Grain Storage, Processing and Marketing

Report No. 82
August 1980

ASSESSMENT OF PUBLIC SECTOR GRAIN STORAGE AND RELATED INSTITUTIONAL NEEDS, PANAMA

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REPORT SUMMARY

Title of Report/Publication: Assessment of Public Sector Grain Storage and Related Institutional Needs, Panama

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Period of Report/Publication: August 9 through September 7, 1980

Project Title: Technical Assistance in Grain Storage, Processing and Marketing and Agribusiness Development

Contract Number: AID/ta-C-1162

Contractor: Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas

SUMMARY STATEMENT

Analysis of current and future grain production in Panama indicates immediate and long-term needs for additional grain storage capacity.

Recommendations for actions regarding long-term and near-term storage capacity requirements have been elaborated to address this situation. Furthermore, assessments of alternatives to government ownership, institutional situation and institutional needs have been undertaken and recommendations given to improve the public sector of grain postharvest management systems.

ASSESSMENT OF PUBLIC SECTOR GRAIN STORAGE AND RELATED INSTITUTIONAL NEEDS, PANAMA

Prepared by

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for the

AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES DEPARTMENT OF STATE

AID/ta-C-1162
Technical Assistance in Grain Storage, Processing, and Marketing and Agribusiness Development

at the

FOOD AND FEED GRAIN INSTITUTE
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ACRONYMS AND ABBREVIATIONS

Azuero - Combined provinces of Herrera and Los Santos
Bl. - Balboa (Panameian unit of currency)
DNMA - National Directorate of Agricultural Marketing
FFGI - Food and Feed Grain Institute
GOP - Government of Panama
IFE - Economic Development Institute
IMA - Agricultural Marketing Institute
KSU - Kansas State University
MIDA - Ministry of Agricultural Development
QQ - Quintals
USAID - United States Agency for International Development

WEIGHTS AND MEASURES

Quintal = 100 pounds
1 Bl. = $1 U.S.

EXECUTIVE SUMMARY

Charged with the responsibility of carrying out the price stabilization functions of the GOP, IMA's responsibilities are very unique. A policy of price stabilization requires of IMA to stand ready to purchase any amount of grain offered to it by farmers and merchants, at any given time, at stated minimum price support levels. It also requires subsequent adequate disposal of accumulated inventories over time. Normally, these activities will require purchases of grains during the harvest seasons and shortly thereafter and gradual disposal of these purchases during the off-season. In case of national surpluses, export possibilities must be considered. In case of deficits, IMA is responsible for importing the required amounts.

As a consequence of the above, IMA's basic storage needs for grains are of a long-term nature (one year or more). This holds true especially for rough rice, since the country has been in a surplus position for a number of years. Large amounts of rough rice have been held in storage for as long as four years.

Such long-term storage needs require (1) adequate carry over storage capacity, (2) adequate grain storage facilities for such long-term storage, (3) adequate technical expertise in grain storage and preservation, and (4) an adequate management system.

Long-Term Storage Capacity Requirements

In order to effectively carry out its responsibilities of price stabilization activites, IMA will need an additional 1,142,000 quintals of total long-term effective storage capacity by 1985-86. This additional storage capacity requirement is composed of 797,800 quintals for carry over purposes and 344,300 quintals for peak seasonal storage capacity requirements.

This additional capacity does not take into account replacement or rehabilitated storage capacity needs of 428,000 quintals.

The long delays in the implementation of the USAID loan has caused the purchasing power of the loan to shrink significantly. Therefore, it is estimated that only a maximum of 400,000 quintals of storage capacity can be built with available funds. It is recommended that 150,000 quintals of storage space be built in the province of Chiriqui and the remainder of the capacity in the region encompassing the provinces of Cocle, Los Santos and Herrera.

It is obvious that the estimated storage capacity that can be built with available funds does not come near the required total storage capacity which IMA will need by 1985-86 and beyond. It is believed that the above suggested general locations will have the greatest beneficial impact in view of the limited funds.

Near-Term Storage Capacity Requirements

The potential for large purchases of grain by IMA during 1980-81 and 1981-82, due to the recent sharp increase in farm support prices for grains, creates an immediate need for additional storage capacity. It is calculated that increased storage capacity requirement to meet this potential level of purchases could exceed one million quintals without consideration of capacity required during peak purchasing periods.

Failure to maintain the planned construction schedule of proposed facilities will contribute to placing IMA in the same precarious situation it experienced in 1974-75 and 1975-76. Therefore, it is imperative that the current time schedule for construction of planned facilities be ridgidly adhered to. However, given the limited time span, it would be of significant benefit to the organization if completion of facilities were to occur well before the scheduled time.

Moreover, contingency planning should be undertaken in time to address the potential storage deficiency in the near future beyond current and planned facilities. Unless these actions are taken, attempts to support prices through purchasing actions will be hampered by complex storage problems and most likely purchases will sharply decline as was evidenced in the past. The resulting inferior storage practices that will be undertaken will lead to large levels of loss and waste as has occurred during the past five years.

Alternatives to Government Ownership

Current adequate alternatives to supplement government owned storage capacity are apparently very limited since the vast majority of grain storage capacity in the private sector is concerned with storage allied with processing This situation has been brought about by the characteristics of the agricultural pricing policy of the GOP. As a result, it has not given the opportunity to the private sector to perform medium- to long-term storage functions.

The only available type of storage space is flat warehouses which are generally not suitably constructed and equipped for grain storage. Also, these facilities may not be in the desired locations.

Institutional Situation

In the recent past, absence of proper long-term planning and implementation of such plans has affected IMA's overall performance, hampered on-going operations, and reduced its capacity as a facilitating institution considerably. As a result of this, deficiencies in storage capacity and practices has resulted in unduly high levels of waste and losses in IMA's grain operations.

The apparent lack of communication and coordination that exists between IMA's technical personnel and management has only helped to exacerbate this situation. In-house technical expertise has not been used to its fullest in terms of their knowledge via management's consultation and implementation.

