocas del Toro, Herrera, Los Santos, and Colón. In the case of Darién, the assumption is that the highway is to be completed so that cleaning, drying, storage, and milling can be done locally rather than shipping the rough rice as it comes from the farms to Panamá for processing and storage. If the highway is not completed, much of the additional capacity indicated for Darién Province will need to be located in Panamá instead.

The major additional increase in country and terminal storage needed by 1980 is in Chiriquí Province -- about 300,000 quintals of the 500,000 quintals for the country as a whole. The remaining additional requirement by that date is divided among the remaining provinces except Coclé, where the existing capacity is adequate to meet projected requirements through 1980.

The needed additional storage capacity for distribution facilities, assuming that the leasing policy is implemented, is 67,000 quintals by 1975 and another 59,700 quintals by 1980 (Section B, Table 6-3). The additional facilities are needed to serve the expanding consumer demand in the cities of Panamá, Colón, and Bocas del Toro. In the calculation of the additional distribution storage capacity for Panamá, 60 percent rather than 80 percent of the IFE elevator is considered available for leasing in years when take-over under the price support program is limited. The other 20 percent of this facility is needed for handling imported wheat and other grains not included in this study.

The possible additional imports of corn and other feed grains to provide full support to the growing demand for poultry and livestock products (Table 4-3) and imports of other kinds of edible beans (Table 4-4) are not reflected in the requirements for storage facilities shown in Table 6-3. Using an annual turnover of 12, such imports would add 30,500 quintals of storage capacity for Panamá in 1975 and raise the additional storage capacity requirement for the country as a whole to 523,300 quintals by 1975 and another 557,500 quintals by 1980.

3. Recommended Types of Additional Storage Facilities

The type, number, and size of the additional storage facilities for an improved total marketing system vary by province. The best configuration

for each province depends upon such factors as (1) the existing facilities, (2) the total additional capacity needed to meet projected requirements, (3) the relative mix of rice, corn, and beans in determining the projected requirements, (4) the average size and type of grain producers in the area, (5) the adequacy of farm-to-market roads, and (6) the ultimate destination of the grain marketed in the area. In view of these factors and the vastly differing conditions in the different provinces, the types of facilities to provide the additional storage capacity can best be presented province by province.

(1) Bocas del Toro. The needs in Bocas del Toro are for small country storage units to serve the producing areas and for expanded distribution facilities in the city of Bocas del Toro to handle shipped-in grain. The projected additional volumes and storage capacities are relatively small in both cases, so simple low-cost structures are needed.

Rice is dominant in determining the storage requirements, so the country storage units should be incorporated with small rice mills and supporting cleaning and drying equipment. These country units should be flat storage structures for receiving and handling grain in sacks. Although they will be small and therefore more costly per quintal, it is believed that three such units will be needed to serve the different production areas.

The distribution units can be small standard warehouses for handling bagged rice, corn, and beans by hand. Perhaps one unit of 4,000 to 5,000 quintals and three smaller units of 1,000 to 1,500 quintals will represent the best type of configuration to serve the city of Bocas del Toro.

(2) Chiriquí. This area is characterized by relatively large mechanized farms and rapidly expanding surplus production of rice. There are a number of mills in the area, all of which have facilities for storage of both rough rice and milled rice, and for drying and cleaning the grain. Farm-to-market roads are adequate, and marketing costs can be reduced by converting from sack to bulk handling directly from the farm. Bulk handling of rice already is working effectively in the Penonomé area of Coclé Province. It is recommended that silo storage be installed to meet the projected requirements at both country and terminal locations in Chiriquí Province. It also is recommended that the terminal facilities be designed for handling milled rice and cleaned and dried corn on pallets or belt conveyors for efficient loading to trucks for the outbound shipments. Approximately four additional country facilities and five additional terminal facilities will be needed by 1980. Some or all of these may represent remodeling of and additions to existing rice mills in the area.

(3) Veraguas. This is a long-established grain production area characterized by many small non-mechanized farms. The small volumes and additional middlemen mean high marketing costs. Additional country storage and milling facilities are needed for direct access by a larger portion of the producers. However, production is expanding more slowly than in many other areas and no additional storage capacity is needed in 1975. By 1980 six additional country facilities of 5,000 quintals of flat storage capacity and accompanying milling, drying, and cleaning equipment are recommended at locations accessible to producers. In addition, one 30,000-quintal silo storage facility will be needed in Santiago or Soná. This facility probably will continue to receive most

of the grain in sacks but should be equipped for efficient loading of both milled rice and bulk corn for outbound shipment. The existing terminal facilities in the province also should have efficient loading for the outbound shipments. All of the added facilities should be equipped for efficient handling of corn as well as rice.

(4) Herrera. Marketing conditions here are somewhat similar to those of Veraguas Province, but the turnover of existing storage capacity is higher (Table 6-2) and additional facilities will be needed by 1975 as well as by 1980. The projected marketings of rice and corn are nearly equal, so facilities need to be designed for handling both. A total of 30,000 quintals of additional space will be needed by 1980. Most of this probably can be provided by flat storage additions to existing facilities -- say 5,000-quintal additions to each of six existing units.

(5) Los Santos. The existing grain storage space in Los Santos Province is limited; and corn production, marketings, and outshipments are projected to expand significantly over the next ten years. As many as six additional country handling facilities, each with 10,000 quintals of flat storage, will be needed by 1980. If the corn production becomes sufficiently concentrated within the province, the alternative of one or two larger units with silo storage for bulk handling of corn may be more efficient than the six smaller units.

(6) Coclé. The grain marketing facilities in Coclé Province already are quite well developed. The silo storage of one of the large rice millers in Penonomé represents the largest facility of this kind in the country. It is being utilized quite effectively with bulk handling direct from the farm. The problem is that production in the area has not expanded as rapidly as anticipated and total storage capacity is

somewhat over-built for the present levels of marketing. This will take care of itself through time if no major additional storage facilities are constructed between now and 1980. Effort in the province should be toward maintaining and improving existing storage and marketing facilities rather than adding to existing capacities.

(7) Panama. The expanding production of rice and corn in this province coupled with the rapidly increasing demand in the area create the need for expanded country facilities, terminal facilities, and distribution facilities. By 1980 additional country facilities will be needed at some of the outlying towns close to the production areas. Three 10,000-quintal flat storage units for receiving corn and rice in sacks are suggested. The additional distribution warehouse capacity needed will reach 84,000 quintals by 1980. It is recommended that these be modern dock-height warehouses with facilities for efficient handling of packaged grain products with belt conveyors or on pallets.

The terminal grain handling facilities that will be needed depend upon how much corn imports will be expanded to serve the feeding industry and whether or not the road to Darien will be completed. If corn imports are not expanded and if storage and processing are developed in Darien, no additional terminal space will be required in Panama. If corn imports are expanded, 80,000 quintals of additional grain elevator capacity will be needed by 1980. If facilities are not developed in Darien, another 130,000 quintals of capacity will be needed.

The type of terminal facilities needed will depend upon the capacity and handling volume decided upon. The existing IFE elevator has 80,000 quintals of silo capacity and limited room for expansion. There are no facilities for ship receiving, so imported grain

must be received in Balboa and transferred through the Canal Zone to the IFE facility. If the full 210,000 quintals of additional terminal capacity will be needed in Panama, a new port receiving elevator may be justified. The port at Panamá is shallow and construction of docks and marine unloading and conveying equipment would be expensive. However, such a facility could be used for receiving imported wheat to support Panama's flour milling industry as well as for receiving corn, rice, and edible beans, so the annual savings might justify the construction cost. A specific feasibility study of the alternatives should be made if corn import policies and policies with respect to shipments from Darién justify the greater elevator storage capacity in Panamá.

(8) Colón. There are no grain storage facilities reported at market points in Colón Province at present. Two types of facilities will be needed to handle the projected market volumes in 1975 and 1980. Country facilities will be needed to serve the expanded marketings of rice and corn in the production areas -- possibly four units with about 10,000 quintals of flat storage capacity each by 1980.

Distribution units for handling packaged rice, corn, and beans represent the other type of facilities needed in Colón. These should be similar in design to those recommended for Panamá, but of smaller capacity. Perhaps three units of about 11,000 quintals storage capacity each will meet the projected needs most effectively.

(9) Darién. Darién Province has far greater long-run potential for expanded grain production than any of the other provinces (Table 4-17). Much of the land is yet undeveloped, but this will change rapidly once the highway into the area is completed.

The present marketing facilities in the area are quite limited and most of the grain is transported by coastal ship to Panama for milling and processing. This system will have to be maintained until a good road into the area is developed. However, once highway transport becomes available, it will be much more efficient to clean, dry, and store the grain as well as mill the rice in the province, much as is now done in Chiriqui. If highway transport becomes available, terminal marketing facilities will be needed in the La Palma-Darien area, with grain storage capacity of 100,000 quintals by 1975 and another 30,000 quintals by 1980. These facilities should include silo capacity for grain storage and efficient warehouse space for packaged grain products. As has been pointed out, if the highway is not to be available until after 1980, these terminal facilities will need to be located in Panama instead.

In either case, additional country storage facilities are needed in Darien Province. In the immediate future these should be flat storage structures for receiving in sacks -- perhaps with about 10,000 quintals of storage each. Four such units will be needed by 1975 and two more will be needed by 1980. Provision should be made for adding silo storage to these units at a later date because once the area really starts to develop, it will be much like Chiriqui Province and bulk handling of grain from the farm will be more efficient than handling the sacks.

The recommended additions to the existing grain storage capacity by province for 1975 and 1980 are summarized in Table 6-4. In terms of scheduling, the recommended additions need to be operational for the 1974-1975 and 1979-1980 marketing years, so construction will need to be started about a year earlier in each case. Furthermore, the expansion needs to be on a somewhat

TABLE 6-4. SUMMARY OF RECOMMENDED ADDITIONAL GRAIN STORAGE FACILITIES
IN PANAMA, 1975 and 1980.

Province	Country Facilities				Terminal Facilities				Distribution Facilities			
	No.	Major Grain	Type	Capacity (1000 qq)	No.	Major Grain	Type	Capacity (1000 qq)	No.	Major Grain	Type	Capacity (1000 qq)
<u>Bocas del Toro</u>												
1975	2	Rice	Flat	6.0					3	Rice	Bag	8.0
1980	1	Rice	Flat	1.0					1	Rice	Bag	1.0
Total	3			7.0					4			9.0
<u>Chiriquí</u>												
1975	2	Rice	Silo	40.0	2	Rice	Silo Pallet	150.0				
1980	2	Rice	Silo	50.0	3	Rice	Silo Pallet	250.0				
Total	4			90.0	5			400.0				
<u>Veraguas</u>												
1975				0.0				0.0				
1980	6	Rice/corn	Flat	30.0	1	Rice	Silo Pallet	30.0				
Total	6			30.0	1			30.0				
<u>Herrera</u>												
1975	3	Rice/corn	Flat	15.0								
1980	3	Rice/corn	Flat	15.0								
Total	6			30.0								
<u>Los Santos</u>												
1975	4	Corn	Flat	40.0								
1980	2	Corn	Flat	20.0								
Total	6			60.0								
<u>Panamá</u>												
1975				0.0	1	Rice/corn	Elevator	30.0	2	Rice	Pallet	32.0
1980	3	Rice/corn	Flat	30.0	1	Rice/corn	Elevator	50.0	2	Rice	Pallet	52.0
Total	3			30.0	2			80.0	4			84.0
<u>Colón</u>												
1975	3	Rice/corn	Flat	33.0					2	Rice	Pallet	28.0
1980	1	Rice/corn	Flat	7.0					1	Rice	Pallet	6.0
Total	4			40.0					3			34.0
<u>Darién</u>												
1975	4	Rice/corn	Flat	46.0	1	Rice/corn	Silo Pallet	100.0				
1980	2	Rice/corn	Flat	18.0	1	Rice/corn	Silo Pallet	30.0				
Total	6			64.0	2			130.0				
<u>Total</u>												
1975	18			180.0	4			280.0	7			68.0
1980	20			171.0	6			360.0	4			59.0
	38			351.0	10			640.0	11			127.0

continucus basis, with some of the construction starting not later than 1973 in order to have the additional capacity available when it will be needed. As indicated in the discussion of needs in each province, the tabular summary of number, type, and capacity of facilities should be interpreted as pointing up the general needs rather than as fixed recommendations for specific facilities. It is believed that most of the needed expansion can be accomplished by remodeling and addition to existing marketing facilities. If so, the expansion could be accomplished relatively easily by making loan funds available to the industry for financing the additions.

For the country as a whole, the recommendations include 29 storage facilities with total capacity of 528,000 quintals by 1975 and an additional 30 facilities with total capacity of 590,000 quintals by 1980. These include 18 country units with 180,000 quintals of capacity by 1975 and another 20 country units with 171,000 quintals of capacity by 1980. The recommended country facilities are flat storage structures for handling in sacks except in Chiriquí Province where the four silo units of 90,000 quintals total capacity are recommended.

The recommended terminal facilities include four units of 280,000 quintals capacity by 1975 and another six units of 360,000 quintals capacity by 1980. These units all include silo storage for grain plus limited warehouse storage and efficient truck loading of packaged grain products. It is believed that this expansion can be accomplished by construction loans to existing millers and handlers operating at the terminal points. The recommended units in Panamá are complete grain elevators or additions and remodeling of the present IFE elevator. The figures shown in the table represent capacity for handling additional corn imports to support poultry and livestock feeding but not for expanded milling and processing of grain from Darién Province (see the

above discussion of recommended additional facilities in Panamá and Darién Provinces).

The recommended distribution facilities are modern warehouses for receiving, storing, and loading milled rice, corn, and edible beans efficiently. They would permit maintaining a month's supply of each grain in the major consumer markets but would turn inventories monthly so that efficient handling is the major key to low-cost operation. It is probable that most of the added distribution facilities would be built by the existing private industry if adequate construction loan funds were made available to them.

B. Need for Additional Rice Milling Facilities

Detailed figures are not available on the existing private industry rice milling capacity by province and location in Panama. In the absence of such figures, it seems reasonable to assume that the milling capacity is distributed in proportion to the distribution of existing storage capacity at market points (Tables 2-16, 2-17, and 6-2). This is true because most of the storage capacity is owned by the millers and is used by them for holding the rough rice from harvest periods until used in milling. Thus, if most of the mills have proper balance between milling and storage capacity, the distribution of milling capacity is proportional to the distribution of storage capacity among the provinces. This assumption has been used as basis for determining the estimated milling capacity to meet the projected requirements by province for 1975 and 1980.

There is evidence to indicate some excess milling capacity in the industry at present. Some of the mills operate for only five or six months out of the year. Many operate on more than one shift only during the harvest period and could substantially increase production by going to two- or three-shift operations for a longer milling season. The budgeted operation under harvesting

conditions in Panama indicate that a well-managed modern mill could produce 58,000 quintals of milled rice with total storage capacity for 40,000 quintals of rough rice and milling capacity of less than 1.5 metric tons of rough rice per hour (Table 6-8). Such a mill could operate for a full ten months per year and at an average of 20 working days per months and 20 hours of production per day, it would need to process 25 quintals of rough rice per hour (25 quintals per hour x 20 hours x 20 working days x 10 months = 100,000 quintals of rough rice and 58,000 quintals of milled rice per year). Most millers do not expect to achieve this kind of performance and utilization of capacity year after year, but the closer that they can approach it, the greater their returns and the lower the over-all marketing costs. Some provision has been made for improved utilization of milling capacity in developing the estimated additional capacity needed to meet the projected requirements by 1975 and 1980.

1. Estimated Requirements for Additional Milling Capacity

The estimated requirements for additional milling capacity to be on stream by the 1975 and 1980 marketing years are shown in Section A of Table 6-5. The numbers in brackets represent the estimated number of units and the figures following the combined capacity of these units in kilograms per hour of rough rice. As has been done for storage capacity, the estimates are developed (1) without availability of the IFE milling capacity in years when delivery under the price support program is limited and (2) with 80 percent of the IFE capacity available for lease to private industry when not needed for the Government operations.

The estimates indicate no need for additional rice milling capacity in four provinces -- Veraguas, Herrera, Los Santos, and Panamá. The projected increase in production in these provinces can be handled by existing capacity

TABLE 6-5. ESTIMATED NEW AND REPLACEMENT RICE MILLING CAPACITY BY PROVINCE IN PANAMA, 1975 and 1980
(Kilograms per hour, Rough Rice)

Category and Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. New Capacity										
1. Without IFE Capacity										
a. 1975	(2)200	(4) 5,000						(2)1,000	(4)3,750	(12) 9,950
b. 1980		(8)12,500				(1)1,500		(1) 250	(2)1,750	(12)16,000
c. Total	(2)200	(12)17,500	(0) 0	(0) 0	(0) 0	(1)1,500	(0) 0	(3)1,250	(6)5,500	(24)25,950
2. With IFE Capacity @80%										
a. 1975	(2)200	(2) 1,000						(2)1,000	(4)3,500	(10) 5,700
b. 1980		(5)11,500						(1) 250	(2)1,500	(8)13,250
c. Total	(2)200	(7)12,500	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0	(3)1,250	(6)5,000	(18)18,950
B. Replacement										
a. 1975		(3) 4,750	(3)3,750	(2)1,250	(2)1,250	(2)1,250	(3)1,250			(15)13,500
b. 1980		(3) 4,750	(1)1,250	(2)1,250	(1) 500	(4)2,500	(3)1,250			(14)11,500
c. Total	(0) 0	(6) 9,500	(4)5,000	(4)2,500	(3)1,750	(6)3,750	(6)2,500	(0) 0	(0) 0	(29)25,000
C. Total with IFE Capacity @80%										
a. 1975	(2)200	(5) 5,750	(3)3,750	(2)1,250	(2)1,250	(2)1,250	(3)1,250	(2)1,000	(4)3,500	(25)19,200
b. 1980		(8)16,250	(1)1,250	(2)1,250	(1) 500	(4)2,500	(3)1,250	(1) 250	(2)1,500	(22)24,750
c. Total	(2)200	(13)22,000	(4)5,000	(4)2,500	(3)1,750	(6)3,750	(6)2,500	(3)1,250	(6)5,000	(47)43,950

and will enable the existing mills to increase operating efficiency. However, if the highway is not developed to Darién Province, the additional capacity shown will be needed in Panamá.

In the country as a whole, an estimated 24 additional milling units with combined capacity of about 26 metric tons per hour will be needed by 1980 without the IFE capacity. With the IFE capacity the requirement is reduced to 18 units with combined capacity of about 19 metric tons per hour. The major additional milling requirements are in Chiriquí and Darién Provinces and for small mills to serve expanding local production areas in Colón and Bocas del Toro Provinces.

2. Estimated Requirements for Mill Replacement

It is believed that the aggregate need for remodeling and replacement of existing mills will be greater than the need for additional milling capacity over the next ten years. The estimated needs for replacement shown in Section B of Table 6-5 are based on the combined capacity and the general conditions of the mills in each province. The needs for replacement are based largely on the private industry because most of the IFE mills now have been remodeled or replaced in line with the recommendations of the Latinoconsult study of 1970.³ The replacements include some up-dating with more modern and efficient equipment as well as replacement of worn-out equipment. The individual units of mill replacement might be installed by different millers or two or more of the units might be installed in a given mill.

Estimated rice mill replacements are indicated for all provinces except Bocas del Toro, Colón, and Darién. The estimated replacement needs are greatest

³ Latinoconsult Argentina, S. A. Programa de Asistencia Técnica al Departamento de Fomento. Panamá. Marzo de 1970.

in Chiriquí, followed by Veraguas, Coclé, Herrera, and Panamá. The estimated total replacement need is 15 mills to be on stream by 1975 and 14 more to be on stream by 1980. Total estimated capacity of the replacement mills is 25 metric tons per hour.

The combined need for replacement and additional capacity with utilization of the IFE facilities is estimated to be 25 milling units with combined capacity of 19,200 kilograms per hour by 1975 plus 22 units with combined capacity of 24,750 kilograms per hour by 1980.

C. Need for Additional Cleaning and Drying Facilities

In order to serve the projected increases in marketings, additional cleaning and drying capacity will be needed both for rice and for corn and edible beans by Panama's grain industry. Likewise, some of the existing equipment will need to be remodeled and replaced over the next ten years. The estimates of needed cleaning and drying equipment by province have been developed in the same manner as those for rice milling equipment. The distribution of existing cleaner and dryer capacity by province and location is assumed to be the same as that of the grain storage capacity at market points. The total requirements for the grain cleaning and drying equipment are based on the projected volumes of rice, corn, and edible beans to be marketed by 1975 and 1980 (Table 6-1).

1. Additional Cleaning and Drying Capacity

The estimated additional cleaner and dryer capacity by province to meet projected marketing requirements for 1975 and 1980 are shown in Table 6-6. The figures in brackets refer to the number of dryer and cleaner units and the following numbers refer to the capacity of these units in metric tons per hour. It should be noted that these capacities may not correspond to

TABLE 6-6. ESTIMATED ADDITIONAL CLEANER AND DRYER CAPACITY BY PROVINCE IN PANAMA, 1975 and 1980
(Metric Tons per Hour)

Category and Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. Without IFE Capacity										
1. Rice										
a. 1975	(2)0.7	(4)17.5						(3)3.5	(8)13.0	(17)34.7
b. 1980		(8)44.0						(1)1.0	(4)6.0	(13)51.0
c. Total	(2)0.7	(12)61.5						(4)4.5	(12)19.0	(30)85.7
2. Corn and Beans										
a. 1975	(1)0.5	(5)10.0		(2)3.0	(4)5.0		(2)3.0	(2)1.0	(4)5.0	(20)27.5
b. 1980		(3)5.0	(3)4.0	(1)1.0	(2)2.0	(2)3.0	(2)2.0	(1)0.5		(14)17.0
c. Total	(1)0.5	(8)15.0	(3)4.0	(3)4.0	(6)7.0	(2)3.0	(4)5.0	(3)1.5	(4)5.0	(34)45.0
3. Combined										
a. 1975	(3)1.2	(9)27.5		(2)3.0	(4)5.0		(2)3.0	(5)4.5	(12)18.0	(37)62.2
b. 1980		(11)49.0	(3)4.0	(1)1.0	(2)2.0	(2)3.0	(2)2.0	(2)1.5	(4)6.0	(27)68.5
c. Total	(3)1.2	(20)76.5	(3)4.0	(3)4.0	(6)7.0	(2)3.0	(4)5.0	(7)6.0	(16)24.0	(64)130.7
B. With IFE Capacity @80%										
1. Rice										
a. 1975	(2)0.7	(2)3.5						(3)3.5	(7)11.0	(14)18.7
b. 1980		(8)40.0						(1)1.0	(4)6.0	(13)47.0
c. Total	(2)0.7	(10)43.5						(4)4.5	(11)17.0	(27)65.7
2. Corn and Beans										
a. 1975	(1)0.5			(2)3.0	(4)5.0			(2)1.0	(4)5.0	(13)14.5
b. 1980		(3)5.0	(3)4.0	(1)1.0	(2)2.0		(2)2.0	(1)0.5		(12)14.5
c. Total	(1)0.5	(3)5.0	(3)4.0	(3)4.0	(6)7.0		(2)2.0	(3)1.5	(4)5.0	(25)29.0
3. Combined										
a. 1975	(3)1.2	(2)3.5		(2)3.0	(4)5.0			(5)4.5	(11)16.0	(27)33.2
b. 1980		(11)45.0	(3)4.0	(1)1.0	(2)2.0		(2)2.0	(2)1.5	(4)6.0	(25)61.5
c. Total	(3)1.2	(13)48.5	(3)4.0	(3)4.0	(6)7.0		(2)2.0	(7)6.0	(15)22.0	(52)94.7

rated capacities of the cleaners because some cleaners are rated on the basis of less foreign material removal than is required in Panama. The cleaner should be big enough to keep up with the corresponding dryer of the capacity shown in the table.

Without the IFE capacity, it is estimated that a total of 37 additional cleaner and dryer units with combined capacity of 62.2 tons per hour will be needed by 1975 and that another 27 sets of cleaners and dryers with combined capacity of 68.5 tons per hour will be needed by 1980. Thirty of the 64 sets will be needed for rice and the remaining are needed for the projected additional marketings of corn and beans. With the IFE facilities available, no additional cleaners and driers will be needed in Coclé, but one or more sets will be needed in all other provinces by 1980.

2. Replacement of Additional Cleaners and Dryers

The increasing volumes marketed will add to the annual use and hasten the time of replacement of some of the existing cleaners and dryers. This, coupled with the need for replacement of some of the equipment because of obsolescence, is the basis for the estimated requirements for replacement by 1975 and 1980 shown in Section A of Table 6-7. The estimated total replacement requirement for the country as a whole is 25 sets of cleaners and dryers by 1975 and another 22 sets by 1980. The estimated replacements will be needed in all provinces except Bocas del Toro and Colón but will be concentrated in Chiriquí and Veraguas Provinces.

When the estimated replacement needs are added to those for additional capacity in the industry, the combined requirements come to the figures shown in Sections B and C of Table 6-7. Without the IFE capacity, an estimated total of 62 sets with capacity of 95.2 tons per hour will be needed for operation by 1975 and an additional 49 sets with capacity of 98.5 tons per hour

TABLE 6-7. ESTIMATED GRAIN CLEANER AND DRYER REPLACEMENTS BY PROVINCE IN PANAMA BY 1975 AND 1980
(Metric Tons per Hour)

Category and Year	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. Replacement										
1975		(6) 8.0	(6) 8.0	(3) 5.0	(4) 4.0	(3) 4.0	(3) 4.0			(25) 33.0
1980		(6) 8.0	(2) 4.0	(3) 4.0	(2) 2.0	(4) 6.0	(3) 4.0		(2) 2.0	(22) 30.0
Total		(12) 16.0	(8) 12.0	(6) 9.0	(6) 6.0	(7) 10.0	(6) 8.0		(2) 2.0	(47) 63.0
B. New Plus Replacement Without IFE Capacity										
1975	(3) 1.2	(15) 35.5	(6) 8.0	(5) 8.0	(8) 9.0	(3) 4.0	(5) 7.0	(5) 4.5	(12) 18.0	(62) 95.2
1980		(17) 57.0	(5) 8.0	(4) 5.0	(4) 4.0	(6) 9.0	(5) 6.0	(2) 1.5	(6) 8.0	(49) 98.5
Total	(3) 1.2	(32) 92.5	(11) 16.0	(9) 13.0	(12) 13.0	(9) 13.0	(10) 13.0	(7) 6.0	(18) 26.0	(111) 193.7
C. New Plus Replacement with IFE Capacity @80%										
1975	(3) 1.2	(8) 11.5	(6) 8.0	(5) 8.0	(8) 9.0	(3) 4.0	(3) 4.0	(5) 4.5	(11) 16.0	(52) 66.2
1980		(17) 53.0	(5) 8.0	(4) 5.0	(4) 4.0	(4) 6.0	(5) 6.0	(2) 1.5	(6) 8.0	(47) 91.5
Total	(3) 1.2	(25) 64.5	(11) 16.0	(9) 13.0	(12) 13.0	(7) 10.0	(8) 10.0	(7) 6.0	(17) 24.0	(99) 157.7

will be needed by 1980. With 80 percent of the IFE capacity available through lease when not needed by the Government, the combined requirements are reduced to 52 sets of cleaners and dryers with capacity of 66.2 tons per hour by 1975 plus 47 sets with capacity of 91.5 tons per hour by 1980.

D. Requirements for Additional Transportation Facilities

The over-all requirements for additional trucking from farm to market, to country facilities, and to terminal facilities are indicated by the projected marketing volumes in Table 6-1. The over-all requirements for transport of inter-province shipments are indicated by the projected shipment volumes in that table, except that much of the rice will be shipped in the form of milled rice. The projections indicate that farm-to-market-to-terminal shipments will increase over 1969-1970 levels by 1,314,800 quintals (50.4 percent) by 1975 and by 2,627,500 quintals (100.8 percent) by 1980. They indicate that inter-province shipments will increase by 744,200 quintals, or 544,600 quintals with the rice on a milled basis (39.8 percent) by 1975 and by 1,657,600 quintals or 1,200,000 quintals with the milled rice (88.6 percent) by 1980.

These increases in the demand for grain transport services are substantial but of a magnitude which can be met by orderly growth and development of the trucking industry. If the average farm-to-terminal haul is 22 miles and the average inter-province shipment 220 miles, this means an annual average increase of 262,750 ton-miles in local hauls and 1.2 million ton-miles in over-the-road hauls.⁴ The added annual volume will require the equivalent of something in the order of six new 10-ton long-haul rigs and 13 new 2.5-ton trucks for farm-to-market hauls per year.⁵

⁴262,750 qq x 22 miles ÷ 22 qq/mt = 262,750 ton miles
120,000 qq x 220 miles ÷ 22 qq/mt = 1,200,000 ton miles

⁵At 100 trips per year with 91 percent payload for the 10-ton trucks and 400 trips per year with 80 percent payload for the 2.5-ton trucks.

At the projected volume of grain shipments from Chiriquí Province to Panamá (about 50,500 metric tons by 1980) question can be raised as to the advisability of shifting from trucking to marine shipments by coastal ship. However, the length of the haul (about 350 miles) makes the possible transportation cost savings marginal because of the extra cost of loading and unloading ships, even if efficient port grain elevator facilities were available. The extra haul to Puerto Armuelles and the present need to off-load at Balboa and tranship through the Canal Zone makes such a plan economically inadvisable under conditions in the foreseeable future.

The present necessity of shipping grain by coastal ship from La Palma-Darién to Panamá will be eliminated when the segment of the PanAmerican highway is completed to the Darién area. The road will greatly enhance development of this potentially rich agricultural area and make possible much lower cost transport of grain to the Panamá consumption center. As has been pointed out elsewhere, development of milling, storage, and marketing facilities in Darién Province should be timed with the construction schedule for the road into the area.

Inter-province shipments of grain by rail are impossible in Panama because there are no railroads. The limited trackage in Chiriquí Province and the Canal Zone Railroad connecting Panamá and Colón are of little or no value because they are not in line with the major inter-province movements (see Figures 5-1 and 5-2). Thus, Panama must continue to count upon highway motor carriers for the expanding shipments of grain within the country.

The farm-to-market transport conditions vary considerably from one grain production area to another. In the commercial production areas such as those of Chiriquí and Coclé Provinces, farm-to-market roads are adequate and trucks are available at combining time. In many cases, the trucks are owned or

engaged by the millers, so the producers can sell their grain at the farm. Several of the largest producers own their own trucks and may do some hauling for neighbors as well as for themselves. The first movement from combine to market under these conditions is shifting rapidly from handling in sacks to bulk hauling, especially in Coclé Province. Bulk handling directly from the combine should soon become the established practice in all of the commercial production areas.

At the other extreme, in many of the areas characterized by small non-mechanized producers, 22 miles is a long and costly distance to the nearest market outlet. Local roads may be impassable if the rains continue during the harvest season. Many of the sales are made a few sacks at a time to a dealer or agent in the local town whenever the producer can get them there by animal cart or any means available to him. These sales normally are picked up at the local assembly point by truck or pickup and hauled to the nearest milling or merchandising point. Obviously, farm-to-market transport and marketing costs per quintal of grain are much higher under these conditions than is true in the commercial production areas.

In summary, if the above figures are used as basis for estimating the number of additional trucks required to serve the expanding volumes of marketing and shipments which have been projected, the requirements will be as follows:

<u>Period Ending</u>	<u>Number of Additional Straight Trucks</u>	<u>Number of Additional Over-the-Road Trucks</u>
1975	66	27
1980	<u>65</u>	<u>33</u>
Total	131	60

The major destinations for the added local hauls and the major origins for the added inter-province shipments in order of importance will be the following (see Table 6-1):

1. David in Chiriquí Province
2. Santiago/Soná in Veraguas Province
3. Penonomé in Coclé Province
4. La Palma/Darién in Darién Province

E. Budgeted Operating Volume and Income for Representative Facilities

Budgeted operating schedules and gross incomes have been developed for a representative rice storage and milling facility and a representative corn storage and merchandising facility in Panama. Each of the facilities is based on annual purchases of 100,000 quintals of grain. The monthly pattern of receipts is based on prevailing harvesting patterns for the two crops. The monthly pattern of sales is based on the relatively uniform market demand throughout the year which is characteristic in Panama.

The budgeted operating schedule for the rice milling facility is shown in Table 6-8. The schedule requires storage capacity for 40,000 quintals of rough rice to support annual purchases and processing of 100,000 quintals, so the annual turnover of storage capacity is 2.5. The budgeted monthly receipts are shown in units of 1,000 quintals in the first column. Some 85 percent of annual receipts come in the first half of the marketing year (July-December), with 35 percent coming in October and another 25 percent in November. Spring receipts peak in April. It is assumed that there are no receipts in June and July and that the entire operation will be shut down for cleanup and repairs during July.

The milling schedule provides full operation of 10,000 quintals of rough rice milled per month from September through May, with 5,000 quintals to be milled in August and in June. The full monthly production requires the equivalent of one 1.0-ton-per-hour mill (milled rice basis) operated for two shifts per day. The monthly receiving and milling schedules mean that

TABLE 6-8. BUDGETED OPERATING SCHEDULE FOR RICE MILLING OPERATION IN PANAMA

Storage Capacity = 40,000 Quintals

Annual Storage Turnover = 2.5

Month	Receipts (1000 qq)	Milled (1000 qq)	Ending Inventory (1000 qq)	Percent Occupancy	Average Age of Inventory (months)	Average Price Rise from October (cents/qq)
July	0	0	0	0.0	0	
August	5	5	0	0.0	0	
September	10	10	0	0.0	0	
October	35	10	25	62.5	0	0.0
November	25	10	40	100.0	1	1.9
December	10	10	40	100.0	2	2.7
January	5	10	35	87.5	3	8.6
February	1	10	26	65.0	4	15.1
March	2	10	18	45.0	5	25.6
April	5	10	13	32.5	6	26.9
May	2	10	5	12.5	7	38.3
June	<u>0</u>	<u>5</u>	<u>0</u>	<u>0.0</u>	<u>8</u>	<u>52.4</u>
Total	100	100	202			
Average per Month	8.33	8.33	16.83	42.08	3.60	6.58

month-end rough rice inventories remain at zero through August and September, rise rapidly for October, remain at peak levels for November and December, and then gradually decline as the milling is continued through June. The inventory schedule provides 202,000 quintal months of storage over the year and average monthly inventory of 16,830 quintals. The average occupancy of the storage capacity is 42 percent. The average age of rough rice inventory during the occupancy period is 3.6 months, but the average age of about 70 percent of the quintal months of storage from October through January is only 1.5 months.

The average price rise from October shown in the last column of Table 6-8 is based on average monthly prices received by farmers in Panama for No. 1 rough rice for the seven marketing years ending June 30, 1970 (see Chapter 7). Under present conditions in Panama, these monthly price differentials provide the primary source of direct income from the grain storage operation.

The budgeted operating schedule for the 100,000-quintal corn merchandising facility is shown in Table 6-9. Following the general corn harvesting pattern for the country as a whole, 60 percent of the corn receipts occur the first half of the marketing year and 40 percent occur in the second half. Some 30 percent of total annual receipts come in October; 20 percent come in April. With the shipment schedule shown in the second column, 25,000 quintals of storage capacity is required, making the annual turnover of corn storage capacity equal to 4.0. This provides 167,500 quintal months of storage and an average annual occupancy rate of 55.83 percent. The average age of inventory with the semi-annual pattern of corn harvest is 2.58 months.

The average seasonal corn price rises over the past seven years from the October and April lows are shown in the last column of Table 6-9. The

TABLE 6-9. BUDGETED OPERATING SCHEDULE FOR CORN MERCHANDISING OPERATION IN PANAMA

Storage Capacity = 25,000 Quintals

Annual Storage Turnover = 4.0

Month	Receipts (1000 qq)	Shipments (1000 qq)	Ending Inventory (1000 qq)	Percent Occupancy	Average Age of Inventory (months)	Average Price Rise for October and April (cents/qq)
July	0.0	10.0	5.0	20	3	74.4
August	0.0	5.0	0.0	0	4	56.5
September	15.0	10.0	5.0	20	0	0.0
October	30.0	10.0	25.0	100	1	0.0
November	10.0	10.0	25.0	100	2	11.3
December	5.0	10.0	20.0	80	3	21.9
January	2.5	10.0	12.5	50	4	11.7
February	2.5	10.0	5.0	20	5	8.0
March	10.0	10.0	5.0	20	6	5.4
April	20.0	0.0	25.0	100	0	0.0
May	5.0	5.0	25.0	100	1	21.9
June	<u>0.0</u>	<u>10.0</u>	<u>15.0</u>	<u>60</u>	<u>2</u>	<u>47.5</u>
Total	100.0	100.0	167.5			
Average per month	8.33	8.33	13.96	55.83	2.58	6.88

differentials shown for November through March are based on the October low. Those shown for May through August are based on the April low. Over the seven-year period, the April low has averaged 4.8 cents per quintal higher than the October low.

The budgeted purchases, sales, and income for the rice milling operation portrayed in Table 6-8 are shown in Table 6-10. The monthly pattern of receipts, purchase cost per quintal, and cost of sales are based on the purchasing and seasonal price schedules from Table 6-8. The average purchase cost per quintal is based on a blend of No. 1, No. 2, and lower grades of rough rice typical of marketings by farmers. They reflect the equivalent of 14 percent moisture content and 0 percent foreign material content, after the dockage scales have been applied (see Section G of Chapter 2).

The schedule of sales volume in Table 6-10 is based on the milling schedule in Table 6-8 and an average yield of milled rice of 58 percent. The average sales price schedule is based on average wholesale price levels for milled rice over the past seven years and reflects the same monthly price differences as shown for the purchase cost of rough rice. The by-product sales schedule represents sales of 13 pounds of rice bran and rice meal per quintal of rough rice at the average price of \$3.00 per quintal. The budgeted schedules provide an annual gross income from the 100,000-quintal rice storage and milling operation of \$167,940. Of this amount, \$10,671 represents direct storage income and \$157,269 represents income from the total milling operation.

The budgeted purchases, sales, and income for the corn storage and merchandising operation are shown in Table 6-11. The purchases are based on the schedule of receipts and seasonal price differentials from Table 6-9. The purchase prices are based on 14 percent moisture and 0 percent foreign material content after dockages have been taken.

The sales schedule for corn is based on the shipment schedule from Table 6-9. The sales prices reflect an average earned margin of \$0.15 per quintal, considering both the handling margin and increases in market value from conditioning and blending. The operation as budgeted provides an annual gross income of \$15,000 from merchandising and \$17,550 from storage, for a total of \$32,550.

The figures in Tables 6-10 and 6-11 are used as basis for the operating cost and profitability analysis of grain marketing facilities in Panama presented in Chapter 10.

TABLE 6-10. BUDGETED PURCHASES, SALES AND INCOME FROM RICE MILLING AND STORAGE OPERATION IN PANAMA

Month	Purchases of Rough Rice			Sales of Milled Rice			Byproduct Sales (\$1000)	Income (\$1000)
	Receipts (1000 qq)	Average Cost (\$/qq)	Cost of Sales (\$1000)	Sales Volume (1000 qq)	Average Price (\$/qq)	Sales Revenue (\$1000)		
July	0	5.34	0.00	0.0	10.09	0.00	0.00	0.00
August	5	5.19	25.95	2.9	10.84	31.44	1.95	7.44
September	10	4.90	49.00	5.8	10.55	61.19	3.90	16.09
October	35	4.81	168.35	5.8	10.46	60.67	3.90	-103.78
November	25	4.83	120.75	5.8	10.48	60.78	3.90	-56.07
December	10	4.84	48.40	5.8	10.49	60.84	3.90	16.34
January	5	4.90	24.50	5.8	10.55	61.19	3.90	40.59
February	1	4.96	4.96	5.8	10.61	61.54	3.90	60.48
March	2	5.07	10.14	5.8	10.72	62.18	3.90	55.94
April	5	5.08	25.40	5.8	10.73	62.23	3.90	40.73
May	2	5.19	10.38	5.8	10.84	62.87	3.90	56.39
June	0	5.33	0.00	2.9	10.98	31.84	1.95	33.79
Total	100	4.88	487.83	58.0	10.67	616.77	39.00	167.94

Storage Income = \$10,671^a
Milling Income = \$167,940 - \$10,671 = \$157,269
= \$1.57/qq rough rice
= \$2.71/qq milled rice

^a Milling Month	1000 qq. rough rice	Rice price increase (\$/1000 qq - Table 6-8)	Total(\$)
January	5	86	430
February	9	151	1,359
March	8	256	2,048
April	3	269	807
April	2	250*	500
May	8	364*	2,912
June	5	523*	2,615
Total			10,671

*Price rise from November rather than October.

TABLE 6-11. BUDGETED PURCHASES, SALES AND INCOME FROM CORN HANDLING AND STORAGE OPERATION IN PANAMA

Month	Receipts (1000 qq)	Purchases Average Cost (\$/qq)	Cost of Sales (\$1000)	Sales Volume (1000 qq)	Sales Average Price (\$/qq)	Sales Revenue (\$1000)	Income (\$1000)
July	0.0	4.66	0.00	10.0	4.81	48.10	48.10
August	0.0	4.48	0.00	5.0	4.63	23.15	23.15
September	15.0	3.95	59.25	10.0	4.10	41.00	-18.25
October	30.0	3.86	115.80	10.0	4.01	40.10	-75.70
November	10.0	3.97	39.70	10.0	4.12	41.20	1.50
December	5.0	4.08	20.40	10.0	4.23	42.30	21.90
January	2.5	3.98	9.95	10.0	4.13	41.30	31.35
February	2.5	3.94	9.85	10.0	4.09	40.90	31.05
March	10.0	3.91	39.10	10.0	4.06	40.60	1.50
April	20.0	3.91	78.20	0.0	4.06	0.00	-78.20
May	5.0	4.13	20.65	5.0	4.28	21.40	0.75
June	<u>0.0</u>	<u>4.39</u>	<u>0.00</u>	<u>10.0</u>	<u>4.54</u>	<u>45.40</u>	<u>45.40</u>
Total	100.0	3.93	392.90	100.0	4.25	425.45	32.55

Merchandising income 100,000 @.15 = \$15,000

Storage income \$32,550 - \$15,000 = \$17,550

CHAPTER VII

ANALYSIS OF PRICE SUPPORTS AND PRICING POLICIES

As discussed in Chapter 2, the prices of rice, corn, and edible beans are supported at the farm level and controlled at the retail level by Government policy in Panama. The price support levels are uniform in all provinces, with no adjustment for transport cost to the consuming markets. They are uniform through time from harvest until the next planting season, with no adjustment for storage costs. They are uniform by class of grain, except that starting with the 1970-1971 marketing year, differentials are made in the support levels for four classes of rice: (1) extra long grain, (2) long grain, (3) medium grain, and (4) short grain. No distinction is made between dent corn and flint corn classes. Differentials for quality in the support levels are made by applying dockage scales for excess moisture and foreign material content to rice and corn and by applying price discount scales for excess moisture, foreign material, and admixture of other classes to edible beans. In addition, the support price for rice now depends upon milling quality in terms of the percentages of sound kernels, broken kernels, and "points". The classification and grading system used under the price support program is more refined than customarily used for grain purchases from farmers by the private trade in Panama.