Also, technical personnel which have received adequate training seem to be hampered in the implementation of their gained knowledge by either lack of experience or proper guidance by management.

This is reflected in IMA's current storage facilities and their conditions and appearance. A few facilities have undergone changes, minor rehabilitation, and needed repairs. However, the general overall conditions of all facilities, as well as the level of sanitation and rodent, bird and insect control measures still need large amounts of improvement.

IMA's management and their ability to plan, communicate, coordinate, organize and control has been weakened by the lack of timely, adequate, and sufficient internal information about IMA's merchandising operation.

Recently, IMA employed the services of Cooper's and Lynbrand/Chandeck and Bosquez regarding the implementation of grain and cost accounting system. The grain accounting system seems to be working well at the level of purchasing centers and grain storage facilities, and with a few exceptions, has been implemented. However, neither system at present goes beyond an information gathering device. The unit in charge of evaluation and analysis of grain and cost accounting information has not been implemented. Therefore, the data gathering process stops at the basic level of assembly.

Since no data analysis and management information system has been put into operation regarding grain and cost accounting, IMA is therefore unable to (1) correctly adjust for real losses in operations, (2) determine the real cost of operations per quintal of grain handled either in total or by cost centers such as facility or product, and (3) adequately report the results of operations to management and planning. Loss adjustment is further complicated by the lack of standardized sack weight which results in inaccurate physical inventories.

The preceding leads to inability to (1) control operations via cost center regarding undesirable traits, (2) perform adequate budgeting, and (3) perform sound planning based on accurate information.

The third major area in need of strengthening is that of technical, marketing, and economic analysis related to IMA's objectives. The Directorate of Planning, which is responsible for these functions, is hindered by lack of management guidance, lack of internal data, and lack of staff. The Directorate, given this lack of resources, cannot possibly cope with IMA's needs regarding necessary medium- to long-range planning, economic and technical analysis, and recommendations to management.

Institutional Needs

The technical and management areas needing strengthening and in need of intensified efforts essentially speak for themselves. In order to improve the performance of these areas, it is recommended that IMA retain the necessary consultancy advice and services. Such consultancy advice should be used to (1) eliminate the communication - implementation gap which currently exists, and (2) develop a work plan to hire and train the necessary personnel for the proposed facilities, implement such plan, and initiate a sound maintenance program for the new facilities. It is essential that such consultancy advice be retained during the implementation of such plan and for at least one year after operation of new facilities has been initiated.

It is further recommended that a final effort be made by IMA to finish implementation of their total grain and cost accounting systems. Beyond this, it is critical that an evaluation and management information system be put into place to provide for regular, accurate, and timely flow of internal information to those in need of it. This will require standardized sack weight for physical inventory purposes which should be implemented without delay.

Finally, further consultancy advice is needed and should be retained for planning and implementing strengthening efforts in the areas of technical, marketing, and economic studies. Such plans should be formulated around staffing, staff qualification and training as well as information and equipment requirements needed to carry out these efforts.

As marketing becomes more complex and the need for coordination more compelling, marketing research needs to increase. Among areas of need are (1) analysis of demand and supply conditions, (2) analysis of production, market, and demand reactions to price changes, (3) research on marketing systems and marketing structures, (4) research on marketing mechanics and operating efficiencies, (5) research on market development and market performance, and (6) research in the technical areas of adaptive technologies.

Foregone Opportunities Caused by Delay

The unfortunate consequence of the five year delay in building the proposed storage facilities and improving institutional performance is further reflected in the extremely high opportunity cost incurred to date.

This delay has led to increased cost of facilities and inability to decrease high levels of loss. In addition, it has probably led to inefficient high cost operations and foregone benefits to certain sectors of the farming community.

Preliminary monetary calculations of this foregone opportunity reveals that it could be as high as 19.5 million balboas. This could have easily built the entire storage capacity now required!

SECTION I

INTRODUCTION

This report addresses important aspects related to future needs for public sector grain storage in Panama. As a result, an attempt was made to evaluate the total grain storage system currently used in Panama. However, major emphasis was placed on evaluating future storage needs of the Agricultural Marketing Institute (IMA), which has the responsibility of carrying out activities related to the agricultural price stabilization program of the GOP. Therefore, 1985-86 was defined as the target year for assessment of long-range future storage capacity requirements within the public sector.

Terms of Reference

The terms of reference for the assessment of IMA's future grain storage requirements are as follows:

1. Estimate the overall storage capacity needed to enable IMA to stabilize grain prices and ensure an adequate supply of rice, corn and other basic grains to meet market requirements on a year round basis through 1985.

2. Survey existing and planned public and private grain storage facilities to determine the degree to which these requirements are being and will be met.

3. Recommend the size and approximate location for any additional facilities needed.

4. Carry out a cost benefit study which analyzes the net benefits to the Government of Panama from construction/maintenance of additional facilities versus the rental of private facilities.

5. Recommend improvements in the institutional capability of IMA needed to ensure adequate functioning of the grains marketing system in Panama.

6. Summarize methodology and conclusion of the above tasks in a bilingual Spanish/English report.

Data Constraints

Normally, the primary information required to satisfy the above terms of reference is not only extensive in nature, but also must be accurate, timely and available. All of the data used in this assessment has been drawn from the sources given below. These sources were made available to the study team mostly be IMA, though a few items were made available by USAID/Panama and the study team members themselves. However, the data thus obtained represents only a portion of what normally would be required. Furthermore, the quality (accuracy) of the information contained in the different sources varied greatly and was less than adequate overall.

Data from different sources dealing with the same subject matter were difficult to reconcile. Also, information compiled and made available by IMA was sometimes found to be incomplete, not up to date, and inconsistent. Different year designations (calendar year, fiscal year, agricultural year) are not being used consistently, making comparison and analysis rather difficult. Depending on what grain information was being gathered, it would range from adequate, however untimely and unformatted, to hardly any information available such as sorghum production data.

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19. IMA. Dirección de Investigación y Desarrollo, "Programa de Estabilización de Precios del Sorgo," Panamá, julio 1976.

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SECTION II

CURRENT GRAIN STORAGE SITUATION

Assessment of the current storage situation for grain in Panama must take into account how and for what purposes the current available capacity is utilized. Also the type and quality of current storage must be assessed since many of the structures now being used for storage cannot be considered adequate for correct grain storage practices.

Storage Facilities 1975-1980

Grain storage capacities during 1975, 1977 and 1980 for private and government sectors are shown in Tables 1 and 2, respectively.

Over this five year period, private sector grain storage capacity has increased slightly over 15 percent or at an annual rate of 3 percent. Privately owned grain storage accounts for slightly over 69 percent of total grain storage available. The rice milling industry is associated with 94 percent of this storage, the balance being used for storage of corn and grain sorghum primarily by the feed processing industry. Storage capacity associated with milling of rice is used for storage of processed product as well as raw commodity. It is not storage capacity for medium- or long-term storage, but for storage of commodity in preparation for processing. It is estimated that of total available storage capacity associated with milling, 2,311,800 qunitals of capacity would be available for the storage of rough rice. Of this available storage capacity, 1,266,300 quintals of capacity would be in the form of bulk storage and 1,045,500 quintals of capacity in the form of bagged storage.

Government storage capacity increased 59 percent between 1975 and 1980. This increase has been primarily in newly constructed bagged grain storage facilities. The capacity due to rented facilities, comprised of common

TABLE 1

PRIVATE SECTOR GRAIN STORAGE CAPACITY BY PROVINCE[1/]

(1,000 QQ)

Year	Type	Bocas del Toro	Chiriqui	Veraguas	Herrera	Los Santos	Cocle	Panama	Colon	Darien	Country Total
1975											
	Total		1,569.9	601.2	5.0	61.0	200.0	196.1	98.3		2,731.5
	Bag		929.9	478.2	5.0	46.0	110.0	132.6	98.3		1,800.0
	Bulk		640.0	123.0		15.0	90.0	63.5			931.5
1977											
	Total	19.0	1,613.3	604.2		124.0	204.2	303.3	99.2		2,967.0
	Bag		973.3	481.2		94.0	114.2	191.8	99.1		1,953.7
	Bulk	19.0	640.0	123.0		30.0	90.0	111.5			1,013.5
1980											
	Total	56.5	1,730.0	629.0	56.1	170.8	375.0	130.5	15.0		3,162.9
	Bag	30.0	832.0	439.0	41.1	157.0	235.0	38.5	15.0		1,787.6
	Bulk	26.5	898.0	190.0	15.0	13.8	140.0	92.0			1,375.3

1/Engineering capacity.

TABLE 2

IMA GRAIN STORAGE CAPACITY BY PROVINCE[1/,2/]

(1,000 QQ)

Year	Type	Bocas del Toro	Chiriqui	Veraguas	Herrera	Los Santos	Cocle	Panama	Colon	Darien	Country Total
1975											
	Total		160.2	89.9			310.9	320.0			881.0
	Bag		160.2	89.9			310.9	240.0			801.0
	Bulk							80.0			80.0
1977											
	Total		120.0	65.0			500.0	595.0			1,280.0
	Bag		120.0	65.0			500.0	455.0			1,140.0
	Bulk							140.0			140.0
1980											
	Total		110.0	63.0			620.0	605.0			1,398.0
	Bag		110.0	63.0			620.0	465.0			1,258.0
	Bulk							140.0			140.0

1/This capacity includes only facilities designed for medium- to long-term storage.
2/Engineering capacity.

warehouses used for the storage of bagged grain, has only slightly declined from 352,000 quintals to 300,000 quintals of capacity. Government owned and rented grain storage capacity and the shifts in these capacities is given in Table 3.

Private Sector Grain Storage and Needs for Public Storage

The concept of private sector grain storage facilities being used to perform storage functions concerned with price stabilization activities under present market and government policy conditions is not feasible. Some of the reasons why the above is valid are as follows:

1. The pricing policy structure is not conducive to long-term storage by the private sector. Past analysis substantiates this conclusion (7). For example, available private storage for rough rice could have possibly stored the total market quantity for the first harvest in 1978-79. However, there is nothing in the pricing structure of rice to encourage this type of action. Differences in monthly prices are not sufficient to make storage actions profitable to private industry.

2. As shown in Table 4, the growth rate of private sector storage capacity (3 percent annually) has increased only at the rate required to store rough rice purchased in the open market. The range of purchases for years 1965-66 through 1970-71 was 1,363,600 to 1,890,000 quintals with an effective average storage capacity of 1,416,000 quintals. For the years 1971-72 through 1975-76, purchases ranged from 1,557,200 to 2,227,100 quintals with effective average storage capacity of 1,666,600 quintals. Purchases for 1976-77 through 1979-80 ranged from 2,023,100 to 2,344,100 quintals with effective average storage capacity of 1,952,200 quintals. The turnover rate for each of the year groups do not vary more than 3 percent, indicating that storage is basically linked to rice milling requirements.

TABLE 3

IMA GRAIN STORAGE CAPACITY BY PROVINCE

Owned and Rented

(1,000 QQ)

Province and Ownership	Years		
	1975	1977	1980
CHIRIQUI	160.2	120.0	110.0
Owned	120.2	120.0	110.0
Rented	40.0		
VERAGUAS	89.9	65.0	63.0
Owned	17.9	65.0	63.0
Rented	72.0		
COCLE	310.9	500.0	620.0
Owned	265.9	500.0	620.0
Rented	45.0		
PANAMA	320.0	595.0	605.0
Owned	125.0	295.0	305.0
Rented	195.0	300.0	300.0
TOTAL	881.0	1,280.0	1,398.0
Owned	529.0	980.0	1,098.0
Rented	352.0	300.0	300.0

TABLE 4

PURCHASES OF ROUGH RICE RELATED TO EFFECTIVE STORAGE CAPACITY, PRIVATE SECTOR

(1,000 QQ)

Year	Total Purchases 1/	Average of Unbalanced Years	Average Effective Rough Rice Storage Capacity 2/	Average Turnover for Effective Capacities
1965-66	1,890.0	1,608.7		
1966-67	1,327.4			
1967-68	1,363.6		1,416.6 3/	1.11
1968-69	1,580.0			
1969-70	1,714.0			
1970-71	1,597.0			
1971-72	1,884.5			
1972-73	1,888.8			
1973-74	1,968.4		1,666.6	1.14
1974-75	2,227.1	1,892.2		
1975-76	1,557.2			
1976-77	2,023.1	2,183.6		
1977-78	2,344.1		1,952.2	1.12
1978-79	2,165.3			
1979-80	2,183.6			

1/First and second crop purchased in the open market.
2/Effective storage = 80 percent of bagged storage capacity plus bulk storage capacity.
3/Estimate.