The support price levels for rice have remained constant for a number of years. However, the milling quality provisions instituted in the rice supports in 1970-1971 (see Chapter 2) have had the effect of slightly lowering the average support levels because \$6.00 per quintal is the maximum support price regardless of milling quality and supports may go as low as \$4.00 per quintal for acceptable quality for delivery to the Government. The long-term trend in market prices paid to farmers for rice has been slightly downward.

The support price for corn was raised to \$4.25 per quintal (the equivalent of \$2.38 per bushel) in August of 1970 in an effort to stimulate increased production. With the increased market demand, particularly by the poultry industry, and the tight regulation of imports, the long-term trend in domestic corn prices received by farmers has been upward.

Support prices for edible beans have been maintained at their present levels (\$8.00 per quintal for frijoles and \$11.00 per quintal for porotos) for some time. However, the long-term trend in market prices has been upward as demand pressure continues to increase.

The stability in support price levels and past record of acceptance of delivery of large quantities of grain under the price support program make the support prices function as forward prices. Farmers know the support levels and have assurance that they will be effective at the time they make their planting decisions. During the past two harvest seasons, market prices for all three grains remained above support levels in virtually all production areas.

A. Existing Seasonal Patterns in Market Prices

The seasonal and secular patterns in prices of rice, corn, and edible beans were analyzed under the direction of Dr. Randall A. Hoffman with the technical support of Iowa State University. The resulting average seasonal patterns in National average prices received by farmers for No. 1 rough rice, No. 2 rough rice, corn and edible beans are shown in Table 7-1. The analysis is based on data for seven years, 1962-1963 through 1969-1970. In the body of the table are shown the monthly price index, the average monthly price, and average difference in the monthly price from the seasonal low. The prices and price differences for each of the grains are in units of dollars per quintal. The coefficients in the lower part of the table include the average

TABLE 7-1. AVERAGE SEASONAL PATTERNS IN PRICES RECEIVED BY FARMERS IN PANAMA FOR RICE, CORN AND BEANS

Month and Parameter	No. 1 Rough Rice			No. 2 Rough Rice			Corn			Edible Beans		
	Index (Percent)	Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	Average Price (\$/qq)	Difference (\$/qq)
January	97.64	5.639	0.086	96.64	4.773	0.052	96.57	3.511	0.117	102.82	10.260	1.308
February	98.76	5.704	0.151	97.83	4.832	0.111	95.56	3.474	0.080	93.69	9.349	0.397
March	100.58	5.809	0.256	101.03	4.990	0.269	94.86	3.448	0.054	89.71	8.952	0.000
April	100.80	5.822	0.269	101.03	4.990	0.269	94.68	3.442	0.048	90.98	9.079	0.127
May	102.78	5.936	0.383	103.60	5.117	0.396	100.72	3.661	0.267	95.59	9.539	0.587
June	105.23	6.077	0.524	105.83	5.223	0.502	107.75	3.917	0.523	101.14	10.092	1.140
July	105.23	6.083	0.530	106.90	5.280	0.559	115.16	4.186	0.792	104.60	10.438	1.486
August	101.64	5.870	0.317	103.13	5.089	0.368	110.23	4.007	0.613	102.33	10.211	1.259
September	97.71	5.643	0.090	97.82	4.831	0.110	95.23	3.462	0.068	102.98	10.276	1.324
October	96.15	5.553	0.000	95.59	4.721	0.000	93.36	3.394	0.000	108.67	10.844	1.892
November	96.48	5.572	0.019	95.10	4.697	-0.024	96.48	3.507	0.113	104.30	10.408	1.456
December	96.91	5.580	0.027	95.50	4.717	-0.004	99.39	3.613	0.219	103.19	10.297	1.345
Average (\bar{y})		5.7753			4.9389			3.6352			9.9787	
Trend (b)		-.0094			-.0097			+.0076			+.0147	
Significance (t)		8.55			8.18			6.07			2.28	

Source of data: Dirección de Estadística y Censo, Contraloría General de la República, Panama

price (over-all mean), the average month-to-month price trend over the period (b-value) and the t-value indicating the statistical significance of the regression in explaining the monthly price variations.

The b-values indicate that prices received by farmers over the seven years for rice have moved downward at the average rate of 0.94 cents per quintal per month in the case of No. 1 and 0.97 cents per quintal per month in the case of No. 2. Corn prices have moved upward at the average rate of 0.76 cents per quintal per month, and edible bean prices have moved upward at an average rate of 1.47 cents per quintal per period. The over-all means and the average monthly prices are for the middle of the seven-year period, so estimated average current prices are above or below those shown in the table as indicated by the b-values. For example, annual average prices for the country as a whole in 1969-1970 were \$5.33 per quintal for No. 1 rough rice, \$4.50 per quintal for No. 2 rough rice, \$3.93 per quintal for corn, and \$10.48 per quintal for frijoles. The price indexes and the monthly price differences shown in the table are independent of the long-term price trends.

The patterns show that even though the price support levels are constant throughout the year, average market prices received by farmers fluctuate seasonally. Rice and corn prices hit seasonal lows at the October harvest and reach seasonal highs the following July before the next fall harvest starts. In the case of corn, a noticeable secondary low is reached at the peak of the spring harvest. The average seasonal maximum price difference is 53 cents per quintal for No. 1 rough rice, 55.9 cents per quintal for No. 2 rough rice, and 79.2 cents per quintal for corn. The seasonal low for edible beans occurs in March at the peak of the spring harvest and the seasonal peak is reached in October. The average maximum seasonal price differential for the edible beans is about \$1.89 per quintal.

These average seasonal fluctuations in the prices received by farmers are significant, but they are not adequate to cover the full costs of storing rice and are barely adequate to cover the full costs of storing corn and edible beans through the production season. The average seasonal price rise for No. 1 rough rice from October to the following July is about 5.9 cents per quintal per month. The full storage cost for rice even in an efficient commercial operation is at least 10 cents per quintal per month (see Chapter 10). At one percent per month the interest on the storage inventory alone is about 5 cents per quintal per month. Thus, at the average seasonal price patterns prevailing in Panama, on-farm storage of rice is not profitable. Off-farm storage at milling points is profitable only because it permits more effective use of milling facilities throughout the year.

The average seasonal price rise for corn from October through March and from April through July is about 6.9 cents per quintal per month. A properly timed commercial storage operation can cover full storage costs at the prevailing seasonal price patterns for corn (Chapter 10), but on-farm storage is not profitable. Corn inventory carrying cost alone is at least 4.0 cents per quintal per month. The average seasonal rise in the price of edible beans from March through October is about 27 cents per quintal per month. This should be adequate to cover full storage costs, even though the inventory carrying cost alone for edible beans is about 10 cents per quintal per month. The average seasonal price for edible beans falls continuously from October through February, so storage through this period cannot be justified (Table 7-1).

The average seasonal patterns for milled rice at the consumer level show little relationship to the price patterns for rough rice at the farm level. The analysis of average milled rice prices to consumers in Panamá

and in David in Chiriquí Province conducted by Dr. Hoffman is summarized in Table 7-2. The format and units in the table are identical to those in Table 7-1. The average seasonal price patterns over the seven-year period in Panamá generally follow the seasonal patterns in prices received by farmers, but the range in the price fluctuations is much less. The average price rise for milled rice to Panamá consumers from October through the following January is 36 cents per quintal (0.36 cents per pound) for No. 1 and 69 cents per quintal (0.69 cents per pound) for No. 2.

It is clear that the seasonally constant price ceiling has kept consumer prices from following normal seasonal patterns resulting from harvest cycles. This is especially evident from the summary of consumer prices shown for David in Table 7-2. Prices have remained so nearly constant at or near ceiling levels that the seasonal patterns are covered up by the declining secular trend in rice prices. The prices for No. 2 rice in David show some seasonal pattern from October through January, but the ceiling price and the secular trend combine to cover up completely the seasonal pattern in the prices for No. 1 rice.

The figures in Table 7-2 also make it clear that the retail ceiling prices for milled rice have been essential and effective in Panama. Without the ceilings, the excess demand in relation to available supplies in the off-harvest months would have pushed consumer prices much higher seasonally. The figures indicate further that the excess demand has been greater for No. 1 rice than for No. 2 rice. Free market prices would have meant greater price differentials between the two grades of milled rice than is provided by the ceiling prices.

TABLE 7-2. AVERAGE SEASONAL PATTERNS IN RICE PRICES PAID BY CONSUMERS IN PANAMA

	No. 1 Milled Rice						No. 2 Milled Rice					
	Index (Percent)	Panamá Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	David Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	Panamá Average Price (\$/qq)	Difference (\$/qq)	Index (Percent)	David Average Price (\$/qq)	Difference (\$/qq)
January	100.99	14.78	0.36	100.45	14.86	-0.03	101.91	13.06	0.69	103.14	13.08	0.38
February	100.92	14.77	0.35	100.47	14.86	-0.03	101.77	13.05	0.68	103.14	13.08	0.38
March	100.85	14.76	0.34	100.49	14.86	-0.03	101.64	13.03	0.66	103.13	13.08	0.38
April	100.77	14.75	0.33	99.38	14.70	-0.16	101.50	13.01	0.64	99.01	12.55	-0.15
May	100.70	14.74	0.32	99.40	14.70	-0.16	101.36	12.99	0.62	99.01	12.55	-0.15
June	100.62	14.73	0.31	99.42	14.70	-0.16	101.22	12.98	0.61	99.02	12.56	-0.14
July	99.75	14.60	0.18	99.45	14.71	-0.12	100.46	12.88	0.51	97.72	12.39	-0.31
August	99.68	14.59	0.17	99.46	14.71	-0.18	100.33	12.86	0.49	97.61	12.38	-0.32
September	99.61	14.58	0.16	99.48	14.71	-0.18	100.22	12.85	0.48	97.50	12.36	-0.34
October	98.51	14.42	0.00	100.65	14.89	0.00	96.48	12.37	0.00	100.13	12.70	0.00
November	98.70	14.45	0.03	100.67	14.89	0.00	96.53	12.38	0.01	100.24	12.71	0.01
December	98.89	14.48	0.06	100.70	14.89	0.00	96.59	12.38	0.01	100.36	12.73	0.03
Average (\bar{y})		14.64			14.79			12.82			12.63	
Trend (b)		-.02			-.01			-.03			-.01	
Significance (t)		9.82			7.73			10.78			7.17	

Source of data: Dirección de Estadística y Censo, Contraloría General de la República, Panamá.

B. Existing Geographic Patterns in Market Prices

Annual average prices received by farmers for rice, corn, and beans by province for the four years ending with the 1969-1970 marketing year are shown in Table 7-3. It is clear that the average prices reflect the geographically uniform support prices and differences in assembly and marketing costs within provinces more than inter-province movement patterns and transport costs (see Figures 2-1 and 2-2). This is especially true of the rice prices. Even though Panamá is the primary destination for the surplus rice production in both Chiriquí and Darién Provinces, the average prices received by the farmers in these provinces for both No. 1 and No. 2 rice are higher than those received by producers in Panamá Province. Only the differentials in Coclé and Veraguas Provinces are sufficient to support shipments from major rice surplus areas to the deficit Panamá and Colón Provinces.

The relatively low average prices for rough rice in Veraguas Province reflect the high first assembly and marketing costs compared to those in other provinces. They indicate one of the major problems among the small non-mechanized rice farmers in developing increased incomes in competition with the large mechanized rice producers in areas such as Chiriquí and Coclé Provinces. The average prices received by Veraguas producers are \$0.49 per quintal below the national average for No. 1 and \$0.29 per quintal below the national average for No. 2 rough rice.

The relatively high average prices received for rice by producers in Chiriquí Province reflect low assembly and marketing costs resulting from concentrated production by large mechanized farmers. They also reflect healthy market conditions as large and efficient millers in the area (and from outside the area) compete for the large quantities of high-quality rice which are available.

TABLE 7-3. ANNUAL AVERAGE PRICES RECEIVED BY FARMERS BY PROVINCE IN PANAMA FOR RICE, CORN AND BEANS
(Four-Year Averages; Dollars per Quintal)

Item	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
<u>No. 1 Rough Rice</u>										
Average Price	<u>5.65</u>	<u>5.77</u>	<u>5.09</u>	<u>5.62</u>	<u>5.84</u>	<u>5.55</u>	<u>5.73</u>	<u>5.68</u>	<u>5.77</u>	<u>5.58</u>
Panamá Differential	<u>-.08</u>	<u>+.04</u>	<u>-.64</u>	<u>-.11</u>	<u>+.11</u>	<u>-.18</u>	<u>0</u>	<u>-.05</u>	<u>+.04</u>	<u>-.15</u>
<u>No. 2 Rough Rice</u>										
Average Price	<u>4.75</u>	<u>4.88</u>	<u>4.44</u>	<u>4.74</u>	<u>5.02</u>	<u>4.47</u>	<u>4.82</u>	<u>4.67</u>	<u>4.84</u>	<u>4.73</u>
Panamá Differential	<u>-.07</u>	<u>+.06</u>	<u>-.38</u>	<u>-.08</u>	<u>+.20</u>	<u>-.35</u>	<u>0</u>	<u>-.15</u>	<u>+.02</u>	<u>-.09</u>
<u>Yellow Corn</u>										
Average Price	<u>4.10</u>	<u>3.86</u>	<u>3.60</u>	<u>3.56</u>	<u>3.69</u>	<u>4.02</u>	<u>4.10</u>	<u>3.61</u>	<u>3.32</u>	<u>3.86</u>
Panamá Differential	<u>0</u>	<u>-.24</u>	<u>-.50</u>	<u>-.54</u>	<u>-.41</u>	<u>-.08</u>	<u>0</u>	<u>-.49</u>	<u>-.78</u>	<u>-.24</u>
<u>Beans (Frijoles)</u>										
Average Price	<u>8.70</u>	<u>10.38</u>	<u>9.68</u>	<u>9.52</u>	<u>9.75</u>	<u>8.81</u>	<u>10.40</u>	<u>8.76</u>	<u>8.54</u>	<u>9.78</u>
Panamá Differential	<u>-.170</u>	<u>-.02</u>	<u>-.72</u>	<u>-.88</u>	<u>-.65</u>	<u>-.159</u>	<u>0</u>	<u>-.164.</u>	<u>-1.86</u>	<u>-.62</u>

Source of Data: Dirección de Estadística y Censo, Contraloría General de la República, Panama

The relatively high average prices for rice in Darién Province reflect the uniform support price and the fact that much of the rice moves directly to IFE under the price support program. The high costs of handling the rice and transporting it by sea to Panamá are absorbed by IFE rather than by the producers in the area.

The relative average prices received for corn and edible beans by farmers in the different provinces much more nearly reflect the locational advantages with respect to the major deficit market in Panamá (see Table 2-15). In general, the differential with respect to Panamá is least for the nearby surplus provinces and greatest for Darién Province, from which shipping costs are highest. The differential is relatively low for Chiriquí Province considering the distance to Panamá, but this reflects the relatively low assembly and marketing costs under conditions in Chiriquí.

The differences in average prices received for No. 1 and No. 2 rough rice in the different provinces indicate that the market incentives to farmers for quality are highest in areas characterized by large mechanized producers. For example, the difference between the No. 1 and No. 2 average prices is \$1.08 per quintal in Coclé, \$0.93 per quintal in Darién, and \$0.89 per quintal in Chiriquí. These differences compare to that of \$0.65 per quintal in Veraguas. This is understandable because a large percentage of the crop purchased from small non-mechanized producers is not bought on the basis of grade. Under such practice, it is difficult to reflect premiums for quality back to the producer -- another handicap to the small farmers.

C. Existing Marketing Margins

Computed average total marketing margins and farmers' shares of the consumers' dollar for rice and edible beans by province in Panama are shown in Table 7-4. For the country as a whole, rice producers receive about

TABLE 7-4. COMPUTED MARKET MARGINS AND FARMERS' SHARES
FOR RICE AND BEANS BY PROVINCE IN PANAMA

Province	No. 1 Rough Rice		No. 2 Rough Rice		Beans (frijoles)	
	Marketing Margin (\$/qq)	Farmers' Share (%)	Marketing Margin (\$/qq)	Farmers' Share (%)	Marketing Margin (\$/qq)	Farmers' Share (%)
Bocas del Toro	2.63	68.6	2.34	67.0	13.84	38.6
Chiriquí	2.51	69.7	2.21	68.8	12.16	46.1
Veraguas	3.19	61.5	2.65	62.6	12.86	42.9
Herrera	2.66	67.9	2.35	66.9	13.02	42.2
Los Santos	2.44	70.5	2.07	70.8	12.79	43.3
Coclé	2.73	67.0	2.62	63.0	13.73	39.1
Panamá	2.55	69.2	2.27	68.0	12.14	46.1
Colón	2.60	68.6	2.42	65.9	13.78	38.9
Darién	2.51	69.7	2.25	68.3	14.00	37.9
Total	2.70	67.4	2.36	66.7	12.76	43.4

Based on 4-year averages, 1966-1967 through 1969-1970

Farm prices from Table 7-3.

Retail prices of rice from Table 7-2, with adjustments for secular trends and milling margins as follows:

$$\text{No. 1 } \$14.64 - (.18 \times 2) \times .58 = \$8.28$$

$$\text{No. 2 } \$12.82 - (.30 \times 2) \times .58 = \$7.09$$

Retail price of frijoles equals $\$20.86 + (.84 \times 2) = \22.54

two-thirds of the consumers' dollar. The percentage is slightly higher for No. 1 than for No. 2 rice, even though on a rough rice basis, the over-all marketing margin is 34 cents per quintal higher for No. 1. As indicated by the previous discussion, rice marketing margins are highest in Veraguas Province because of the added assembly costs. Strangely enough, the lowest total marketing margins for rice are in Los Santos Province. This may be explained by the downward production trend in this one province and the resulting added competition among millers as they bid for rice to maintain in processing volumes at economic levels.

Marketing margins on edible beans are relatively wide in Panama, with farmers receiving less than 45 percent of the consumers' dollar. Most of the beans are produced by relatively small farmers so that local assembly costs are high. In addition, the handling volumes are small, so handling methods are relatively expensive and unit costs relatively high at all steps in the marketing system. Total marketing margins for edible beans are lowest in Panamá Province where transport costs are relatively low and in Chiriquí Province where assembly costs are relatively low. They are highest in Darién Province where transport costs to the major consumer markets are relatively high.

The marketing margins for corn in Panama vary greatly between that portion channeled to poultry and livestock feed manufacturers and other industrial outlets and that portion channeled to retail food outlets. Farmers receive between 75 and 80 percent of the users' dollar for the portion channeled to industry but only about 60 percent of that channeled to human consumption. Average marketing margins for corn are lowest in Panamá and Bocas del Toro where producers have locational advantages with respect to deficit markets and highest in Darién where transport costs to major markets are highest.

D. Price Support Recommendations for Rice

It appears that the present price support program for rice has been effective in maintaining minimum prices to farmers and stimulating increased production. It is recommended that the support prices be maintained at approximately the present levels. Even though the support levels result in higher prices for milled rice to Panama's consumers than would be true under world market prices, the supports have been necessary to develop domestic production. Panama will not be concerned with exporting rice in competitive world markets for some years to come, so the fact that domestic prices remain above world prices poses no major problem.

It is believed that certain refinements could be made in the structure of rice supports to more accurately reflect differences in value due to place, time, and form (quality) utility. With respect to the latter, the modifications initiated in 1970 to reflect length of kernel and milling quality in the support prices should help to reward producers for the high quality desired by Panama's consumers; it is recommended that they be continued. Because the higher qualities continue to be in short supply, it is recommended that consideration be given to raising the maximum support price for rough rice on the present scales from \$6.00 per quintal to \$6.50 per quintal (see Section G-1 of Chapter 2). It is recommended further that the scales be modified slightly to increase the support price differential between No. 1 and No. 2 rice by approximately \$0.25 per quintal.

In order to reflect quality premiums to small producers under the price support program, it is recommended that arrangements be made to give the small farmer a supplemental support payment whenever the milling quality scale indicates a higher price than the average support price he receives when delivery is made. This would permit the present immediate cash settlement

with the small farmer at the average support price and give him the quality premium later when the rice is moved to a grading location where the milling quality can be determined. It is believed that these modifications would stimulate the marketing of higher quality rice by providing the incentives for improved production, harvesting, and handling methods.