3. In view of the preceding, the conclusion can be made that the availability of adequate private sector rough rice storage for lease to government appears to be marginal. Though other flat storage facilities would be available, their use is questionable due to the following reasons:

a. The vast majority of flat storage warehouses are not constructed primarily for the storage of grain.

b. Their use would lead to increased losses and quality deterioration as has occurred recently.

c. Probable inadequacies in location and size, as well as management problems, will lead to higher costs of transportation, quality maintenance of grain, and handling costs.

4. Private sector storage capacity for corn and grain sorghum was only 22 percent of the 1978-79 domestically produced marketable quantity of corn and grain sorghum. These storage facilities, for the most part, are allied to feed processing and used as throughput storage for the processing of animal feeds. While there appears to be sufficient seasonal price fluctuations in corn which would pay for storage costs, industry has not been able to avail itself of this opportunity because of probable high assembly costs brought about by the existing production system of corn (90 percent small farmers) and very small quantities being marketed by the great majority of farmers. Also, feed grain supplies have in the past been in a deficit situation requiring imports.

As a result of the above, it is apparent that adequate private sector grain storage facilities are extremely limited. Continued past price policy actions by government will tend to perpetuate this marginal situation regarding adequate private sector storage facility availability. Furthermore, the influence of price policy on the current private sector grain storage system will continue to prevent medium- and long-term storage activities from developing within the private sector.

Utilization of IMA Storage Facilities

Important aspects of public grain storage facilities include the degree of utilization, as well as the conditions of the storage facilities. Both aspects influence the ability to maintain the quality of grain placed into medium- to long-term storage.

Utilization of storage facilities is analyzed on the basis of effective storage capacity. Effective storage capacity, in the case of bagged grain warehouse storage, is 80 percent of engineering capacity (cubic measurement). This allows for proper stacking methods which implies adequate space between stacks, adequate space between stacks and walls, and correct height level of stacks. These procedures are necessary for correct sanitation, rodent control, fumigation, physical inspection, physical inventory, and stock rotation.

Effective bulk storage capacity is the same as engineering capacity since bulk storage capacity is specifically designed for grain.

Table 5 described IMA's total effective medium- and long-term storage capacity by province of the years 1975, 1977 and 1980. Out of current total effective capacity, only 12 percent is in bulk storage capacity.

The ratio of purchases to sales over the past six years, as shown in Table 6, indicates that major increases in grain support prices in the mid 1970s, caused extremely high purchase levels. Subsequent declines in the ratio was brought about by drawing down high inventory levels, especially by the export of rice in 1977-78. Therefore, it is evident that government storage has been utilized for extremely long-term storage of grain. For example, up to four years in the case of rough rice.

Growth of IMA's effective storage capacity, as given in Table 5, has been relatively limited as related to needs. The calculated ratio of carry over grain stocks to effective storage capacity, as detailed in Table 7, has been rather large. The large grain purchases that occurred in 1974-75 and

TABLE 5

IMA EFFECTIVE GRAIN STORAGE CAPACITY BY PROVINCE

(1,000 QQ)

Year	Location	Type	Engineering Capacity	Effective Capacity 1/
1975	Chiriqui	Bag	160.2	128.2
	Veraguas	Bag	89.9	71.9
	Cocle	Bag	310.9	248.7
	Panama	Bag	240.0	192.0
		Bulk	80.0	80.0
	TOTAL		881.0	720.8
1977	Chiriqui	Bag	120.0	96.0
	Veraguas	Bag	65.0	52.0
	Cocle	Bag	500.0	400.0
	Panama	Bag	455.0	364.0
		Bulk	140.0	140.0
	TOTAL		1,280.0	1,052.0
1980	Chiriqui	Bag	110.0	88.0
	Veraguas	Bag	63.0	50.4
	Cocle	Bag	620.0	496.0
	Panama	Bag	465.0	372.0
		Bulk	140.0	140.0
	TOTAL		1,398.0	1,146.4

1/80 percent of engineering capacity for bag storage.

TABLE 6

RATIO OF PURCHASES TO SALES

IMA

Year	Provinces				
	Chiriqui	Veraguas	Cocle	Panama[1/]	National
1974-75					3.18
1975-76	11.72	4.43	1.41	4.27	9.79
1976-77	0.55	0.52	1.69	0.58	0.79
1977-78	0.55	1.18	1.41	1.89	0.61[1/]
1978-79	0.91	4.94	2.07	0.58	1.07
1979-80	5.27	2.83	6.13	1.39	3.07

1/Includes export rice sales.

TABLE 7

CARRY OVER RELATED TO EFFECTIVE STORAGE CAPACITY

IMA

Year	Ratio of Average Carry Over to Effective Storage Capacity
1975-76	2.35
1976-77	2.15
1977-78	1.03
1978-79	1.09
1979-80	1.31

1975-76, resulted in levels of carry over of at least twice the effective storage capacity. This resulted in using temporary and unsuitable storage facilities as well as severe overcrowding of permanent facilities.

While the remaining years show a decrease in this ratio, it has not declined even with the impact of reduced purchases, to a desirable level of one.

Overcrowding of all facilities, given their condition, has led to inadequate storage practices and unduly high losses.