With respect to place utility under the projected net distribution patterns for rice (see Figure 5-1), it is recommended that consideration be given to slight modifications in the uniform support levels in all provinces. It is suggested that this be accomplished by applying a "province differential" to the support price as determined by the present quality scale. This province differential would be somewhat less than the full cost of transport -- perhaps a maximum of \$0.25 per quintal of rough rice. Using the present support levels as base, the province differentials might be approximately the following:

<u>Province</u>	<u>Differential (\$/qq rough rice)</u>
Panamá	+0.10
Colón	+0.10
Coclé	+0.05
Herrera	0.00
Los Santos	0.00
Veraguas	-0.05
Chiriquí	-0.15
Darién	-0.15

The differential for Bocas del Toro would depend upon whether roads are developed for moving rice from production areas to consumption areas within the province. If this is done, the differential should be positive -- perhaps at least +\$.10 per quintal. If roads are not developed and rice must be shipped back from Colón to Bocas del Toro, the differential in the price support to farmers for the province may need to be zero or even negative.

It is believed that the province differentials would help to stimulate production in areas closer to major market outlets, thus reducing the stress

on the marketing system. Furthermore, because costs of production are relatively low in Chiriquí and Darién, it is believed that a slight lowering of support levels will have no adverse effects on the incentives for increasing production in these provinces. The slight lowering of rice supports in Veraguas might affect producers adversely, but any such effect can be offset several-fold by initiating special programs for the small producers. The geographic differentials in the price support levels will reduce the losses on transport costs which now must be absorbed by IFE (and also by the private trade) in moving rice to the consumption centers of Panamá and Colón.

It is recommended that moderate seasonal price differentials be introduced into the support prices for rice by introducing a scale of premiums for delivery in months other than October. The scale could be applied uniformly in all provinces and might be about as follows:

<u>Delivery Month</u>	<u>Premium (\$/qq., rough rice)</u>
October	None (base)
November	None
December	0.10
January	0.15
February	0.20
March	0.25
April	0.30
May	0.35
June	0.40
July	0.45
August	0.50
September	None

Premiums in the support prices of these amounts will not cover the full costs of storage, as indicated in Section A of this chapter, but they will encourage farmers to plant for harvest in the off-months. To the extent that producers respond, the seasonal scale in the support prices will help to level out production and reduce the requirements and costs for rice storage. They also will help to insure Panama's consumers of adequate supplies of rice throughout the year.

E. Price Support Recommendations for Corn

The price supports for corn have been less effective in stimulating increased production in Panama than have the price supports for rice. It is too early to measure the production response that can be attributed to the recent increase in support prices for corn. Some response can be expected, but it appears that many farmers still find rice a more profitable crop and will not make a significant shift to corn production. It seems probable that market prices for corn have not been the limiting factor to increased corn production; programs are needed to reduce the per-quintal costs of corn production in order to make this crop more profitable to farmers and thereby stimulate increased production.

A major problem with higher support prices and higher market prices for corn is the depressing effect on the poultry and livestock industries. At prevailing world market prices, corn and other feed grains represent important and economic ingredients for poultry and livestock rations. When feed grains are available at reasonable cost, the poultry and livestock industries are stimulated to expand to meet growing demands for meat, eggs, and dairy products. When the feed grains are high-priced, poultry and livestock production costs are high, even though other ingredients are substituted in the ration as far as possible. When poultry and livestock production are forced to compete with human food outlets in demand for corn, the domestic poultry and livestock industries remain depressed and the needed meat, eggs, and dairy products must be imported.

There may be a relatively easy answer to Panama's dilemma in this respect. The kind of corn needed to supply the demand for human food is flint corn. The flint varieties grown in Panama are adapted to cultivation by the small producers. Yields are relatively low and costs of production relatively high, but the human food market can support relatively high prices to cover the

production costs. Price supports for flint corn at the present level of \$4.25 per quintal or even higher can be absorbed without serious adverse effects on Panama's economy.

Dent corn rather than flint corn normally represents the economic source of energy in poultry and livestock rations. The high-yielding dent corn hybrids are more suited to cultivation by the large mechanized producers than by the small farmers in Panama. Production management is more exacting than for the indigenous flint varieties. Mechanical harvesting, drying, and handling in bulk is desirable. Specialized grain storage facilities are needed on the farm or at nearby market points. When the production management and handling system is provided, the dent hybrids provide high yields and can be produced at a low cost per quintal. If these things are developed and the market is assured, dent corn production can be profitable to Panama's larger farmers with suitable soil and climatic conditions at price support levels of \$3.50 per quintal or less.

In order to move in the direction of flint corn for human consumption and dent corn for poultry and livestock feed, it is recommended that separate classes for the two kinds of corn be provided in the price supports. At first, the differential in the support prices for the two classes should be small in order not to discourage increased dent corn production. Perhaps the support price for flint corn could be left at \$4.25 per quintal and that for dent corn established at \$4.00 per quintal, for example. If separate research and educational programs are tailored to flint corn production by small farmers and dent corn by the mechanized farmers to bring the desired production responses, the differential in the price support level for the two classes of corn can be increased over time.

It is also recommended that geographic price differentials be introduced into the corn price supports, for the same reasons that they are recommended in the rice price supports. Because the greatest potentials for increased corn production are in the central provinces relatively near to the major markets, it is believed that the geographic support price differentials for corn should be somewhat greater than those for rice. Something in the order of the following schedule of differentials from the present support price is recommended:

<u>Province</u>	<u>Differential (\$/qq)</u>
Panamá	+0.25
Colón	+0.25
Coclé	+0.15
Herrera	+0.10
Los Santos	+0.10
Veraguas	0.00
Chiriquí	-0.25
Bocal del Toro	-0.25
Darién	-0.25

These geographic differentials would be applied to the price supports for both flint corn and dent corn.

It is recommended that seasonal differentials be introduced into the price support schedules for corn also. However, because corn harvesting now more nearly follows a twice-per-year pattern, the schedule of seasonal something like the following is suggested:

<u>Delivery Month</u>	<u>Premium (\$/qq)</u>
October	none(base)
November	none
December	0.10
January	0.15
February	0.20
March	0.05
April	0.05
May	0.10
June	0.15
July	0.20
August	0.25
September	none

These seasonal differentials will not cover storage costs but will cover additional production costs for off-season harvest, at least in some areas. They should help to level out seasonal production patterns and reduce the requirements for additional storage facilities for corn.

As soon as the potential for grain sorghum is demonstrated through the recommended production research (see Chapter 8), it is recommended that price supports be established for this crop. It is recommended that grain sorghum prices be supported at about \$0.25 per quintal less than dent corn but follow the same geographic and seasonal patterns.

F. Price Support Recommendations for Edible Beans

As the yields have increased over the past several years, Panama's farmers have continued to reduce plantings of edible beans. Apparently, most farmers do not consider them a competitive cash crop with rice or corn. Much of the production by the small farmer is intended for his own use and increased yields enable him to reduce plantings. As they now cultivate them, the production labor requirements become a limiting factor for edible beans. Increased support prices would bring some production response but probably not enough to turn around the downward trend in plantings. This trend has continued through the past two seasons even though market prices have remained well above support levels.

It appears that programs must be directed toward reducing labor requirements and farm production costs in order to stimulate increased production of edible beans in Panama. At least until such programs have been tried, increases in the general level of support prices are not recommended. Marketing costs are relatively high, so substantial increases in support prices would drive up consumer price levels. Many of the beans are eaten by those

at the lower income levels who can least afford higher food costs. Higher consumer prices would be inequitable as well as unpopular.

Consideration should be given to structuring the price supports for edible beans to reflect geographic and seasonal price differentials, however. Differentials by province of the following general magnitudes are recommended:

<u>Province</u>	<u>Support Price Differential (\$/qq)</u>
Panamá	+.25
Colón	+.25
Coclé	+.15
Los Santos	.00
Herrera	.00
Veraguas	-.10
Chiriquí	-.25
Bocas del Toro	-.25
Darién	-.25

Such differentials will not defray the full transport cost to the major consumer markets, but they will help to reduce the costs absorbed by IFE on the long shipments. They may provide some encouragement for increased production closer to the markets.

Seasonal premiums are suggested in the price supports for edible beans, using the major harvest months of March and April as base. The seasonal premium scale might be roughly as follows:

<u>Delivery Month</u>	<u>Seasonal Premium (\$/qq)</u>
March	none (base)
April	none
May	.25
June	.50
July	.75
August	1.00
September	1.00
October	1.00
November	1.00
December	.75
January	.50
February	.25

It is believed that such a scale would help to level out seasonal harvest patterns and reduce storage requirements. This is more important for edible

beans than for rice and corn because of the consumer preference for the recently harvested product.

G. Recommended Retail Ceiling Prices

It is believed that the retail ceiling prices on milled rice, corn, and edible beans have been necessary and reasonably effective in Panama. It is recommended that they be continued. In general, the existing levels of the ceiling prices provide price protection to consumers and yet enable efficient millers and handlers to cover costs. It appears that no major adjustment in the general level of ceiling prices is needed.

It is recommended that consideration be given to establishing differentials in the retail ceiling prices to reflect geographic production and consumption patterns and seasonal harvesting patterns. Such differentials would reflect costs for storage and transportation and should make the ceiling prices easier to enforce. They should also stimulate millers and handlers to increase storage and reduce seasonal market shortages as well as to transport grain from surplus areas and reduce shortages in the deficit markets.

The recommended general magnitude of differentials by province in the retail ceiling prices for milled rice, corn, and edible beans are shown in Table 7-5. The differentials are shown in cents per pound above or below the present ceiling prices for the country as a whole. They would apply to all classes and grades of the three products at the retail level. They provide for increases in the ceiling prices in the major deficit markets such as Panamá and Colón and reductions in the ceiling prices in provinces with surplus production such as Chiriquí and Darién. The recommended differentials reflect the projected flow patterns shown in Figures 5-1 and 5-2.

The recommended seasonal differentials in retail ceiling prices are shown in Table 7-6. The figures are in cents per pound above and below the

TABLE 7-5. RECOMMENDED DIFFERENTIALS IN RETAIL CEILING PRICES
FOR RICE, CORN AND EDIBLE BEANS BY PROVINCE IN PANAMA

(Cents per Pound)

<u>Province</u>	<u>Milled Rice</u>	<u>Corn</u>	<u>Edible Beans</u>
Bocas del Toro	+2.0	+1.0	+3.0
Chiriquí	-1.0	-0.5	-3.0
Veraguas	-0.5	-0.5	-1.0
Herrera	0.0	0.0	0.0
Los Santos	0.0	0.0	0.0
Coclé	+0.5	0.0	+1.0
Panamá	+1.0	+0.5	+2.0
Colón	+1.0	+0.5	+2.0
Darién	-0.1	-0.5	-3.0

TABLE 7-6. RECOMMENDED SEASONAL DIFFERENTIALS IN
RETAIL CEILING PRICES FOR RICE, CORN
AND EDIBLE BEANS IN PANAMA

(Cents per Pound)

<u>Month</u>	<u>Milled Rice</u>		<u>Corn</u>	<u>Edible Beans</u>
	<u>No. 1</u>	<u>No. 2</u>		
July	+1.0	+0.5	+0.5	+2.0
August	+1.0	+0.5	+0.5	+2.0
September	0.0	-0.5	-0.5	+2.0
October	0.0	-0.5	-0.5	+2.0
November	0.0	-0.5	-0.5	0.0
December	0.0	-0.5	0.0	0.0
January	+0.5	0.0	0.0	0.0
February	+0.5	0.0	0.0	0.0
March	+0.5	0.0	0.0	-2.0
April	+0.5	0.0	0.0	-2.0
May	+1.0	+0.5	0.0	-2.0
June	+1.0	+0.5	+0.5	-2.0

present ceiling prices. The differentials represent approximations to seasonal marketing and price patterns but are based on four-month periods (three-month periods for corn) in order to avoid over complexity in the structure of ceiling prices. The recommended seasonal patterns in the ceiling prices for No. 1 and No. 2 rice are identical. The differentials for No. 1 rice reflect the recommended increase in the difference between the prices of No. 1 and No. 2 rice. The recommendation would increase the difference in the ceiling prices by 0.5 cents per pound throughout the year.

It is recommended that the retail ceiling price for corn be applicable for flint corn with not more than five percent admixture of dent corn. The retail ceiling price for dent corn should be established at a level substantially lower than that for flint corn in order to divert the dent corn from human food channels into livestock feed. It is recommended that a wholesale ceiling price be established for dent corn at a level approximately 50 cents per quintal below that for flint corn in order to further encourage its use as an ingredient for poultry and livestock feeds.

H. Recommended Imports to Support Price Policies

The present program of regulating grain imports by permitting no imports except those made directly by IFE is effective and should be continued. So long as domestic prices remain above world market prices, this kind of control is necessary. The difference between import costs and domestic sales revenues provides an important source of income to support the Government price control and marketing operations for rice, corn, and edible beans.

The present IFE policy of importing rice and edible beans only when and to the extent necessary to maintain balance between domestic supply and demand should be continued. The same policy should be followed with respect to imports of flint corn for human food. However, until substantial increases

in the domestic production of dent corn (or grain sorghum) can be stimulated, it is recommended that imports of feed grain be increased to support development of the domestic poultry and livestock industries. The feed grain imports should include dent corn and/or grain sorghum, whichever represents the cheapest source of net energy in the world market. The feeding value of grain sorghum is about 97 percent of that of dent corn of comparable quality; the point of indifference in the price relationship between the two feed grains is in the ratio of roughly 0.97 for dent corn to 1.00 for grain sorghum. The demand projections and recommended additional marketing facilities presented in this study reflect the recommended imports of feed grain to support the domestic poultry and livestock industries.

CHAPTER VIII

SUPPORTING PROGRAMS FOR IMPROVED PRODUCTION AND MARKETING

As indicated in Chapter 1, balanced development of production and marketing is needed in order to achieve the goals of self-sufficiency in food production for Panama. The direct linkages between grain production and grain marketing need to be recognized and reflected in both production programs and marketing programs. The interrelationships certainly must be reflected in identifying and planning the kinds of supporting programs by public agencies which will be needed to make the production and marketing programs effective.

The supporting services discussed in the present chapter include (1) market news and outlook, (2) applied research, (3) extension education, (4) production credit, (5) inspection and grading, and (6) public warehousing. Price supports and related policies are discussed in Chapter 7. Other supporting services which relate primarily to other sub-sectors of agriculture but which affect grain production and marketing are outlined briefly in the final section of this chapter.

A. Key Parameters for Planning Supporting Programs

It seems clear that certain conditions and parameters must be recognized before supporting programs can be developed to achieve Panama's grain production potentials within acceptable bounds with respect to over-all development and equity goals for the economy. The key parameters include the following:

- (1) Production and marketing programs must be tailored to the unique conditions in each province.
- (2) Programs which are effective for the mechanized farming areas may not be effective for the small non-mechanized producers.

- (3) Supporting programs include a whole package of related services, any one of which can become the limiting factor to continued development of the sub-sector.
- (4) Private industry represents the backbone of grain production, processing, and distribution in Panama; Government programs should be designed to strengthen free enterprise, including individual businesses, co-operatives, and corporations.
- (5) A complex but predictable diffusion process is involved in the adoption of new ideas and technology; this process must be recognized and reflected in the supporting programs.

A brief description of these key parameters may provide a helpful setting for the recommended supporting programs for continued development of grain production and marketing in Panama.

1. Need for Coordinated Production and Marketing Programs

The development of the grain sub-sector over the past ten years has demonstrated the essential need for coordination of production and marketing. On the farm input side, increased production through the use of higher-yielding varieties cannot take place without retail distribution of seed, fertilizers, pesticides, farm machinery, petroleum, and other technical production inputs. Production credit, technical and managerial advice, and other services also must be provided. On the marketing side, outlets must be available when and where they are needed to handle increasing quantities of green rice and wet corn at harvest and to provide the farmer cash payment at a fair price for his products.

The input distribution and product marketing programs as well as the grain production programs must be tailored to local conditions. The whole set of local conditions (size and type of farms, soil and climatic conditions, farm-to-market roads, resistance of prevailing varieties to diseases and other pests, marketing practices, etc.) establish the framework within which the production and marketing programs must be coordinated.

2. Need for Distinctive Programs for Small Producers

In Panama, as in many other countries, small producers do not have the same opportunities as large producers to benefit from higher-yielding varieties and improved cultural practices. It is impractical for them to employ large mechanical combine harvesters, airplane application of chemical controls, trucks to transport grain to market, and so on. Tailored farm machinery and cultural practices for the new varieties under their unique conditions have not been developed. In some cases, they could not handle sharply increased yields, even if they could achieve them. Consequently, their costs of production remain high and may increase as labor becomes more scarce and costly during critical planting and harvest periods. Farm-to-processing point marketing costs are high and increased crop revenues may fail to offset increased production costs. Under such conditions, neither the new varieties nor relatively high support prices may do much toward increasing the net incomes of the small farmers.

If conditions are to be changed so that small farmers can share in the benefits of the "green revolution", special imaginative new supporting programs must be designed for them. The limiting factors must be identified and steps taken to correct them. For example, if harvesting becomes the limiting factor, simple small animal-drawn reapers or headers may be needed. If complex cultural practices are required, "packages" of inputs with simple diagram instructions or oral instructions by radio or tape recorder may be needed. If improved village market outlets are needed, simple but efficient gathering stations may have to be developed. Whatever the programs, they must be tailored to the unique conditions of the small farmers and designed to overcome the limiting factors under these conditions.

3. Need for a Package of Supporting Services

A number of different kinds of production and marketing services are needed to support continued increases in output by the grain sub-sector. If any one of these services is lacking or inadequate, it is likely to become the limiting factor which prevents achievement of the desired goals. Even though the remaining services are provided effectively, they may not accomplish their intended purposes because of the inadequate service which represents the limiting factor in the over-all development. For example, suppose that the lack of production credit to grain producers is the limiting factor. In this case, crop production research, extension education, grain grading, and other service programs may not achieve the desired results until the credit problem is solved.

4. Need to Stimulate Private Industry

In planning and conducting public programs and supporting services to achieve development goals, the potential impacts on private industry must be appraised carefully. So long as free enterprise is expected to perform the dominant role in grain production and marketing, the success of any development program depends upon maintaining healthy conditions within all segments of the industry. The right kinds of Government programs can serve to stimulate improved structure and performance of both primary agriculture and associated agricultural business. The wrong kinds of Government programs can bring about depressed conditions or damage the competitive structure within one or more segments of the grain industry.

5. Need to Adapt to the Diffusion Process

The adoption of new ideas and practices in either grain production or grain marketing follows a characteristic diffusion process. Producers and

handlers do not adopt profitable new techniques the first time they are exposed to them. Most of them follow practices which they have seen work well for neighboring producers and handlers which they respect. The process of adoption takes time and the newer and more complex the innovation, the longer the process of adoption.

All people can be characterized into five classes with respect to adoption of new ideas and practices. The innovators always try anything new even though it may not be practical. They represent a small percent of the total population and are usually considered "crackpots" by neighbors. The early adopters pick up new ideas quickly once they have been proven. They usually are considered "community leaders" by their neighbors and, in contrast to the innovators, make ideal demonstration farmers for spreading new practices. The early majority gradually pick up new practices which the early adopters have proven to be successful, but they want to be sure before they try anything new. They are usually considered "solid citizens" by their neighbors. The late majority are reluctant to change from habitual practices and adopt new ideas only after they have been thoroughly proven. They are usually considered "somewhat old-fashioned" by neighbors. The laggards are the last small percentage to change to proven new practices. They are considered "behind the times" by neighbors.

There is no short-cut to the diffusion process, but if it is recognized, the rate of adoption of profitable new techniques and practices can be increased by well-selected and well-conducted demonstrations and maximum use of communications from farmer to farmer, miller to miller, etc. Expert-to-farmer and expert-to-miller communications will work for the early adopters, but not for the majority of people.

B. Market News and Outlook

Reliable and timely market news and outlook information is an essential service for all segments of the grain sub-sector, from producer to food retailer. More complete crop and market news will be needed as Panama continues to move from subsistence production to a market-oriented economy. The kind of information needed includes the following:

(1) Annual statistical summary

- (a) Plantings, yield, production and disposition of each grain by crop, by province and preferably by county within province.**
- (b) Off-farm marketings and average prices received by farmers for each grain by month, by province and preferably by county.**
- (c) Volume of receipts and average retail prices for each grain by month for the major market locations.**
- (d) Supply and utilization balances for each grain by province and for Panama as a whole.**
- (e) Year-end summary of stocks of grain in inventory by position and location.**
- (f) Summary of storage, milling, and drying capacities and corresponding volumes for the past year by market location.**
- (g) Summary of crop production costs and average net income per hectare and per quintal for each crop by province.**

(2) Monthly reports

- (a) Current summary of crop conditions and estimated plantings, yields and production of each grain by province for the current semester and crop year.**
- (b) Off-farm marketings and average prices received by farmers for each grain by province for the past month.**
- (c) Volume of receipts, milling volume, shipments, and average retail prices for each grain at each of the major market locations for the past month.**
- (d) Month-end stocks of grain in inventory by position and location.**

(3) Weekly reports

- (a) Summary of market receipts, milling volume, shipments, and average weekly prices for each grain by major market location.**

(4) Daily reports

- (a) Estimated volume of receipts and current price quotations for each grain by major market location.

(5) Special reports

- (a) Annual crop production and market outlook for the forthcoming crop year.
- (b) Reports of major changes in Government policies or special events affecting grain production and marketing as they occur.

The Bureau of Statistics and Census in Panama now assembles the basic data, makes the analysis and prepares several of the annual statistical reports outlined above. It is believed that if the Bureau is provided the additional budget and staff, the full set of needed crop and market news reports can be developed within 12 to 18 months. It is recommended that priority be given to this development, including the needed technical assistance to support the development.

Attention needs to be given to the methods and system of dissemination of the crop and market news. The daily and weekly reports need to be released on a regular schedule to the press and radio stations throughout the country. Conferences should be held with the market news reporters from the media to insure that release schedules and methods of dissemination meet their needs. The monthly and annual reports also should go to the news media as well as to trade publications, farm organizations, extension offices, millers, and Government and private grain buying offices throughout the country. They also should be released on a predetermined schedule. The earlier they can be released the better, so the users can have the benefit of current information at all times.

C. Crop Production Research

Panama has given considerable attention to crop production research, especially for rice. The basic research on crop breeding and selection needs

to be continued. The applied research on fertilization, chemical pest control, seeding rates, and other cultural practices needs to be expanded, particularly at the outlying experiment stations throughout the country. Latin-square and other experimental designs need to be used to measure the interactions of various cultural practices, varieties, soil, and climate. Field scale experiments need to be used to test the most promising combinations under practical conditions for Panama's producers.

Research on corn production needs to be redirected and accelerated. Two major thrusts are recommended. One is for the selection of high-yielding dent hybrids and the associated cultural and management practices for mechanized production by larger producers. The other is for the selection of flint hybrids and associated cultural and management practices for intensified production by small non-mechanized or partially mechanized producers. The corn production research should be concentrated in the central provinces where soil and climatic conditions are most suitable for substantial increase in corn production.

A concentrated research program to select adapted hybrids and cultural practices for commercial production of grain sorghum needs to be initiated immediately. Grain sorghum appears to have considerable potential on the lighter, better drained soils in the commercial rice production areas in Chiriquí, Darién, and Coclé Provinces. If so, grain sorghum production could do much to solve the growing feed grain deficit in Panama.

Research on edible bean production needs to be directed toward making frijoles a more profitable cash crop for the small farmers. Identifying cultural practices which will reduce labor requirements without reduction in yields appears to be one promising approach. Improved harvesting and handling methods may offer at least part of the answer.

D. Marketing Research

Research on grain marketing methods and practices in Panama needs to be accelerated. The research which has been done on milling of the new rice varieties has been very helpful, but milling yields remain relatively low. This work should be expanded, perhaps by working cooperatively with private millers. Other needed technical market research includes grain handling, conditioning, and drying practices, warehouse design and handling systems, transportation and packaging.

Very little has been done by way of economic and management research on grain marketing problems; research is needed to improve the operating efficiency of individual marketing operations and the marketing system as a whole. The millers and other grain marketing firms are fairly well developed, so they are in position to make good use of productive economic and management research. Cost center studies, industrial engineering studies, plant location studies, facility design studies, employee productivity studies, feasibility studies on new equipment and facilities, operating control studies, and plant utilization studies all represent examples of the kinds of market research which should have high pay-off in Panama over the next ten years.

E. Extension Education for Producers

Extension educational programs for grain producers need to be expanded and tailored to the widely differing needs of the mechanized producers on the one hand and the small non-mechanized producers on the other. In both cases, more emphasis needs to be placed on the systematic application of an interrelated "package" of cultural practices. The extension methods need to place more emphasis on on-farm demonstrations, farmer-to-farmer education, and other procedures consistent with the diffusion process. The field extension workers need to be supported by a staff of specialists at the province level

to provide assistance in the various fields of technical agriculture -- land preparation, seeds and seeding, fertilization, weed control, disease control, insect control, harvesting, and so on.

In the commercial farming areas, the field extension workers need to work closely with the producers. They also need to work directly with those providing services to the farmers -- combine harvester operators, fertilizer and chemical applicers, seed producers and distributors, farm-to-market truckers, and so on. The concept needs to be the total "system" of crop production, including securing the technical inputs, the production management, and the delivery of the grain to the market outlet.

More qualified extension workers are needed in the production areas characterized by small non-mechanized farms. They must be aware of and sympathetic to the special problems of these producers. They must be able to work with them individually as well as in small groups for demonstrations and other effective educational methods for these conditions. They must work closely with those conducting production research directly applicable to the small producer. They must be aware of the diffusion process and how to use it to bring about adoption of profitable new ideas and techniques in grain production.

F. Marketing Education

Marketing education must be pointed to the millers, handlers, and others directly involved in the marketing processes. It must be pointed to helping them increase operating efficiency and therefore the net income from their operations. As with the farm extension workers, the marketing extension workers must be well qualified so that those with whom they work have full confidence in them.

Much of the marketing education can be conducted through short courses and other training meetings on specialized subjects of direct interest to the participants. Grain classification and grading, improved milling techniques, management of bulk rice storage, mill accounting, grain truck operation and management, and material flow and handling are examples of the kinds of specialized subjects to be covered. The individual short courses will vary in length from one or two days to as much as two weeks or longer, depending upon the subject and the depth of the training to be provided. Much of the training can be built around demonstration and experience under operating conditions and by actually working through case problems. Classroom lectures should be minimized.

There is also a need for the development of extension manuals on specific phases of the total operations by millers and handlers. Some of these can be based directly upon the results of the market research studies which are recommended. Others can be based on manuals provided by equipment manufacturers or on experience and procedures of outstanding operations. The extension manuals should be clear and easy to follow, emphasizing "how to do it". Diagrams, worksheets, checksheets, etc., should be used as much as possible to avoid lengthy narrative descriptions.

G. Production Credit

As discussed in Section G of Chapter 2, Panama has made good strides in providing expanded and more effective production credit to farmers. Continued progress in improved credit programs will be needed if production goals for the next ten years are to be met.

More attention needs to be given to developing specialized production credit programs for the small producers. Most of them need more production credit in order to adopt the new technologies for increased production.

Many of them can use the additional credit effectively and profitably if they are given adequate supervision. The amount and type of credit must be tailored to the specific total production needs of each producer. The loans must be extended on a supervised credit basis so that both the lenders and the producer know that it will be used effectively.

Supervised credit is more expensive to administer than agricultural loans to large producers. Complete monthly income and expense statements need to be budgeted for the borrower, and his borrowing and repayment schedules tailored to the statements. Loan officers must be qualified to give sound farm management advice to the borrower. Simplified farm and home accounting must be established to insure that the farmer is operating according to the plan upon which his loan is based. The average loans are relatively small, so unit costs will be higher than if the supervised loans were relatively large. Yet this kind of production credit is essential if small farmers are to be able to participate in the benefits of increased crop production. Under these circumstances, it seems probable that costs of administering the supervised credit program will have to be subsidized by the Government.

H. Inventory Financing

Inventory financing of grain stored by farmers, merchants, millers, distributors, wholesalers, and retailers is essential to efficient grain marketing. The total inventory value of grain sold by Panama's farmers in 1969-1970 was about \$12.5 million at the farm and nearly \$19 million after the value added by the marketing system. Because of the seasonal nature of production, some of the grain must be held in inventory for several months at some point in the marketing system. The operating capital required to finance this inventory is substantial. The costs of this operating capital represent an important element in total grain marketing costs.

In the developed countries, loans for financing grain inventories can be obtained at low interest and on favorable terms. The loans are virtually risk-free because they are secured by the commodity. They are short-term loans, so the loan funds turn over rapidly. The individual loans are in relatively large denominations so that the unit costs of administration are minimal. These same conditions for low-cost grain inventory loans can be developed in Panama. The recommended seasonal differentials in support prices will reduce the risks of the inventory loans (see Chapter 7). The expanded grading and inspection programs and the public grain warehousing recommended in the following sections will further reduce the risks of grain inventory loans.

It is recommended that a special capital loan fund be established for the grain inventory loans and that these loans be administered under a separate program. This will permit tailoring the program to the specific needs for inventory financing and for establishing the interest charges and loan terms to the unique characteristics of this kind of loan.

I. Grading and Inspection

As pointed out in Section G of Chapter 2, the grain grade standards and methods of grading used by IFE are believed to be sound and suitable for conditions in Panama. Panama will not be concerned with grain exports over the next ten years and need not be concerned with meeting the export grade standards at this time. The moisture and foreign material contents and the classes of rice, corn, and edible beans are readily determined and can be understood by producers and handlers alike. The milling tests for rice involve special equipment and training, but this is a service which can be provided by IFE whether the grain is delivered under the price support or traded in private channels.

More people need to be trained in the techniques of grain inspection, including sampling, classification, moisture testing, and foreign material determination for rice, corn, and edible beans. It is recommended that IFE's program be expanded and that grading schools be conducted for millers and other grain buyers throughout the nation. Education and reference materials will need to be prepared, including colored illustrations of reference classifications. These should be available to everyone involved in buying and selling grain. It is also recommended that a national grain grading laboratory be established as a center for the training programs and also to perform appeal grading on a fee basis when buyer or seller desires to have the appeal grade determination made.

It is suggested that a system be developed for inspecting and checking the calibration of moisture meters and other grain grading equipment. The system could be attached to the checking of scales used in buying and selling grain. In any case, the checking of grading equipment should be done by an official Government agency. The calls to individual buying and grading points should be on a random schedule and unannounced. The Government inspectors should have the authority, skill, and equipment to recalibrate moisture meters and other grading equipment as needed. They also should have the power to condemn equipment which is faulty.

J. Public Grain Warehousing

Panama is approaching the time when a public grain warehousing act and an administrative authority to supervise the act will be desirable. This would permit storage of grain under warehouse receipt in approved bonded warehouses in bulk as well as in bags. Owners of grain, whether farmers, handlers, millers, or IFE, could safely place grain in a public warehouse with assurance that it will be kept safe and in good condition. Millers

and handlers with storage facilities which meet the requirements of the act can become licensed public warehouses and store grain at established charge rates. The warehouse receipts become negotiable instruments upon which to obtain inventory financing, or through which to transfer title of the grain. Public grain warehousing can facilitate sound and low-cost inventory financing, reduce speculation, and improve the flow of grain through market channels.

It is recommended that a small study group be designated to study public grain warehousing in other countries, seek council from knowledgeable people, and draft proposed public grain warehousing legislation for Panama. It is believed that a public grain warehousing system should be in operation by 1975.

K. Other Supporting Programs

Several other kinds of supporting programs will need to be expanded to insure achievement of the grain production and marketing goals in Panama. Most of these programs are outside the grain sub-sector as such, but they affect grain production and marketing and can become limiting factors to the development of the sub-sector. Some of the more important of these types of programs are outlined below.

1. Certified Seed Production and Distribution

An effective seed certification program is needed to insure producers of pure high-quality seed which will give the performance expected. This requires an orderly system of control of seed production. It requires adequate facilities for seed processing and packaging. It requires an effective and low-cost system of seed distribution. As the development of improved varieties and hybrids continues and as plantings continue to expand, the requirements for seed production and distribution will increase over the next ten years.

2. Distribution of Fertilizers and Agricultural Chemicals

The requirements for fertilizers and chemicals for weed, disease, and pest control will become more exacting and greater in volume over the next ten years. Supporting import policies, price controls, safety regulations and marketing programs for the distribution and application of these materials will need to be refined and expanded.

3. Farm Machinery Manufacture, Distribution, and Maintenance

The requirements for farm machinery will continue to increase to support expanded grain production. This will be true of the large tractors and power equipment for the large farms and for small specialized equipment for the small farms. The machinery must be of the right size and design for the intended purpose. It must be properly serviced and maintained to avoid breakdowns during critical periods of use. It must be kept busy in order to keep total per-unit operating costs under control.

Panama's farm machinery industry will need to develop in several respects over the next ten years. Probably the most critical need is for the design, manufacture, and servicing of small simple machines which can be used on the small farms, either by the farmer or by custom operators. Needed machines which are effective and economical for the small farms include those for tillage, planting, application of fertilizers and chemicals, and harvesting and handling the grain.

4. Farm Management Services

Expanded farm management services are needed for both the commercial farms and the small farms. In case of the commercial farms, the cost of production study program could be expanded to include analysis of factors affecting production costs, farm records, and analysis and management advisory

services. The total program might be patterned after those of the state farm management associations in the USA.

A different kind of program is needed by the small farmers, however. Perhaps "packaged" farm management service programs where the key technical inputs, financing, and management guidance are provided as a group will be more effective. Such programs might be offered by rice millers who also distribute farm supplies in a manner similar to the programs with contract growers offered by tomato canning plants. In any case, some type of integrated farm management service seems to be called for if the small farmers are to be able to keep pace with the large commercial farmers.

5. Feed Industry Services

A package of supporting services will be required in order to foster development of a healthy and competitive poultry and livestock feed industry. This will become increasingly important to the grain sub-sector as production of corn and grain sorghum for feed grain develops. The producers of feed grains must be able to rely on alternative outlets and a dependable market for relatively large volumes of production.

6. Transportation Services

As pointed out in Chapters 5 and 6, the grain sub-sector will become increasingly dependent on effective transportation both from farm to market and for inter-province shipments. Orderly development and effective regulation of transport will be essential. The private trucking industry will respond to the expanding needs if an effective economic climate is maintained and if the development and improvement of roads keeps pace with the growing requirements.

CHAPTER IX

ESTIMATED EXPENDITURE FOR RECOMMENDED PROGRAMS

The estimated expenditures needed to handle the additional grain marketing volumes and to finance the recommended supporting programs developed herein are limited to those directly concerned with grain marketing. Expenditures for recommended programs related to grain production and to the acquisition and distribution of essential farm inputs are not included. The estimated expenditures for such programs should be added to those presented here to obtain the estimated total expenditures for continued development of the grain sub-sector of Panama's agriculture over the next ten years.

The estimated expenditures needed for continued development of grain marketing include (1) capital expenditures for replacement and additions to grain storage, milling, conditioning, and transport facilities, (2) working capital for expanded marketing operations, (3) expenditures for improved price support and regulatory programs, (4) expenditures for expanded crop and market news reporting, (5) expenditures for additional marketing research, (6) expenditures for marketing education and training, (7) expenditures for expanded grain grading and inspection services, and (8) expenditures for developing a public grain warehousing system.

The cost estimates presented are considered minimal to accomplish the desired goals if the funds are used wisely and effectively. No contingency has been built into the estimates; planners using the figures may need to add an appropriate contingency (say 10 or 15 percent) to the totals presented. Furthermore, the estimates do not include provision for any kind of additional infrastructure. The cost for additional office facilities by millers and private handlers as well as by Government agencies, for additional research and educational facilities, for additional roads, for additional land development

and any other additional infrastructure development which may be needed should be considered over and above the estimated costs presented here.

A. Capital Investment in Expanded and Improved Marketing Facilities

The estimates of capital expenditures for additional grain storage, milling, conditioning, and transport facilities are developed in two parts. The first part includes the added capacity to the existing facilities which will be needed to handle the projected additional volumes by 1975 and 1980. The second part includes the replacement and remodeling of existing facilities which will become worn out or obsolete in the years ahead. All of the estimates are built up by province in order to highlight the geographic distribution of the additional capital investment that will be needed.

The estimates are developed for two periods, 1975 and 1980. These dates should be interpreted as the end point by which the investments shown should have been made and the facilities brought into operation. Thus, estimated capital expenditures shown for 1975 should be incurred prior to or during that year, so that by the end of 1975 the total shown will have been expended.

1. Storage Facilities

The estimated capital costs for additional new grain storage facilities by province are shown on lines "1" of Table 9-1. The cost estimates cover the recommended additional storage facilities from Table 6-4. The estimates are based on assumed average unit costs for construction of \$1.20 per quintal of storage capacity for units of less than 20,000 quintals capacity and \$1.00 per quintal of capacity for units of 20,000 quintals of storage capacity or more. The exception to this is in Panama, where more modern facilities are needed and all facilities are estimated at \$1.20 per quintal of storage capacity. The estimates are intended to cover costs of site preparation, materials,

TABLE 9-1. ESTIMATED CAPITAL COST FOR RECOMMENDED NEW GRAIN MARKETING FACILITIES BY PROVINCE IN PANAMA, 1975 and 1980

(\$1,000)

Year and Type of Facility	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. 1975										
1. Storage ^a	16.8	190.0		18.0	48.0		74.4	73.2	155.2	575.6
2. Milling ^b	10.0	40.0						40.0	140.0	230.0
3. Cleaning and Drying ^c	4.8	12.3		10.5	17.5			16.3	56.0	117.4
4. Subtotal ^d	31.6	242.3		28.5	65.5		74.4	129.5	351.2	923.0
5. Transport ^d	5.0	210.0	140.0	20.0	25.0	55.0	50.0	10.0	85.0	600.0
6. Total	36.6	452.3	140.0	48.5	90.5	55.0	124.4	139.5	436.2	1,523.0
B. 1980										
1. Storage ^a	2.4	300.0	66.0	18.0	24.0		158.4	15.6	51.6	636.0
2. Milling ^b		345.0						11.0	60.0	416.0
3. Cleaning and Drying ^c		117.5	14.0	3.5	7.0		7.0	5.5	21.0	175.5
4. Subtotal ^d	2.4	762.5	80.0	21.5	31.0		165.4	32.1	132.6	1,227.5
5. Transport ^d		305.0	130.0	20.0	20.0	95.0	25.0	5.0	55.0	655.0
6. Total	2.4	1,067.5	210.0	41.5	51.0	95.0	190.4	37.1	187.6	1,882.5
C. Total										
1. Storage ^a	19.2	490.0	66.0	36.0	72.0		232.8	88.8	206.8	1,211.6
2. Milling ^b	10.0	385.0						51.0	200.0	646.0
3. Cleaning and Drying ^c	4.8	129.8	14.0	14.0	24.5		7.0	21.8	77.0	292.9
4. Subtotal ^d	34.0	1,004.8	80.0	50.0	96.5		239.8	161.6	483.8	2,150.5
5. Transport ^d	5.0	515.0	270.0	40.0	45.0	150.0	75.0	15.0	140.0	1,255.0
6. Total	39.0	1,519.8	350.0	90.0	141.5	150.0	314.8	176.6	623.8	3,405.5

^aTable 6-4; Unit costs for country storage under 20,000 qq @ \$1.20 per qq and over 20,000 qq @ \$1.00 per qq; terminal storage @ \$1.00 per qq, except elevator storage in Panamá @ \$1.20 per qq.

^bTable 6-5; Cost in units of \$1,000 for mill and building per ton-hour of milling capacity as follows: 50 for 100-kg. mills, 44 for 250-kg. mills, 40 for 500-kg. mills, 35 for 1-ton mills, 30 for 2-ton mills, 25 for 3-ton mills.

^cTable 6-6; Cost in units of \$1,000 including equipment and installation per ton-hour of capacity as follows: 4.0 for 0.5-ton units, 3.5 for 1.0-ton units, 3.0 for 2.5-ton units, and 2.5 for 5.0-ton units.

^dRequirements from Section D of Chapter 6; Distribution by province based on Table 6-1; estimated average unit cost \$5,000 for 2.5-ton trucks, \$10,000 for 10-ton trucks.

and construction cost, including attendant grain handling equipment, but not office buildings and related structures.

The estimated total capital cost for additional grain storage facilities is \$575,600 for those needed by 1975 plus \$636,000 for those needed by 1980, for a total of slightly more than \$1.2 million (Table 9-1). By province, the largest expenditure is needed in Chiriquí (\$490,000), followed by Panamá (\$232,800) and Darién (\$206,800). If the IFE facilities are made available when not in use as recommended in Chapter 6, no expenditure for additional storage facilities will be needed in Coclé prior to 1980 and none will be needed in Veraguas prior to 1975.

The estimated capital cost for modern storage facilities to replace outmoded existing capacity is shown on Lines "1" of Table 9-2. These estimates are based on replacement of 10 percent of the existing flat storage capacity by 1975 and another 10 percent by 1980. It is assumed that none of the existing bulk storage capacity would need to be replaced prior to 1980. The estimated unit cost for replacement of existing storage is taken at \$0.80 per quintal of storage capacity replaced. On this basis, the estimated capital cost for replacement is \$133,000 by 1975 and another \$132,900 by 1980, for a total of \$265,900. The greatest cost for storage replacement is in Chiriquí (\$114,500), followed by Veraguas (\$62,500), Coclé (\$43,700), and Panamá (\$33,900).

The estimated total capital cost for additional plus replacement grain storage capacity is shown on Lines "1" of Table 9-3. The estimated total expenditure is just under \$1.5 million -- \$708,600 by 1975 and \$768,900 by 1980. Expenditures for grain storage facilities will be needed in all provinces but concentrated in Chiriquí, Panamá, and Darién.