Conditions of IMA Facilities

As stated before, the second aspect of public grain storage facilities is the condition of such facilities. Old and out-of-condition facilities, as well as poorly maintained structures, resulted in excessive grain losses in the early 1970s. In recent years these conditions have been improved, but there still exists great opportunities for significant improvement, as summarized in Table 8. Improvements appear to be hindered by disregard and slow implementation of sound technical advice provided by external and internal sources. Lack of quick response to problem situations has certainly caused less than optimal storage maintenance.

Waste and Losses in Current IMA Grain Storage Facilities

Post-harvest losses and aspects of quality changes during storage and handling of grain in Panama have received little in-depth attention so far. Though their occurrence is not denied, their measurements are nonexistent and the subsequent implications have not been taken into account in a serious manner by the public sector (IMA).

Waste, losses, and quality changes occur as a result of many interrelated factors. Some of these factors which were observed and discussed with IMA's personnel are:

TABLE 8

IMA STORAGE FACILITIES CONDITION BY LOCATION

Location	Type	Capacity 1,000 QQ	Conditions and Observations
Chiriqui			
David	Bagged	110	Not observed. Same warehouse as used in 1975. Dryer unit added but no other rehabilitation.
Cocle			
Penonome	Bagged	500	Basically sound. No bird screens, easy access by rodents, doors don't fit tightly, and poor sanitation. Only needs proper management to bring up to good standard.
Penonome (Sonadora)	Bagged	120	Needs total rehabilitation for proper sanitation and preservation of grain. (Storage capacity of this facility seems to be seriously overstated.)
Panama			
Silos Panama	Bulk	80	Basically sound construction. Needs complete rehabilitation.
	Bagged	105	While clean, a poor to average bagged storage area. Easily accessible by birds and rodents. Easy water penetration. Plant environment very cluttered by debris and repair and maintenance materials.
Tocumen	Bagged	300	Basically good warehouse. Has defects: lack of ventilation screens, doors not properly fitted, easy access by rodents and birds, leaky roof, drainage problems, and lack of correct sanitation procedures.
Chepo	Bulk	40	Needs further rehabilitation and maintenance.
	Bagged	50	Needs rehabilitation. Drainage problems, easy access by birds and rodents, lack of correct sanitation procedures, and poor maintenance.
Capira	Bulk	20	Needs further rehabilitation even though just maintenanced.
	Bagged	10	Easily accessible by birds and rodents. Incorrect sanitation procedures.
Veraguas			
Santiago	Bagged	13	Old mill warehouse. Totally inappropriate for grain storage.
Sona	Bagged	50	New facility. Not observed.

1. Grain spillage due to improper techniques, procedures, and facilities for handling bagged grain.

2. Severe insect damage due to lack of, improper, and/or infrequent fumigation of stored grain as well as overall sanitation.

3. Rodent damage due to inadequate rodent control.

4. Heat damage to grain due to lack of proper and adequate drying facilities and/or practices.

5. Excess foreign material in some grain.

6. Less than enthusiastic application and adoption of simple, yet effective, technical advice regarding grain storage and preservation.

Recently, some of the above factors and others have been the subject of two experiments (22, 23) dealing with losses of grain while in storage in IMA's operations. Due to their shortcomings, and therefore not final in their findings, these studies showed among other things, improper frequency of fumigation as well as fumigation practices, high incidence of insect activity, high or marginal foreign matter content, and high incidence of quality deterioration.

Furthermore, the accurate determination of losses is further hampered by current grain and cost accounting procedures used by IMA. Though otherwise properly designed, the grain accounting process does adjust for normal shrinkage on a periodic basis (monthly). Furthermore, otherwise adequate and important information generated by both accounting systems is not being processed to a useful level of compilation, format, and periodically timely availability to management and planning. Therefore, lack of proper documentation does not permit at this time, accurate calculation of post-harvest losses in IMA's grain operations. Consequently, only an extremely rough estimate of current losses can be assessed. Above normal dissappearance of grain while

in storage suggests that the possibility exists for losses in rice to be as great as 29 percent, and losses in corn and grain sorghum as high as 15 percent for current government storage installations.

SECTION III

FUTURE GRAIN STORAGE CAPACITY REQUIREMENTS

Foremost in determining future grain storage requirements are the levels of future production and the level of government purchases which will go into storage. Then, current capacity and condition of that capacity can be analyzed as to future additional needs.

Existing Patterns of Grain Production

1. Rice

The reported annual production by province in Panama for the crop years 1960-61 through 1978-79 are shown in Table 9. Production of rough rice has increased more than 2½ percent annually. Production levels year to year were erratic; as evidenced in Table 9 and Figure 1. This erratic behavior has two causes. Significant changes in area planted to rice, as illustrated in Figure 3, resulted in cyclical patterns over this time period.

The second cause is fluctuating yield levels as illustrated in Figure 1. Yield data is based upon planted, not harvested area, and are therefore subject to massive error.[1/]

The trend pattern, while rising steeply in the late 1960s and early 1970s, appears to have shifted to a lower rate of increase. The rate of yield increase prevented a substantial drop in production due to decline in planted area. From the yield trend pattern, average yield is expected to be at 42 to 43 quintals per hectare by 1985-86.

2. Corn

Annual production of corn by province in Panama for the years 1960-61 through 1978-79 is shown in Table 10 and Figure 8. While production rose at a rapid rate in the 1960s, it declined to an average production level of

1/Data exists for yields of harvested area for 1976-77 to date only.