TABLE 9-2. ESTIMATED CAPITAL COST FOR RECOMMENDED REPLACEMENT GRAIN MARKETING FACILITIES BY PROVINCE IN PANAMA, 1975 and 1980

(\$1,000)

Year and Type of Facility	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. 1975										
1. Storage ^a	0.2	57.3	31.2	2.2	2.1	21.8	17.0		1.2	133.0
2. Milling ^b		83.1	65.6	25.0	25.0	25.0	27.5			251.2
3. Cleaning and Drying ^c		20.0	20.0	12.5	10.0	10.0	10.0			82.5
4. Subtotal	0.2	160.4	116.8	39.7	37.1	56.8	54.5		1.2	466.7
5. Transport ^d	3.2	339.2	127.2	28.0	24.8	96.8	16.0	3.2	48.8	687.2
6. Total	3.4	499.6	244.0	67.7	61.9	153.6	70.5	3.2	50.0	1,153.9
B. 1980										
1. Storage ^a	0.2	57.2	31.3	2.1	2.1	21.9	16.9		1.2	132.9
2. Milling ^b		83.1	21.9	25.0	10.0	50.0	27.5			217.5
3. Cleaning and Drying ^c		20.0	10.0	10.0	5.0	15.0	10.0		5.0	75.0
4. Subtotal	0.2	160.3	63.2	37.1	17.1	86.9	54.4		6.2	425.4
5. Transport ^d	6.4	449.6	197.6	38.4	38.4	127.2	48.0	9.6	91.2	1,006.4
6. Total	6.6	609.9	260.8	75.5	55.5	214.1	102.4	9.6	97.4	1,431.8
C. Total										
1. Storage ^a	0.4	114.5	62.5	4.3	4.2	43.7	33.9		2.4	265.9
2. Milling ^b		166.2	87.5	50.0	35.0	75.0	55.0			468.7
3. Cleaning and Drying ^c		40.0	30.0	22.5	15.0	25.0	20.0		5.0	157.5
4. Subtotal	0.4	320.7	180.0	76.8	54.2	143.7	108.9		7.4	892.1
5. Transport ^d	9.6	788.8	324.8	66.4	63.2	224.0	64.0	12.8	140.0	1,693.6
6. Total	10.0	1,109.5	504.8	143.2	117.4	367.7	172.9	12.8	147.4	2,585.7

^aTable 6-2; 10 percent replacement of flat storage in 1975 and in 1980 @\$0.80 per quintal.

^bTable 6-5; unit cost for replacement estimated at 50 percent of the unit cost for new mills.

^cTable 6-7; unit cost for replacement estimated at \$1,000 per ton-hour of capacity less than new units.

^dBased on Table 6-1; estimated 50 percent of large trucks and 80 percent of small trucks replaced every five years; replacement cost estimated at 30 percent of new cost.

TABLE 9-3. ESTIMATED CAPITAL COST FOR RECOMMENDED NEW AND REPLACEMENT GRAIN MARKETING FACILITIES BY PROVINCE IN PANAMA, 1975 and 1980.

(\$1,000)

Year and Type of Facility	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. 1975										
1. Storage	17.0	247.3	31.2	20.2	50.1	21.8	91.4	73.2	156.4	708.6
2. Milling	10.0	123.1	65.6	25.0	25.0	25.0	27.5	40.0	140.0	481.2
3. Cleaning and Drying	4.8	32.3	20.0	23.0	27.5	10.0	10.0	16.3	56.0	199.9
4. Subtotal	31.8	402.7	116.8	68.2	102.6	56.8	128.9	129.5	352.4	1,389.7
5. Transport	8.2	549.2	267.2	48.0	49.8	151.8	66.0	13.2	133.8	1,287.2
6. Total	40.0	951.9	384.0	116.2	152.4	208.6	194.9	142.7	486.2	2,676.9
B. 1980										
1. Storage	2.6	357.2	97.3	20.1	26.1	21.9	175.3	15.6	52.8	768.9
2. Milling		428.1	21.9	25.0	10.0	50.0	27.5	11.0	60.0	633.5
3. Cleaning and Drying		137.5	24.0	13.5	12.0	15.0	17.0	5.5	26.0	250.5
4. Subtotal	2.6	922.8	143.2	58.6	48.1	86.9	219.8	32.1	138.8	1,652.9
5. Transport	6.4	754.6	327.6	58.4	58.4	222.2	73.0	14.6	146.2	1,661.4
6. Total	9.0	1,677.4	470.8	117.0	106.5	309.1	292.8	46.7	285.0	3,314.3
C. Total										
1. Storage	19.6	604.5	128.5	40.3	76.2	43.7	266.7	88.8	209.2	1,477.5
2. Milling	10.0	551.2	87.5	50.0	35.0	75.0	55.0	51.0	200.0	1,114.7
3. Cleaning and Drying	4.8	169.8	44.0	36.5	39.5	25.0	27.0	21.8	82.0	450.4
4. Subtotal	34.4	1,325.5	260.0	126.8	150.7	143.7	348.7	161.6	491.2	3,042.6
5. Transport	14.6	1,303.8	594.8	106.4	108.2	374.0	139.0	27.8	280.0	2,948.6
6. Total	49.0	2,629.3	854.8	233.2	253.9	517.7	487.7	189.4	771.2	5,991.2

Estimates from Table 9-1 plus those from Table 9-2.

2. Milling Facilities

The estimated capital costs for additional rice milling capacity to meet the projected volumes of marketing are shown on Lines "2" of Table 9-1. These estimates cover the milling facilities itemized in Table 6-5 and are based on the following estimated average unit costs for mill building, complete equipment and installation:

<u>Mill Capacity (kilograms/hour)</u>	<u>Capital Cost per Metric Ton per Hour of Capacity</u>
100	\$50,000
250	\$44,000
500	\$40,000
1,000	\$35,000
2,000	\$30,000
5,000	\$25,000

The projected patterns of rice production indicate that additional milling capacity by 1980 will be required only in four provinces -- Chiriquí, Darién, Colón, and Bocas del Toro. The estimated capital cost for the needed new capacity is \$230,000 by 1975 and \$416,000 by 1980, for a total of \$646,000.

Estimated capital expenditures for replacement of existing mills by 1975 and 1980 are shown on Lines "2" of Table 9-2. The estimates cover the mill replacements provided in Table 6-5. They are based on an average unit cost equal to one-half that for new mills on the supposition that most of the existing mill buildings and some of the existing equipment would be salvaged in the remodeling.

Capital expenditures for rice mill replacement will be needed in all provinces except Bocas del Toro, Colón, and Darién. The estimated expenditure for mill replacement for the country as a whole is \$468,700 -- \$251,200 by 1975 and \$217,500 by 1980.

The combined expenditures for additional and replacement rice mills are estimated at \$481,200 by 1975 plus \$633,500 by 1980 (Lines "2", Table 9-3). Over the total period, about one-half the total mill expenditure

(\$551,200) will be needed in Chiriquí Province alone. However, some expenditure will be needed in all provinces.

3. Cleaning and Drying Facilities

The estimated capital expenditures for additional cleaner and dryer capacity for rice, corn, and edible beans are shown on Lines "3" of Table 9-1. The estimates cover the facilities outlined in Table 6-6. They are based on the following schedule of estimated unit costs for the equipment and installation:

<u>Capacity (metric tons/hour)</u>	<u>Capital Cost per Metric Ton per Hour of Capacity</u>
0.5	\$4,000
1.0	\$3,500
2.5	\$3,000
5.0	\$2,500

On this basis, the estimated capital cost for the additional cleaner and drier capacity needed is \$117,400 by 1975 and another \$175,500 by 1980, for a total of \$292,900. Among the provinces the requirement is greatest in Chiriquí at \$129,800, second in Darién at \$77,000, and third in Los Santos at \$24,500.

The estimated capital expenditures for cleaners and dryers to replace existing capacity shown on Lines "3" of Table 9-2 are based on the requirements from Table 6-7 and estimated replacement costs of \$1,000 per ton per hour of capacity less than for new installations. Estimated replacements are needed in all provinces except Bocas del Toro and Colón and total to \$157,500 through 1980.

The total combined capital cost for cleaners and dryers at market points is estimated at about \$200,000 by 1975 and another \$250,000 by 1980 (Lines "3" of Table 9-3). Investment for cleaners and dryers is needed in all provinces. Prior to 1975 the greatest need is in Darién, but between 1975 and 1980 the need is greatest in Chiriquí.

The estimated total capital requirement for storage, milling, and conditioning facilities at market points is \$3,042,600 (Lines "4" of Table 9-3). Of this amount, \$1,389,700 will need to be invested by 1975 and the remainder, \$1,652,900, will be needed between 1975 and 1980. Nearly 44 percent of the total, or \$1,325,500, will be needed in Chiriquí Province.

4. Transportation Facilities

The estimated capital costs for grain transportation include small trucks for hauling from the combine or local assembly point to milling points in the province and large trucks for hauling from these milling points to the major deficit market locations. The estimates do not include costs for the development of roads and bridges nor costs for development of other modes of transport. The cost estimates are based on the estimated truck requirements developed in Section D of Chapter 6 and the distribution by province indicated by the projected marketing and shipment volumes from Table 6-1. The assumed average unit cost is \$5,000 for the trucks used for farm-to-market hauls and \$10,000 for the trucks used for long-distance hauls. The estimated capital cost for trucks to haul the projected added volume of grain to be marketed is \$600,000 by 1975 and another \$655,000 by 1980, for a total of \$1,255,000 (Lines "5" of Table 9-1).

The estimated capital costs for trucks to replace wornout vehicles shown in Table 9-2 are based on the assumption that 16 percent of the small trucks and 10 percent of the large trucks will be replaced each year. The replacements between 1970 and 1975 are based on the fleet needed for 1970 movements. Those between 1975 and 1980 are based on the fleet needed for projected 1975 movements. It is assumed that the trucks can be replaced for 80 percent of the cost of outright purchase of new equipment. The estimated total capital cost for replacement of trucks for hauling grain is \$687,200 by 1975 and \$1,006,400 between 1975 and 1980.

The estimated capital expenditures for new plus replacement trucks by province are shown on Lines "5" of Table 9-3. The total estimate for the country as a whole is \$1,287,200 by 1975 and another \$1,661,400 by 1980. Over the full period the estimates vary from \$14,600 in Bocas del Toro and \$27,800 in Colón to \$594,800 in Veraguas and \$1,303,800 in Chiriquí.

The estimated total capital expenditures for grain marketing facilities through 1980 are shown on Lines "6" of Table 9-3. Over the total period, approximately \$6 million will be required in Panama as a whole. Of the total, \$2,676,900 will be needed by 1975 and \$3,314,300 will be needed between 1975 and 1980. The continued dominance of Chiriquí Province in grain production and marketing is clear from the estimates of required total capital expenditures by province. This province accounts for only about 36 percent of the total requirement prior to 1975 but more than 50 percent of that between 1975 and 1980 and 44 percent of the total over the period.

B. Working Capital for Expanded Operations

Substantial sums of working capital are required to finance the inventories of grain and grain products through the marketing channels. The projected added marketing volumes shown in Table 6-1 will add correspondingly to the requirements for working capital within the marketing system. Unless the added funds are provided, the marketing system will not be able to function efficiently and effectively.

Estimated annual average values of grain inventories in marketing channels for 1970, 1975, and 1980 are presented in Table 9-4. The figures are calculated from the volumes of the three crops marketed off farms from Table 6-1. The values of inventories are calculated from the average monthly inventory levels shown for the budgeted operations in Tables 6-8 and 6-9 plus an average marketing period through the total marketing system of two months.

TABLE 9-4. ESTIMATED ANNUAL AVERAGE VALUE OF GRAIN INVENTORIES IN MARKETING CHANNELS BY PROVINCE IN PANAMA, 1970, 1975, and 1980

(\$1,000)

	Bocas del Toro	Chiriquí	Veraguas	Herrera	Los Santos	Coclé	Panamá	Colón	Darién	Total
A. 1970										
1. Rice ^a	9.1	1,830.9	395.2	58.8	53.4	602.6	80.5	19.6	150.6	3,200.7
2. Corn ^b	2.5	256.7	192.0	81.7	55.7	14.6	67.3	19.2	103.5	793.2
3. Beans ^c	1.1	70.4	77.7	3.5	6.3	11.6	9.1	1.8	11.6	193.1
4. Total	<u>12.7</u>	<u>2,158.0</u>	<u>664.9</u>	<u>144.0</u>	<u>115.4</u>	<u>628.8</u>	<u>156.9</u>	<u>40.6</u>	<u>265.7</u>	<u>4,187.0</u>
B. 1975										
1. Rice	12.9	2,368.4	662.7	118.7	53.4	753.0	263.2	63.7	302.9	4,598.9
2. Corn	4.6	419.4	275.0	84.3	119.5	82.1	181.9	32.4	168.6	1,367.8
3. Beans	1.4	52.4	141.5	3.5	6.3	18.6	9.5	2.8	11.6	247.6
4. Total	<u>18.9</u>	<u>2,840.2</u>	<u>1,079.2</u>	<u>206.5</u>	<u>179.2</u>	<u>853.7</u>	<u>454.6</u>	<u>98.9</u>	<u>483.1</u>	<u>6,214.3</u>
5. Increase	6.2	682.2	414.3	62.5	63.8	224.9	297.7	58.3	217.4	2,027.3
C. 1980										
1. Rice	12.9	3,213.0	926.6	150.9	53.4	1,005.3	293.1	77.9	409.4	6,142.5
2. Corn	6.3	540.6	370.9	100.8	171.3	142.6	272.2	40.2	208.8	1,853.7
3. Beans	1.4	36.9	153.3	3.5	6.3	19.0	10.9	3.5	11.6	246.4
4. Total	<u>20.6</u>	<u>3,790.5</u>	<u>1,450.8</u>	<u>255.2</u>	<u>231.0</u>	<u>1,166.9</u>	<u>576.2</u>	<u>121.6</u>	<u>629.8</u>	<u>8,242.6</u>
5. Increase	1.7	950.3	371.6	48.7	51.8	313.2	121.6	22.7	146.7	2,028.3
6. Total Increase	<u>7.9</u>	<u>1,632.5</u>	<u>785.9</u>	<u>111.2</u>	<u>115.6</u>	<u>538.1</u>	<u>419.3</u>	<u>81.0</u>	<u>364.1</u>	<u>4,055.6</u>

^a Average inventory from Table 6-8 plus two months' inventory in system times average price of \$5.00/qq times

^b Marketing volumes from Table 6-1.

^c Average inventory from Table 6-9 plus two months' inventory in system times average price of \$4.00/qq times marketing volume from Table 6-1.

^c Average inventory from Table 6-8 plus two months' inventory in system times average price of \$10.50/qq times marketing volume from Table 6-1.

Adjustments have not been made for the value added through the marketing channels, so the corresponding actual time for the grain in marketing channels is about five or six weeks. The inventory values used for computing Table 9-4 are \$5.00 per quintal for rough rice, \$4.00 per quintal for corn, and \$10.50 per quintal for edible beans.

For the country as a whole, the total increase in capital requirements for financing inventories in marketing channels is almost identical from 1970 to 1975 as from 1975 to 1980 -- \$2,027,300 compared to \$2,028,300. The computed total increase in capital needed for financing inventories over the ten-year period is \$4,055,600, or an average increase of \$405,560 per year. Although a relatively large portion of the additional working capital requirement is concentrated in Chiriquí (about 40 percent), the balance is more evenly spread among the other provinces than is true of the needed capital outlay for marketing facilities. Other provinces with major additional working capital requirements include Veraguas (19 percent), Coclé (13 percent), Panamá (10 percent), and Darién (9 percent of the total additional requirement for the country).

It should be noted that the figures in Table 9-4 represent average monthly inventory financing requirements throughout the year. The actual requirements from month to month will fluctuate around these averages by as much as 50 percent. The peak requirements will continue to be in October through December following the major off-farm marketings of rice and corn. The minimum requirements will continue to be in July and August prior to start of harvest of the new crop. This will apply to the added requirement as well as to the total working capital requirements shown in Table 9-4. The average additional working capital requirement for financing inventories of about \$400,000 per year will fluctuate from about \$600,000 additional per year during October,

November, and December to about \$200,000 additional per year during July and August.

C. Price Supports and Regulation

The recommendations regarding Panama's grain price supports and regulations which will involve added expenditure for administration include (1) establishing price differentials for seasonal and geographic patterns, (2) establishing separate classes and price supports for flint corn and dent corn, (3) establishing price supports for grain sorghum, (4) leasing unused IFE marketing facilities to the private trade, and (5) increasing imports of feed grain to support the growing poultry and livestock industries. The added administrative cost for establishing and operating each of these recommended programs may be looked upon as an investment, because each of them will more than pay for itself over time in reduced cost or increased income to the Government.

The recommended geographic and seasonal differentials in price support levels will reduce the annual operating losses incurred by IFE in marketing rice, corn, and edible beans delivered under the price support program. The geographic differentials will reduce the losses absorbed by IFE on grain transportation costs for shipments to Panamá from Chiriquí and Darién by \$0.15 per quintal for rough rice (about \$0.25 per quintal for milled rice), \$0.25 per quintal for corn, and \$0.25 per quintal for edible beans. The seasonal differences will serve to reduce the losses incurred by IFE on the storage of grain delivered under the price support program by \$0.05 per quintal per month on rice and corn and by \$0.25 per quintal per month on edible beans (see Sections D, E, and F of Chapter 7).

The recommended support price differential for flint corn and dent corn will serve to reduce the losses incurred by IFE on take-over corn supplies

to the poultry feed manufacturers. The reduction in this loss will be \$0.25 per quintal when the program is initiated and more as the price spread between dent corn and flint corn is widened.

Support prices for grain sorghum are recommended as soon as research and farm demonstration have proven the crop to be economically profitable. When this point is reached, most of the production will be on large mechanized farms in Chiriquí, Darién, and Coclé Provinces. If the response is good and substantial volumes are delivered under the price support program, IFE will be able to reduce per-unit marketing costs of corn through more effective utilization of existing facilities. If the grain sorghum volume proves sufficient to justify earlier conversion to bulk handling from combine through to the final use in feed manufacture, the resulting reduction in per-unit marketing costs for corn will be substantial.

The recommended leasing of up to 80 percent of idle IFE marketing facilities to the private trade will provide a source of direct income to Government price support operations. The total annual income from this source can be substantial in years when market prices remain above support levels and little grain is delivered under the price support program.

The recommended increased imports of feed grain to help supply deficits until Panama's production of dent corn and grain sorghum can be increased will provide an additional source of direct income to IFE. The longer range outlook indicates that world market prices for feed grains will remain substantially below the recommended selling prices to the domestic formula feed industry. It is probable that the import program will produce an income to the Government of at least \$0.50 per quintal.

These benefits in reduced cost and increased income to IFE will be gained only if an investment is made in staff time and expenses for developing the

recommended programs. Some of the investment will be of a non-recurring nature, needed only once to develop and initiate the program. The other part of the investment in the programs will be in the nature of added annual operating costs for administration. The estimated additional costs of initiating and administering the five recommended programs in Panama are shown in Table 9-5. The non-recurring development costs are separated into staff costs, costs for technical assistance, and operating expenses. The total added annual cost for administering each program once it is initiated is shown as a single figure. All of the cost estimates are shown in units of \$1,000.

The estimated total cost for developing the five recommended programs is \$423,000. Of this amount, \$198,000 would be incurred in 1972-1973, \$185,000 in 1973-1974, and \$40,000 in 1974-1975. Once all five programs are in operation, the estimated total added administrative expense is \$225,000 per year, making a total of \$1,535,000 through 1979-1980. Over the period, the combined estimate of development cost and added annual administrative cost is about \$2 million (\$1,958,000).

D. Market News and Outlook

The complete crop and market news reporting service discussed in Section B of Chapter 8 is essential for the balanced development of the grain sub-sector and is recommended for priority implementation in Panama. All segments of the sub-sector from grain producers to food retailers need the service. However, it is difficult if not impossible to assess charges so that the service can be made self-supporting. The usual procedure, and that recommended for Panama, is for the Government to provide the crop and market news service at no direct charge to the users. This means that the costs of assembling the data, analysis and preparation of reports, and dissemination of the information must be supported from general Government revenues.

TABLE 9-5. ESTIMATED DEVELOPMENT AND ANNUAL COSTS FOR RECOMMENDED
PRICE SUPPORT AND REGULATION PROGRAMS IN PANAMA

(\$1,000)

Program and Year	Development Costs			Total	Total Annual Cost
	Staff	Technical Assistance	Operating Expense		
A. Seasonal and Geographic Price Differentials					
1. 1972-73	25.0	25.0	10.0	60.0	
2. 1973-74	25.0		20.0	45.0	50.0
B. Flint and Dent Corn					
1. 1972-73	15.0	15.0	8.0	38.0	
2. 1973-74	20.0		15.0	35.0	25.0
C. Grain Sorghum					
1. 1973-74	20.0	15.0	15.0	50.0	
2. 1974-75	20.0		20.0	40.0	40.0
D. Facility Leasing					
1. 1972-73	30.0	25.0	15.0	70.0	
2. 1973-74	30.0		25.0	55.0	70.0
E. Feed Grain Imports					
1. 1972-73	20.0		10.0	30.0	40.0
2. 1973-74					
F. All Programs					
1. 1972-73	90.0	65.0	43.0	198.0	
2. 1973-74	95.0	15.0	75.0	185.0	185.0
3. 1974-75	20.0		20.0	40.0	225.0
4. Beyond 1975					225.0
5. Total	205.0	80.0	138.0	423.0	1,535.0 ^a

^aThrough 1979-80

The estimated costs of developing and implementing the recommended crop and marketing news service are shown in Table 9-6. The estimates are based on the assumption that the service will be developed by building upon the present crop and market statistical reporting already in operation by the Bureau of Statistics and Census. It is believed that the recommended program can be developed and implemented in this manner much more effectively and economically than in any other way in Panama because it represents building upon a successful running start. The cost estimates represent additions to the present budget of the Bureau of Statistics and Census.