TABLE 9

PRODUCTION OF ROUGH RICE BY PROVINCE

1,000 QQ

Year	Bocas del Toro	Chiriqui	Veraguas	Herrera	Los Santos	Cocle	Panama	Colon	Darien	Country Total
1960-61	4.2	523.4	657.5	223.7	285.9	157.3	184.0	36.4	42.4	2,144.8
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	194.6	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	6.8	1,368.5	761.0	260.1	281.9	559.9	223.1	57.6	125.0	3,643.0
1970-71	5.8	1,227.2	454.0	126.5	210.2	681.9	132.7	29.5	23.7	2,891.5
1971-72	5.8	1,377.4	400.4	139.8	163.7	702.6	153.9	34.8	23.7	3,002.1
1972-73	5.8	1,511.3	391.4	92.5	140.5	459.5	107.6	28.3	23.7	2,760.6
1973-74	5.8	1,674.0	425.3	156.0	226.2	792.9	235.4	34.0	23.7	3,573.3
1974-75	5.8	1,753.8	447.6	175.1	176.3	993.7	308.1	48.3	23.7	3,932.4
1975-76	5.8	1,722.4	497.3	194.8	239.0	978.6	362.5	50.8	23.7	4,074.9
1976-77	190.6	1,354.1	433.2	158.8	221.5	503.6	212.7	53.4	57.0	3,184.9
1977-78	82.4	1,568.8	573.1	272.7	386.8	670.6	399.8	66.6	83.9	4,104.7
1978-79	39.2	1,726.3	439.3	194.6	294.6	505.3	276.6	53.9	50.1	3,579.9

FIGURE 1

AVERAGE ANNUAL YIELDS FOR ROUGH RICE

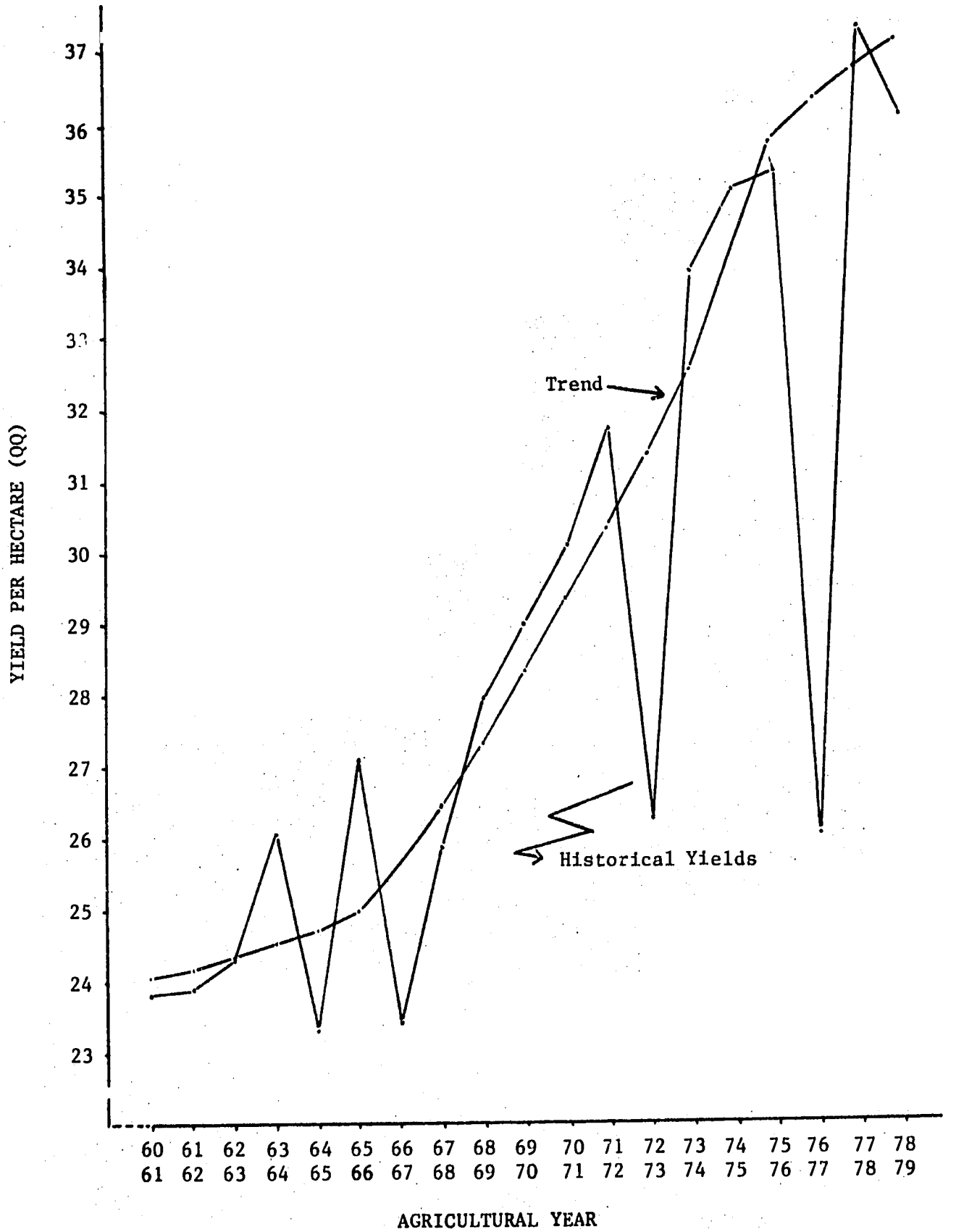


TABLE 10

PRODUCTION OF CORN BY PROVINCE

1,000 QQ, Shelled

Year	Bocas del Toro	Chiriqui	Veraguas	Herrera	Los Santos	Cocle	Panama	Colon	Darien	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	11.1	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	9.6	475.8	441.2	201.0	338.2	120.4	204.3	50.9	87.9	1,929.3
1970-71	2.5	328.3	199.5	124.7	252.0	130.4	115.6	31.5	59.3	1,243.8
1971-72	2.5	309.7	227.7	114.9	233.8	123.7	103.3	17.3	59.3	1,192.2
1972-73	2.5	247.4	198.8	95.1	214.2	62.1	74.1	24.2	59.3	977.7
1973-74	2.5	224.0	212.9	139.0	298.8	94.3	155.5	19.7	61.3	1,208.0
1974-75	2.6	267.1	225.6	159.6	306.6	98.6	164.4	24.9	59.3	1,308.7
1975-76	2.6	236.1	246.7	158.1	351.7	125.9	216.6	40.7	59.3	1,437.7
1976-77	19.2	297.6	215.7	151.0	347.3	74.2	140.8	71.6	92.9	1,410.3
1977-78	0.6	333.6	298.8	203.8	472.6	100.7	141.3	68.3	137.3	1,757.0
1978-79	10.8	191.3	269.0	172.8	375.7	69.6	163.6	62.6	106.4	1,421.8

1.3 million quintals in the mid to late 1970s. This was a result of decline in area planted as illustrated in Figure 4. Average yields illustrated in Figure 2 reveal erratic levels with a trend pattern of yield increase of less than 1 percent annually.[1/]

3. Grain Sorghum

Grain sorghum is relatively new grain crop grown in significant volume only since 1975-76. Annual production by province in Panama for years 1975-76 through 1979-80 is given in Table 11. Production is rising at a very rapid rate with major production occurring in the provinces of Cocle, Chiriqui, and Azuero. A major portion of production is produced as a second crop after first crop rice.

Existing Patterns of Grain Marketing

Existing patterns of marketing for grains are shown in Table 12, 13, and 14 for rough rice, corn and grain sorghum, respectively. For rough rice, marketable quantities[2/] exhibit an increasing percentage of production over time, indicating that rice is increasingly becoming, as a proportion of production, a commercial agricultural commodity rather than a combination of subsistence and commercial crop. This applies to all farm sizes since the proportion of production by large farms has not changed significantly in the last eight years.[3/]

IMA purchases of rough rice exhibit erratic cyclical shifts. These shifts are related to marketable quantities and the amount of private sector purchases in relationship to private industry storage capacity (Section II). The pronounced increase during the high cycles in IMA purchasing is discussed in the following subsection.

1/Average yields based upon planted area. Yields for harvested area available for 1976-77 through 1978-79 years only.

2/Production less on farm usage and seed requirements, i.e., amount of production available for sale.

3/Table A-12, Appendix A.

FIGURE 2

AVERAGE ANNUAL YIELDS FOR CORN

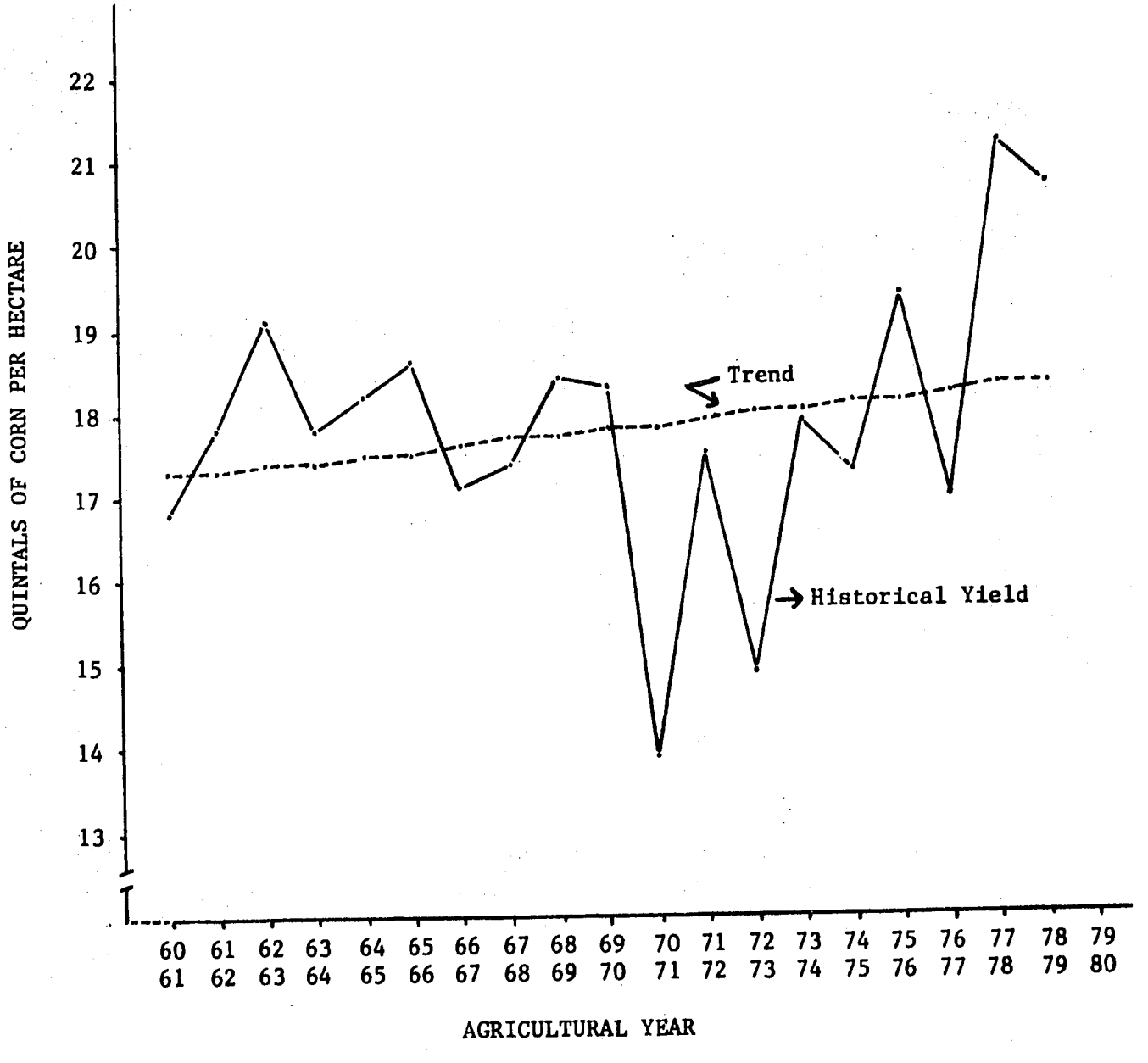


TABLE 11

PRODUCTION OF GRAIN SORGHUM BY PROVINCE

Year	Bocas del Toro	Cocle	Colon	Chiriqui	Darien	Herrera	Los Santos	Panama	Veraguas	National Total
1973-74										50.0 1/
1974-75										150.0 1/
1975-76		40.0		150.0		9.4	21.0			220.4
1976-77		22.9		188.8		12.6	21.2	4.0	0.5	250.0
1977-78		32.0		208.0		18.7	56.3	6.0	4.0	325.0
1978-79		33.3		216.6		19.5	58.7	6.2	4.2	338.5
1979-80		55.9		491.9		59.9	258.5	28.8	4.4	899.4

1/No information available by province.