The estimated costs for the recommended program are presented in two parts. The first is the non-recurring development and testing and the second is for the annual operating costs of the program once development and testing is completed. The estimates are developed separately for the three major types of reports -- (1) crop conditions and statistics, (2) volumes and prices by market, (3) industry conditions and statistics. The estimated total cost of developing and testing the programs is \$370,000. This figure includes \$165,000 for staff and technical assistance, \$135,000 for field and operating expenses and \$70,000 for new equipment and computer rental during the development period.

The estimated annual operating expense over and above that for the present crop and market reporting is \$304,000 during the first two years when \$14,000 is provided for technical assistance, and \$290,000 thereafter. The total estimated expense for development and implementation shown in Section C of Table 9-6 is based on the assumption that development and testing would be completed during 1972-1973, and the program would be implemented on July 1, 1973. On this basis, the estimated total cost for the recommended crop and market news program through 1979-1980 is \$2,428,000.

TABLE 9-6. ESTIMATED COSTS OF DEVELOPING AND IMPLEMENTING THE
RECOMMENDED CROP AND MARKET NEWS SERVICE
(\$1,000)

Item	Crop Conditions and Statistics	Market Volumes and Prices	Industry Conditions and Statistics	Total All Reports
A. Development and Testing				
1. Staff	40.0	35.0	35.0	110.0
2. Technical Assistance	20.0	20.0	15.0	55.0
3. Equipment	30.0	20.0	20.0	70.0
4. Field Expense	25.0	20.0	20.0	65.0
5. Operating Expense	<u>30.0</u>	<u>20.0</u>	<u>20.0</u>	<u>70.0</u>
6. Total	145.0	115.0	110.0	370.0
B. Implementation - Annual				
1. Staff	55.0	30.0	25.0	110.0
2. Technical Assistance ^a	6.0	4.0	4.0	14.0
3. Equipment	15.0	10.0	10.0	35.0
4. Field Expense	25.0	15.0	15.0	55.0
5. Operating Expense	<u>40.0</u>	<u>30.0</u>	<u>20.0</u>	<u>90.0</u>
6. Total	141.0	89.0	74.0	304.0
C. Total Annual Expense				
1972-73				370.0
1973-74				304.0
1974-75				304.0
1975 onward				<u>290.0</u> ^b
				2,428.0 ^b

^aFirst two years of operation only

^bTotal through 1979-1980

E. Expanded Marketing Research

It is believed that the recommended marketing research program for Panama discussed in Section D of Chapter 8 should be financed from public funds. Eventually, the industry should be willing to help pay for the research and a small per-unit tax on the volume of grain handled to support marketing research and marketing education might be justified. However, until private millers and handlers learn the importance and value of market research, public support and control of these programs is warranted.

It is believed that a total market research budget of \$150,000 per year, about equally divided between technical research and economic and management research, is needed in Panama over the next several years. During the first two or three years, the expenditures would be about as follows (in \$1,000):

<u>Item</u>	<u>Technical Research</u>	<u>Economic and Management Research</u>	<u>Total</u>
1. Staff	25.0	30.0	55.0
2. Technical Assistance	20.0	20.0	40.0
3. Operating Expense	15.0	10.0	25.0
4. Supporting Services	<u>15.0</u>	<u>15.0</u>	<u>30.0</u>
5. Total	75.0	75.0	150.0

After two or three years, it is probable that the technical assistance could be reduced or eliminated and the staff and other budget items increased accordingly. At an annual budget of \$150,000, the total cost for the marketing research program through 1979-1980 would be \$1,200,000.

F. Marketing Education and Training

As discussed in Section F of Chapter 8, education and training programs are needed by those at all levels in the grain marketing system. At least in the foreseeable future the budget for these programs needs to be provided from public funds. Some educational work is being done with processors and marketing agencies by IFE and other public agencies but these programs need

to be expanded and formalized. A substantial annual budget is required to do so. A specific annual budget in the order of \$250,000 for the next several years is suggested. A general breakdown of this budget for the first two years might be about as follows (in \$1,000):

<u>Item</u>	<u>Technical Training</u>	<u>Management Training</u>	<u>Total</u>
1. Staff	40.0	45.0	85.0
2. Technical assistance	15.0	15.0	30.0
3. Operating expense	40.0	30.0	70.0
4. Supporting services	<u>30.0</u>	<u>35.0</u>	<u>65.0</u>
5. Total	125.0	125.0	250.0

Later, as the program develops, the technical assistance can be reduced and the staff budget increased accordingly. The total cost for the marketing education and training programs over the next eight years will be \$2,000,000 at the recommended annual budget.

G. Grain Grading and Inspection

The grain inspection, grading, and milling quality testing program by IFE is well under way. The price support program wisely is being used to stimulate trading on the basis of grades and quality in private channels. The present program is basically sound and can be expanded if budget is provided.

The only recommended changes in the existing grain standards and methods of grading are the separation of corn into two classes, flint and dent, and the addition of grain sorghum standards when this crop comes into commercial production. Neither of these recommendations will add greatly to total grading and inspection costs. The major additions to these costs will come from (1) expansion of the coverage of inspection and (2) the added market volume of grain to be graded. Both of these will require additional staff, grading and laboratory equipment, manuals, and so on. In addition, the recommended

central laboratory for training inspectors and handling appeal grades will need to be budgeted.

The estimated additional budget for grain inspection and grading includes both added capital investment and added annual costs. The estimated capital investment for grading and laboratory equipment and facilities is as follows:

<u>Marketing Year</u>	<u>Estimated Cost (\$1000)</u>
1972-1973	65.0
Annual thereafter	7.0

The estimated additional annual cost for the recommended program is as follows:

<u>Item</u>	<u>Annual Cost (\$1000)</u>
1. Staff	40.0
2. Materials and publications	15.0
3. Operating expense	20.0
4. Supporting services	<u>25.0</u>
5. Total	100.0

These figures make the estimated total annual cost for the program \$165,000 for 1972-1973 and \$107,000 thereafter. The total cost through 1979-1980 is \$914,000.

It is probable that some of the estimated cost for the inspection, grading, and laboratory program could be recovered through fees for the grading and laboratory tests of milling quality. However, over the next few years, it is recommended that the total budget be provided from public funds in order to encourage trading on the basis of grades and tests of milling quality.

H. Public Grain Warehousing

It is believed that the development of a public grain warehousing system is less urgent than the other recommended programs to support grain marketing in Panama. At the projected rate of development of grain production and marketing, it appears that the optimum timing for implementation of the public grain warehousing program will be about July 1975. If so, the development

costs for the program will come prior to that date, but there will be no annual operating costs until the 1975-1980 period. The proposed budget for development of public grain warehousing is based on this time schedule.

The estimated budget for the development phase of the recommended public warehousing program is as follows:

<u>Item</u>	<u>Estimated Cost (\$1000)</u>
1. Staff	35.0
2. Technical Assistance	25.0
3. Travel and Operating Expense	25.0
4. Supporting Services	<u>25.0</u>
5. Total	110.0

The estimated annual operating expense for the program after implementation is as follows:

<u>Item</u>	<u>Annual Cost (\$1000)</u>
1. Staff	45.0
2. Technical Assistance	5.0
3. Operating Expense	25.0
4. Supporting Services	<u>15.0</u>
5. Total	90.0

If developed for implementation in July of 1975, the estimated total cost of the recommended public grain warehousing program through 1979-1980 will be \$560,000. Of this amount, \$110,000 will be needed prior to July of 1975 and the \$450,000 will be needed in the 1975 to 1980 period.

I. Summary of Estimated Expenditures for Recommended Programs

The estimated expenditures for the recommended programs to support grain marketing in Panama through 1980 are summarized in Table 9-7. The estimated total needed expenditure is \$8,204,200 by 1975 and \$10,902,600 by 1980. Over the total period about 31 percent of the total estimated budget of \$19,106,800 will be needed for marketing facilities, including transport equipment. Another 21 percent will be needed for added working capital to

TABLE 9-7. SUMMARY OF ESTIMATED COSTS FOR RECOMMENDED GRAIN MARKETING PROGRAMS IN PANAMA BY 1975 and 1980

(\$1,000)

<u>Program</u>	<u>1975</u>	<u>1980</u>	<u>Total</u>
1. Storage, milling and conditioning	1,389.7	1,652.9	3,042.6
2. Grain trucks	1,287.2	1,661.4	2,948.6
3. Working capital	2,027.3	2,028.3	4,055.6
4. Price supports	833.0	1,125.0	1,958.0
5. Market news	978.0	1,450.0	2,428.0
6. Market research	450.0	750.0	1,200.0
7. Marketing education	750.0	1,250.0	2,000.0
8. Grain grading	379.0	535.0	914.0
9. Public warehousing	<u>110.0</u>	<u>450.0</u>	<u>560.0</u>
Total	8,204.2	10,902.6	19,106.8

finance grain inventories in market channels. The remaining 48 percent will be needed to develop and administer the supporting programs for grain marketing.

The total figure may appear rather large for the development of grain marketing in a country the size of Panama, but it must be remembered that estimates cover a full eight-year period. The corresponding average annual expenditure is \$2,388,350. The total estimated expenditure amounts to about \$0.55 per quintal on the projected domestic grain production to be marketed over the expenditure period.

CHAPTER X

BUDGETED ANNUAL OPERATING COSTS AND RETURN ON INVESTMENT

In order to test the profitability of grain milling and marketing operations in Panama, operating cost budgets have been developed for a representative rice milling and storage operation and a representative corn storage and merchandising operation. The rice milling operation is based on the capacities, volumes, and margins presented in Tables 6-8 and 6-10. The corn handling operation is based on the capacity and operating schedules presented in Tables 6-9 and 6-11. The budgeted operating costs for the two operations are related to the corresponding schedules of total capital investment and operating income to determine the discounted present values, benefit-cost ratios, and internal rate of return on total capital investment.

Many of the operating cost items have been standardized in the budgets to eliminate the variations that can be expected from one commercial operation to another. Effort has been made to reflect all variable and fixed operating costs, including those such as shrinkage and interest on working capital which are often overlooked in calculations of handling, storage, and processing costs in Panama. It is hoped that the budgeted operating cost schedules can serve as guidelines for calculating and summarizing operating costs from accounting records for individual operations and for analyzing the feasibility of proposed capital investment in specific grain marketing facilities.

A. Operating Costs for Rice Milling

The budgeted annual operating costs for the rice milling operation are shown in Table 10-1. The cost budgets reflect the capacities and operating schedules presented in Tables 6-8 and 6-10. The capacities include 40,000

TABLE 10-1. BUDGETED ANNUAL COSTS FOR RICE MILLING OPERATION IN PANAMA WITH CAPACITIES AND VOLUMES FROM TABLE 6-8.

(\$1,000)

Item	Cleaning and Drying	Storage	Milling	Handling and Marketing	Total
A. Operating Costs					
1. Wages and salaries	4.8	2.4	18.0	4.8	30.0
2. Fuel and power	2.1	0.4	1.5	0.2	4.2
3. Repairs and maintenance	0.8	0.7	1.6	0.1	3.2
4. Supplies and materials	0.2	0.6	0.4	1.3	2.5
5. Interest	0.0	10.1	0.0	1.6	11.7
6. Shrinkage	(0.5%) 2.5	(0.05%) 0.5	0.0	(0.2%) 1.0	4.0
7. Other	0.4	0.2	1.0	0.8	2.4
8. Total	10.8	14.9	22.5	9.8	58.0
9. Total per quintal	10.8¢	7.4¢	38.8¢	16.9¢	\$1.00
B. Fixed Costs					
1. Administration	0.7	0.8	5.5	3.0	10.0
2. Office costs	0.2	0.5	2.2	1.5	4.4
3. Depreciation	1.2	1.3	4.5	1.5	8.5
4. Taxes and insurance	0.1	0.4	0.6	0.2	1.3
5. Interest	0.6	2.6	6.9	1.5	11.6
6. Other	0.3	0.3	1.0	0.5	2.1
7. Total	3.1	5.9	20.7	8.2	37.9
C. Total Cost					
1. Total	13.9	20.8	43.2	18.0	95.9
2. Total per					
a. Quintal rough rice	13.9¢	20.8¢	43.2¢	18.0¢	95.9¢
b. Quintal month		10.3¢			
c. Quintal milled rice			74.5¢	31.0¢	\$1.65
d. Quintal milled rice-excluding storage					\$1.29

quintals of storage capacity for rough rice, drying and cleaning capacity of 4.0 metric tons per hour, and rice milling capacity of 1.0 metric ton per hour of milled rice. The receiving and handling capacities correspond to those for drying and milling. The annual volumes of operation include purchase of 100,000 quintals of rough rice (basis 14 percent moisture and 0 percent foreign material), 202,000 quintal-months of rough rice storage, and sales of 58,000 quintals of milled rice.

The budgeted annual costs for the rice storage and milling operation include variable operating costs and annual fixed costs. Separate costs are shown for the four operations performed, (1) cleaning and drying, (2) storage, (3) milling, and (4) handling and marketing. All figures are in units of \$1000 except where the units are indicated in the table.

1. Variable Operating Costs

The variable operating costs include plant wages and salaries, fuel and power costs, repairs and maintenance, supplies and materials, interest on working capital, shrinkage, and other miscellaneous costs. The costs from these sources vary directly with the volume handled and tend to remain relatively constant per unit of volume regardless of the total annual volume.

The plant wages and salaries are based on an annual average wage for grain plant workers in Panama of \$600, including the employer's contribution to social security programs. The total annual payroll of \$30,000 corresponds to the equivalent of 50 full-time workers for the budgeted operation. Some 30 of these workers are involved in the two-shift milling operation alone.

The fuel and power costs include fuel for the dryers and power for the entire operation. These costs vary somewhat in Panama, depending upon the location of the mill, but the budgeted total annual cost of \$4,200 is believed to be representative for this volume of operation.

The annual repair and maintenance cost varies from mill to mill and from year to year in the same mill. These costs are standardized at roughly five percent of the original installed machinery cost plus one percent of the original building cost. These percentages are realistic for the use rate for the budgeted operation; they would be slightly less for a lower utilization rate and slightly more for a higher utilization rate.

Supplies and materials include various plant supplies. Major items include grain fumigants (charged to the storage function) and grain sacks (charged to the handling and marketing function). The sack costs are based on the assumption that sound sacks would be reused as is now done in Panama.

The interest cost is assessed to the rough rice inventories in storage and to the milled rice accumulated for sale. The average storage inventories are based on the schedules in Table 6-8. The milled rice inventories are based on the assumption that an average of 10 days' sales is held in stock. An interest charge of one percent per month is used as the cost of working capital.

The shrinkage cost reflects losses in volume that can be expected in normal, well-controlled operations under conditions in Panama. The sources of shrinkage include losses of weight due to grain dust from handling the grain, spillage, respiration of the kernels, and other sources. They do not include weight losses resulting from removal of moisture and foreign material nor from milling yields. The standardized shrinkage rates used are 0.5 percent for cleaning and drying, 0.05 percent per month for storage, and 0.2 percent for grain handling. The "hidden" shrinkage in the milling operation is reflected in the 58 percent milling yield of marketable polished rice.

The budgeted total annual direct operating costs for the 100,000 quintals of rough rice milled is \$58,000. This includes drying and cleaning costs of 10.8 cents per quintal of rough rice, 7.4 cents per quintal-month of rough rice storage, 38.8 cents per quintal of polished rice milled, and 16.9 cents per quintal of milled rice marketed.

2. Annual Fixed Costs

The budgeted annual fixed costs for the rice storage and milling operation include administrative salaries and expenses, office costs, depreciation on buildings and equipment, taxes and insurance on the facilities, interest on capital investment and miscellaneous fixed costs (dues, donations, corporate fees, meeting expense, etc.). These costs may be expected to remain relatively constant regardless of handling volume, so the greater the volume, the lower the fixed cost per unit.

Total annual administrative cost for the operation is standardized at \$10,000. A large percentage of this total is charged to the milling and marketing operations because of the greater requirements for management attention compared to the conditioning and storage operations.

Office costs include bookkeeping and clerical salaries, utilities, telephone, office supplies, depreciation on office equipment, and related expenses. Total annual office costs are standardized at \$4,400, of which 50 percent is charged to the milling operation.

The annual depreciation costs are based on straight-line schedules and average useful lives of 10 years for plant machinery and 30 years for buildings. No depreciation is taken on the land and site preparation costs. The depreciation charged to cleaning and drying applies to the equipment only; that charged to storage applies to the storage structure only. Depreciation on all receiving, conveying, and handling machinery is charged to the handling

and marketing operation. Depreciation charged to milling includes that on the mill machinery plus that on the mill building and warehouse. The total annual depreciation on the plant is \$8,500.

Taxes and insurance are charged at approximately one percent of the original cost of the plant and machinery. The largest portion of this cost is charged to the milling and storage operations.

Interest on the facilities is charged at the annual rate of 10 percent on the depreciated value of buildings and equipment. The depreciated values are assumed to be one-half the original cost of the facilities. On this basis, the annual interest cost for the complete plant is \$11,600, \$6,900 of which applies to the mill building and equipment.

The total annual fixed cost on the complete operation is \$37,900. Of this amount, \$20,700 is charged to milling, \$8,200 to handling and marketing, \$5,900 to storage, and \$3,100 to cleaning and drying.

3. Total Annual Costs

The total annual costs for the budgeted rice storage and milling operation are shown in Section C of Table 10-1. Total costs come to \$95,900, or 95.9 cents per quintal of rough rice handled. Total costs are \$13,900 for cleaning and drying, \$20,800 for storage, \$43,200 for milling and \$18,000 for handling and marketing.

The most meaningful unit cost figure for the storage operation is the cost per quintal-month. The total cost per quintal-month is 10.3 cents, 7.4 cents of which is variable cost and 2.9 cents is fixed cost. Interest on the storage inventory alone represents 5.0 cents per quintal-month of storage.

The most meaningful unit cost figure for milling and for handling and marketing is the cost per quintal of milled rice sold. The total cost for

the entire budgeted operation is \$1.65 per quintal of rough rice. The total cost excluding the storage operation is \$1.29 per quintal of milled rice. Total cost of milling alone is 74.5 cents and that for handling and marketing alone, 31.0 cents per quintal of milled rice sold.

B. Operating Costs for Corn Merchandising

The comparable budgeted annual operating costs for corn merchandising and storage in Panama are shown in Table 10-2. The budgeted costs represent the capacities and volumes presented in Tables 6-9 and 6-11. The capacities include 25,000 quintals of storage capacity, corn cleaning and drying capacity of 3.0 metric tons per hour, and corresponding receiving and handling capacity. The annual volumes include 100,000 quintals merchandised and 167,500 quintal-months of storage.

1. Variable Operating Costs

Budgeted total variable operating costs for the corn handling operation are \$24,400 for the operation as a whole. Of this amount, \$6,400 is charged to cleaning and drying, \$12,100 to storage, and \$5,900 to handling and marketing.

The budgeted wages and salaries are based on a plant crew of 12 men plus additional part-time help in the rush seasons. The largest portion of the \$8,000 for wages and salaries is charged to handling and marketing, but this source also represents a major portion of total annual operating costs for the conditioning and storage functions.

The fuel and power costs are constructed in the same manner as those for the rice operations. They represent average costs for these utilities in Panama, rather than those for a specific location.

The repair and maintenance costs represent average annual expected costs of approximately five percent of the original cost of plant machinery and

TABLE 10-2. BUDGETED ANNUAL COSTS FOR CORN MERCHANDISING
OPERATION IN PANAMA WITH CAPACITIES AND VOLUMES
FROM TABLE 6-9.

(\$1,000)

Item	Cleaning and Drying	Storage	Handling and Marketing	Total
A. Operating Costs				
1. Wages and salaries	2.4	2.0	3.6	8.0
2. Fuel and power	1.5	0.3	0.1	1.9
3. Repairs and maintenance	0.5	0.6	0.1	1.2
4. Supplies and materials	0.2	0.5	0.8	1.5
5. Interest	0.0	8.2	0.0	8.2
6. Shrinkage	(0.4%) 1.5	(0.05%) 0.3	(0.2%) 1.0	2.8
7. Other	<u>0.3</u>	<u>0.2</u>	<u>0.3</u>	<u>0.8</u>
8. Total	<u>6.4</u>	<u>12.1</u>	<u>5.9</u>	<u>24.4</u>
9. Total per quintal	6.4¢	7.2¢	5.9¢	24.4¢
B. Fixed Costs				
1. Administration	0.3	0.5	2.0	2.8
2. Office costs	0.1	0.3	0.5	0.9
3. Depreciation	0.9	0.8	0.6	2.3
4. Taxes and insurance	0.1	0.2	0.1	0.4
5. Interest	0.5	1.3	0.3	2.1
6. Other	<u>0.1</u>	<u>0.2</u>	<u>0.2</u>	<u>0.5</u>
7. Total	<u>2.0</u>	<u>3.3</u>	<u>3.7</u>	<u>9.0</u>
C. Total Cost				
1. Total	8.4	15.4	9.6	33.4
2. Total per				
a. Quintal handled	8.4¢	15.4¢	9.6¢	33.4¢
b. Quintal month		9.2¢		

one percent of the original cost of structures. Supplies and material costs include those for sacks, fumigants, and other plant materials.

The interest cost is based on a standard charge of one percent per month on the cost value of corn in inventory. This entire cost of \$8,200 is charged to the storage function.

Shrinkage costs represent normal losses which can be expected under well-managed operations in Panama. The shrinkage rates include 0.4 percent for the cleaning and drying operation, 0.05 percent per month for the storage operation, and 0.2 percent for the handling and marketing operation.

Other variable costs include miscellaneous operating items such as contract expenses and other items not included in the previous categories.

2. Annual Fixed Costs

Total annual fixed costs for the corn merchandising and storage operation are fairly low at \$9,000 per year. The total is divided among the three operating functions with \$2,000 to cleaning and drying, \$3,300 to storage, and \$3,700 to handling and marketing.

Administration (\$2,800), depreciation (\$2,300) and interest on investment (\$2,100) represent the major sources of fixed cost. Depreciation charges are based on straight-line schedules and a useful life of 10 years for plant machinery and 30 years for buildings. Interest costs are computed at 10 percent of the depreciated value of investment in the plant. The depreciated value of facilities is assumed to equal one-half the original cost.

3. Total Annual Costs

The budgeted total annual cost for the 100,000-quintal corn merchandising operation is \$33,400. This cost is made up of \$8,400 for cleaning and drying, \$15,400 for storage, and \$9,600 for handling and marketing.

The total cost for the storage function is 9.2 cents per quintal-month of storage. This is made up of 7.2 cents in variable operating cost and 2.0 cents per quintal-month in annual fixed cost. The charge for working capital alone represents about 4.9 cents per quintal-month, or about 53 percent of the total storage cost.

The total budgeted annual cost for the corn operation amounts to 33.4 cents per quintal handled. If the storage function is excluded, the total cost per quintal for corn merchandising alone is 18 cents per quintal.

C. Annual Operating Revenue for Rice and Corn Operations

The budgeted net operating revenues for the rice milling and corn merchandising operations are obtained from the sales schedule in Tables 6-10 and 6-11 and the annual operating costs from Tables 10-1 and 10-2. The results are summarized in Table 10-3. Separate columns are shown for the storage function and for the remaining functions in the two operations. The total operating costs are divided into two categories. The first is the "operating cost", which includes the total fixed and variable operating cost less the "investment cost". The second category, "investment cost", includes the interest on working capital, annual depreciation, and interest on capital investment in facilities and equipment.

The Lines "3" subtotals in Table 10-3, "Income before investment cost", are relevant for analyzing the potential earning power of total capital investment in rice milling and grain merchandising facilities in Panama. The total "net income before tax" on Lines "5" is relevant for comparison with annual accounting operating statements for these kinds of facilities or with budgeted annual operating statements of alternatives.

TABLE 10-3. BUDGETED ANNUAL OPERATING REVENUES FOR RICE MILLING
AND CORN MERCHANDISING OPERATIONS IN TABLES 6-8 and 6-9.

(Dollars)

Item	Grain Storage	Milling and Handling	Total
A. Rice Milling			
1. Revenue ^a	10,671	157,269	167,940
2. Operating cost ^b	<u>6,800</u>	<u>57,300</u>	<u>64,100</u>
3. Income before investment cost	3,871	99,969	103,840
4. Investment cost ^c	<u>14,000</u>	<u>17,800</u>	<u>31,800</u>
5. Net income before tax	-10,129	82,169	72,040
B. Corn Merchandising			
1. Revenue ^d	17,550	15,000	32,550
2. Operating cost ^e	<u>5,100</u>	<u>15,700</u>	<u>20,800</u>
3. Income before investment cost	12,450	- 700	11,750
4. Investment cost ^f	<u>10,300</u>	<u>2,300</u>	<u>12,600</u>
5. Net income before tax	2,150	- 3,000	- 850

^aTable 6-10

^bTable 10-1; totals minus investment costs

^cTable 10-1; lines A-5, B-3 and B-5

^dTable 6-11

^eTable 10-2; totals minus investment costs

^fTable 10-2; lines A-5, B-3, and B-5

1. Rice Milling Operation

The budgeted annual operating revenues shown in Section A of Table 10-3 indicate that the total rice storage and milling operation is quite profitable. The operation provides an annual budgeted income before investment cost of \$103,840, and an annual net income before income tax of \$72,040. Viewed alone, however, the rough rice storage function is not profitable. This function returns \$3,871 before investment costs, but shows a loss of \$10,129 after the investment costs are subtracted.

This seems to be a clear case in which the storage function is complementary with rice milling and merchandising function. The storage function can be operated at a loss because it permits much more effective use of the milling and marketing facilities throughout the year. The complementary relationship is such that as long as the milling operation remains profitable, the total operation is more profitable with the storage function than would be true without it. The cleaning and drying functions fall into the same category, because no direct income is derived from these services. The established dockage scales in Panama cover only the losses in weight associated with cleaning and drying the grain. They do not provide a direct income to cover the 13.9 cents per-quintal cost of the cleaning and drying.

This situation gives rise to the interesting reality in Panama that rice conditioning and storage is economically justified by the milling industry and by IFE installations which include rice mills but not by commercial rice producers nor by grain handlers without rice milling facilities. The situation is not an ideal one because it encourages integration and restricts entry into the individual functions such as grain storage. It is probable that the total marketing industry is less competitive and total marketing margins higher than would be true if each of the marketing functions

were to stand on its own feed economically. The recommended differentials in support prices and retail ceiling prices and the recommended expansion of the grain grading system will help to rectify these conditions in the years ahead.

2. Grain Merchandising Operation

The budgeted annual operating revenues for grain merchandising shown in Section B of Table 10-3 indicate that as a whole the operation is not profitable. The total income before investment cost is \$11,750, but the net income before income tax is -\$850. The operation as budgeted will not pay out at the capital charges used of 10 percent per year for fixed capital and 1 percent per month for working capital.

The corn storage operation alone does pay out at the budgeted figures. The storage function returns \$12,450 before investment cost and \$2,150 net income after deduction of the investment cost. One reason why the corn storage function is more profitable than the rice storage function is that the seasonal price pattern for corn is more favorable to storage. The other reason is that the harvesting pattern for corn permits more effective utilization of the storage capacity, so the total per-unit cost of storage is less.

It is clear that the budgeted handling margin of \$0.15 per quintal is not adequate to cover corn cleaning and drying costs plus those of handling and marketing. The operating cost for these functions of the corn merchandising operation is \$15,700 -- \$700 more than the gross revenue from merchandising. At a total operating cost of \$9,600, the merchandising function would pay out nicely if it were not for the costs and no off-setting income for cleaning and drying. It appears that appropriate discount scales or more severe dockage scales for excess moisture and foreign material in corn would be an effective way to make specialized corn storage and merchandising operations profitable in Panama.

Under the existing handling margins and dockage scales, corn drying, cleaning, and merchandising is a profitable supplemental enterprise for rice millers. Millers can charge most of the fixed costs shown in Table 10-2 to the rice operation and, therefore, operate a supplemental corn merchandising enterprise at only slightly above the direct variable operating costs. If they were able to eliminate all but \$1,000 of the fixed cost chargeable to corn, the \$850 loss in Section B of Table 10-3 would become a \$7,250 profit before income tax. This situation further explains the dominant role of rice millers in Panama's grain marketing and why there are relatively few specialized corn merchandisers.

D. Estimated Capital Investment and Rate of Return

The estimated total capital investments for the budgeted rice milling and corn merchandising operations are shown in Table 10-4. The estimates are given separately for the four functions and for the operations as a whole. The capital cost estimate for plant and facilities includes land with site preparation, buildings with utilities, and the installed cost of equipment. The working capital estimate includes the investment in grain inventories, both during storage and during warehousing awaiting sale and delivery. All figures are shown in units of \$1,000.

1. Rice Milling Operation

The estimated total capital investment for the budgeted rice milling operation from Table 6-8 is shown in Section A of Table 10-4. The total estimate includes \$25,000 for site, \$110,000 for buildings, \$72,000 for machinery and equipment and \$97,500 for working capital. The estimate for the storage function alone includes \$6,000 for site, \$40,000 for building and \$84,200 for working capital, for a total of \$130,200.

These estimated capital costs are related to the budgeted annual income and expense (before interest and depreciation) from Table 10-3 for the computer analysis of internal rate of return, discounted present values, and benefit-cost ratios for the rice milling operation shown in Tables 10-5 and 10-6. The analysis summarized in Table 10-5 shows the annual rate of return on investment in the total rice milling operation to be 36.47 percent -- a highly attractive rate. That summarized in Table 10-6 shows the rate of return for the storage function alone to be only 2.02 percent -- substantially less than the cost of capital. The computer analysis verifies and reinforces the comments regarding the rice milling and storage operations made in Section C above.

2. Corn Merchandising Operation

The estimated total capital investment for the budgeted corn merchandising operation from Table 6-9 is shown in Section B of Table 10-4. The total estimated investment of \$123,300 includes \$55,000 for plant and facilities and \$68,300 for working capital. The facilities estimate includes \$5,000 for site, \$35,000 for buildings, and \$15,000 for machinery and equipment. The estimated capital cost for the storage function alone is \$98,300, of which \$68,300 is for working capital, \$25,000 for buildings, and \$5,000 for the land and site preparation.

These estimated capital investment figures plus the budgeted annual income and expense figures from Section B of Table 10-3 are the basis for the computer analysis of profitability for the corn merchandising operation shown in Tables 10-7 and 10-8. The annual rate of return on total capital investment for the entire operation is only 8.29 percent (Table 10-7). This return is somewhat less than satisfactory for private investment under existing conditions in Panama. The annual return for the storage function of

the budgeted corn merchandising operation is 11.62 percent (Table 10-8). Even this rate is marginal for private investment in Panama.

The analyses summarized in Tables 10-7 and 10-8 further reinforce the statements regarding corn merchandising in Panama. So long as the basic market conditions reflected in the budgeted costs and returns prevail, the rice milling industry can be expected to expand grain storage and corn merchandising functions. Investment is not likely to flow into specialized corn merchandising operations nor into grain storage facilities on farms or at other locations not controlled by the millers. However, these market conditions can be expected to change through time as the grain sub-sector in Panama continues to develop. A number of the specific recommendations presented herein will help to bring changes which are more conducive to specialized storage and grain merchandising operations.

TABLE 10-4. ESTIMATED TOTAL CAPITAL INVESTMENT FOR BUDGETED RICE
MILLING AND CORN MERCHANDISING OPERATIONS IN PANAMA
(\$1,000)

Item	Cleaning and Drying	Storage	Milling	Handling and Marketing	Total
A. Rice Milling					
1. Land		6.0	19.0		25.0
2. Buildings		40.0	70.0		110.0
3. Machinery and Equipment	12.0		30.0	30.0	72.0
4. Total facilities	12.0	46.0	119.0	30.0	207.0
5. Working capital		84.2		13.3	97.5
6. Total investment	12.0	130.2	119.0	43.3	304.5
B. Corn Merchandising					
1. Land		5.0			5.0
2. Buildings		25.0		10.0	35.0
3. Machinery and equipment	9.0			6.0	15.0
4. Total facilities	9.0	30.0		16.0	55.0
5. Working capital		68.3			68.3
6. Total investment	9.0	98.3		16.0	123.3

I N V E S T M E N T F E A S I B I L I T Y A N A L Y S I S

TABLE 10- 5. BUDGETED 100,000-QUINTAL RICE MILLING OPERATION IN PANAMA
A. TOTAL OPERATION

ANNUAL RETURN ON CAPITAL 36.47 PERCENT

YEAR		INVESTMENT (DOLLARS)			OPERATING (DOLLARS)			PRESENT	PRESENT VALUE	
NO.	IDENT.	FACILITIES	WORKING CAPITAL	TOTAL	TOTAL REVENUE	OPERATING EXPENSES **	NET REVENUE	VALUE FACTOR	INVESTMENT	NET REVENUE
0	1972	207000.	0.	207000.	0.	0.	0.	1.0000	207000.	0.
1	1973	0.	97500.	97500.	167940.	64100.	103840.	0.7328	71446.	76092.
2	1974	0.	0.	0.	167940.	64100.	103840.	0.5370	0.	55758.
3	1975	0.	0.	0.	167940.	64100.	103840.	0.3935	0.	40859.
4	1976	0.	0.	0.	167940.	64100.	103840.	0.2883	0.	29940.
5	1977	0.	0.	0.	167940.	64100.	103840.	0.2113	0.	21940.
6	1978	0.	0.	0.	167940.	64100.	103840.	0.1548	0.	16077.
7	1979	0.	0.	0.	167940.	64100.	103840.	0.1135	0.	11781.
8	1980	0.	0.	0.	167940.	64100.	103840.	0.0831	0.	8633.
9	1981	0.	0.	0.	167940.	64100.	103840.	0.0609	0.	6326.
10	1982	0.	0.	0.	167940.	64100.	103840.	0.0446	0.	4635.
11	1983	-98330.	-97500.	-195830.	0.	0.	0.	0.0327	-6406.	0.
TOTAL		108670.	0.	108670.	1679400.	641000.	1038400.		272040.	272040.

INTEREST
PER CENT

2.00
6.00
10.00
15.00
25.00
50.00

BENEFIT/COST
RATIO

6.43
3.90
2.81
2.09
1.38
0.76

PRESENT VALUE IN DOLLARS
REVENUE OUTLAY BALANCE

932752. 145089. 787662.
764271. 195820. 568451.
638052. 226999. 411053.
521149. 249690. 271459.
370761. 268178. 102583.
204079. 269736. -65657.

**EXCLUDING DEPRECIATION, INTEREST, AND INCOME TAX

I N V E S T M E N T F E A S I B I L I T Y A N A L Y S I S

TABLE 10-6. BUDGETED 100,000-QUINTAL RICE MILLING OPERATION IN PANAMA
B. STORAGE FUNCTION ONLY

ANNUAL RETURN ON CAPITAL 2.02 PERCENT

YEAR		INVESTMENT (DOLLARS)			OPERATING (DOLLARS)			PRESENT VALUE FACTOR	PRESENT VALUE	
NO.	IDENT.	FACILITIES	WORKING CAPITAL	TOTAL	TOTAL REVENUE	OPERATING EXPENSES **	NET REVENUE		INVESTMENT	NET REVENUE
0	1972	46000.	0.	46000.	0.	0.	0.	1.0000	46000.	0.
1	1973	0.	84200.	84200.	10671.	6800.	3871.	0.9802	82533.	3794.
2	1974	0.	0.	0.	10671.	6800.	3871.	0.9608	0.	3719.
3	1975	0.	0.	0.	10671.	6800.	3871.	0.9418	0.	3646.
4	1976	0.	0.	0.	10671.	6800.	3871.	0.9231	0.	3573.
5	1977	0.	0.	0.	10671.	6800.	3871.	0.9049	0.	3503.
6	1978	0.	0.	0.	10671.	6800.	3871.	0.8870	0.	3433.
7	1979	0.	0.	0.	10671.	6800.	3871.	0.8694	0.	3365.
8	1980	0.	0.	0.	10671.	6800.	3871.	0.8522	0.	3299.
9	1981	0.	0.	0.	10671.	6800.	3871.	0.8353	0.	3234.
10	1982	0.	0.	0.	10671.	6800.	3871.	0.8188	0.	3170.
11	1983	-32670.	-84200.	-116870.	0.	0.	0.	0.8026	-93797.	0.
TOTAL		13330.	0.	13330.	106710.	68000.	38710.		34736.	34736.

INTEREST PER CENT

BENEFIT/COST RATIO

PRESENT VALUE IN DOLLARS
REVENUE OUTLAY BALANCE

2.00	1.01	34772.	34555.	217.
6.00	0.45	28491.	63868.	-35377.
10.00	0.29	23786.	81583.	-57798.
15.00	0.21	19428.	94097.	-74669.
25.00	0.13	13821.	103321.	-89500.
50.00	0.08	7608.	100782.	-93174.

**EXCLUDING DEPRECIATION, INTEREST, AND INCOME TAX

I N V E S T M E N T F E A S I B I L I T Y A N A L Y S I S

TABLE 10-7. BUDGETED 100,000-QUINTAL GRAIN MERCHANDISING OPERATION IN PANAMA
A. TOTAL OPERATION

ANNUAL RETURN ON CAPITAL 8.29 PERCENT

YEAR		INVESTMENT (DOLLARS)			OPERATING (DOLLARS)			PRESENT VALUE		
NO.	IDENT.	FACILITIES	WORKING CAPITAL	TOTAL	TOTAL REVENUE	OPERATING EXPENSES **	NET REVENUE	PRESENT VALUE FACTOR	INVESTMENT	NET REVENUE
0	1972	55000.	0.	55000.	0.	0.	0.	1.0000	55000.	0.
1	1973	0.	68300.	68300.	32550.	20800.	11750.	0.9235	63072.	10851.
2	1974	0.	0.	0.	32550.	20800.	11750.	0.8528	0.	10020.
3	1975	0.	0.	0.	32550.	20800.	11750.	0.7875	0.	9253.
4	1976	0.	0.	0.	32550.	20800.	11750.	0.7272	0.	8545.
5	1977	0.	0.	0.	32550.	20800.	11750.	0.6716	0.	7891.
6	1978	0.	0.	0.	32550.	20800.	11750.	0.6202	0.	7287.
7	1979	0.	0.	0.	32550.	20800.	11750.	0.5727	0.	6729.
8	1980	0.	0.	0.	32550.	20800.	11750.	0.5289	0.	6214.
9	1981	0.	0.	0.	32550.	20800.	11750.	0.4884	0.	5738.
10	1982	0.	0.	0.	32550.	20800.	11750.	0.4510	0.	5299.
11	1983	-28330.	-68300.	-96630.	0.	0.	0.	0.4165	-40245.	0.
TOTAL		26670.	0.	26670.	325500.	208000.	117500.		77828.	77828.

INTEREST
PER CENT

BENEFIT/COST
RATIO

PRESENT VALUE IN DOLLARS
REVENUE QUILAY BALANCE

2.00	2.39	105545.	44245.	61301.
6.00	1.26	86481.	68530.	17951.
10.00	0.87	72199.	83223.	-11024.
15.00	0.63	58971.	93621.	-34651.
25.00	0.41	41953.	101340.	-59386.
50.00	0.23	23092.	99416.	-75324.

**EXCLUDING DEPRECIATION, INTEREST, AND INCOME TAX

I N V E S T M E N T F E A S I B I L I T Y A N A L Y S I S

TABLE 10-8. BUDGETED 100,000-QUINTAL GRAIN MERCHANDISING OPERATION IN PANAMA
B. STORAGE FUNCTION ONLY

ANNUAL RETURN ON CAPITAL 11.62 PERCENT

YEAR		INVESTMENT (DOLLARS)			OPERATING (DOLLARS)			PRESENT VALUE FACTOR	PRESENT VALUE	
NO.	IDENT.	FACILITIES	WORKING CAPITAL	TOTAL	TOTAL REVENUE	OPERATING EXPENSES **	NET REVENUE		INVESTMENT	NET REVENUE
0	1972	30000.	68300.	98300.	0.	0.	0.	1.0000	98300.	0.
1	1973	0.	0.	0.	17550.	5100.	12450.	0.8959	0.	11154.
2	1974	0.	0.	0.	17550.	5100.	12450.	0.8026	0.	9993.
3	1975	0.	0.	0.	17550.	5100.	12450.	0.7191	0.	8952.
4	1976	0.	0.	0.	17550.	5100.	12450.	0.6442	0.	8020.
5	1977	0.	0.	0.	17550.	5100.	12450.	0.5771	0.	7185.
6	1978	0.	0.	0.	17550.	5100.	12450.	0.5171	0.	6437.
7	1979	0.	0.	0.	17550.	5100.	12450.	0.4632	0.	5767.
8	1980	0.	0.	0.	17550.	5100.	12450.	0.4150	0.	5167.
9	1981	0.	0.	0.	17550.	5100.	12450.	0.3718	0.	4629.
10	1982	0.	0.	0.	17550.	5100.	12450.	0.3331	0.	4147.
11	1983	-21670.	-68300.	-89970.	0.	0.	0.	0.2984	-26848.	0.
TOTAL		8330.	0.	8330.	175500.	51000.	124500.		71452.	71452.

INTEREST PER CENT

2.00
6.00
10.00
15.00
25.00
50.00

BENEFIT/COST RATIO

4.31
1.80
1.15
0.79
0.49
0.25

PRESENT VALUE IN DOLLARS

REVENUE	OUTLAY	BALANCE
111833.	25940.	85893.
91633.	50905.	40728.
76500.	66766.	9734.
62484.	78962.	-16478.
44453.	90572.	-46119.
24468.	97260.	-72792.

**EXCLUDING DEPRECIATION, INTEREST, AND INCOME TAX