TABLE 12

PRODUCTION, MARKETABLE QUANTITIES, AND SECTOR PURCHASES OF ROUGH RICE

(1,000 QQ)

Year	Production	Marketable Quantities		IMA Purchases		Private Sector Purchases	
		Quantity 1/	% 2/	Quantity	% 3/	Quantity	% 3/
1965-66	3,339.4	2,037.7	61.0	147.7	7.0	1,890.0	93.0
1966-67	3,088.3	1,429.4	46.3	102.0	7.1	1,327.4	92.9
1967-68	3,327.3	1,590.6	47.8	227.0	14.3	1,363.6	85.7
1968-69	3,594.4	1,841.0	52.2	261.0	14.2	1,580.0	85.8
1969-70	3,643.0	1,851.0 4/	50.8	137.0	7.0	1,714.0	93.0
1970-71	2,891.5	1,732.0 4/	59.9	135.0	7.8	1,597.0	92.2
1971-72	2,972.6	2,018.3	67.9	134.0	6.6	1,884.5	93.4
1972-73	2,731.1	1,999.8	73.2	111.0	5.5	1,888.8	94.5
1973-74	3,543.8	2,460.0	69.4	491.6	19.8	1,968.4	89.2
1974-75	3,902.9	2,952.9	75.7	725.8	24.4	2,227.1	75.6
1975-76	4,045.4	2,775.4	68.6	1,218.2	43.6	1,557.2	56.4
1976-77	3,184.9	2,179.6	68.4	156.5	7.2	2,023.1	92.8
1977-78	4,104.7	2,705.9	65.9	361.8	13.4	2,344.1	86.6
1978-79	3,579.9 5/	2,560.5 6/	71.5 6/	395.2	15.4 6/	2,165.3	84.6
1979-80	4,017.5 5/	2,593.4 6/	64.6 6/	409.8	15.8 6/	2,183.6	84.2

1/Production less on-farm use and seed use.
2/As a percentage of production.
3/As a percentage of marketable quantities.
4/No survey available. Used census figures for estimating marketable surpluses.
5/Forcast.
6/Calculated.

TABLE 13

PRODUCTION, MARKETABLE QUANTITIES, AND SECTOR PURCHASES OF CORN

(1,000 QQ)

Year	Production	Marketable Quantities		IMA Purchases		Private Sector Purchases	
		Quantity[1]	%[2]	Quantity	%[3]	Quantities	%[3]
1965-66	1,860.1	600.1	32.3	100.5	16.7	499.6	83.3
1966-67	1,849.0	697.1	37.7	44.7	6.4	652.4	93.6
1967-68	1,959.5	638.4	32.6	63.9	10.0	574.5	90.0
1968-69	1,046.1	570.0	30.9	24.0	4.2	501.0	95.8
1969-70	1,929.3	606.4[4]	31.4	69.0	11.4	537.4	88.6
1970-71	1,243.8	411.7[4]	33.1	58.5	14.2	353.2	85.8
1971-72	1,192.2	366.9	30.8	102.4	27.9	264.5	72.1
1972-73	977.7	229.4	23.5	152.9	66.7	76.5	33.3
1973-74	1,208.0	308.7	25.6	81.1	26.3	227.6	73.7
1974-75	1,308.7	387.2	29.6	144.8	37.4	242.4	62.6
1975-76	1,437.7	465.0	32.3	257.5	55.4	207.5	44.6
1976-77	1,410.3	563.3	39.9	123.4	21.9	439.9	78.1
1977-78	1,757.0	661.5	37.6	252.6	38.2	408.9	61.8
1978-79	1,421.8	578.2	40.7	133.2	23.0	445.0	77.0
1979-80				144.7			

1/Production less on-farm use, seed use, on-farm animal feed use.
2/As a percentage of production.
3/As a percentage of marketable quantities.
4/No survey available. Used census figures for estimation of marketable surpluses.

TABLE 14

PRODUCTION AND SECTOR PURCHASES OF GRAIN SORGHUM

1,000 QQ

Year	Production	IMA Purchases	%1/	Private Sector Purchases	%1/
1973-74	50.0				
1974-75	150.0				
1975-76	220.4	135.2	61.3	85.2	38.7
1976-77	250.0	138.8	55.5	111.2	44.5
1977-78	325.0	105.9	32.6	219.1	67.4
1978-79	338.5	0.0	0.0	338.5	100.0
1979-80	899.4	16.5	1.8	882.9	98.2

1/As a percentage of production.

In the case of corn, marketable quantities exhibit a very slight growth trend over time as a percentage of production. This is as expected since 90 percent of production is grown on small farms.[1/] Production on small farms has prevented the crop from being commercialized.

As a result of this type of marketing pattern, IMA purchases are extremely erratic from year to year. The level of marketable quantities in latter years (1972-73 through 1978-79) appears to have had an impact upon IMA's increased average level of purchasing.

Since the marketing channels for corn are more diffused (11), the private sector, being primarily the animal feed industry, cannot be considered as a buyer of the same significance as in the rough rice marketing structure.

Marketing patterns of grain sorghum cannot be identified due to the relatively newness of the crop. It appears that the animal feed industry has, over the past three years, gone into the market in a substantial manner as a direct purchaser from producers rather than buying through IMA.

Impact of Price Support Policy

Government grain price support over the past twenty years has had an apparent effect upon production. Since governmental storage requirements for grain are directed toward price stabilization of farm prices, the impact of price support policy actions upon production and marketing were investigated to prepare forecasts of storage requirements.

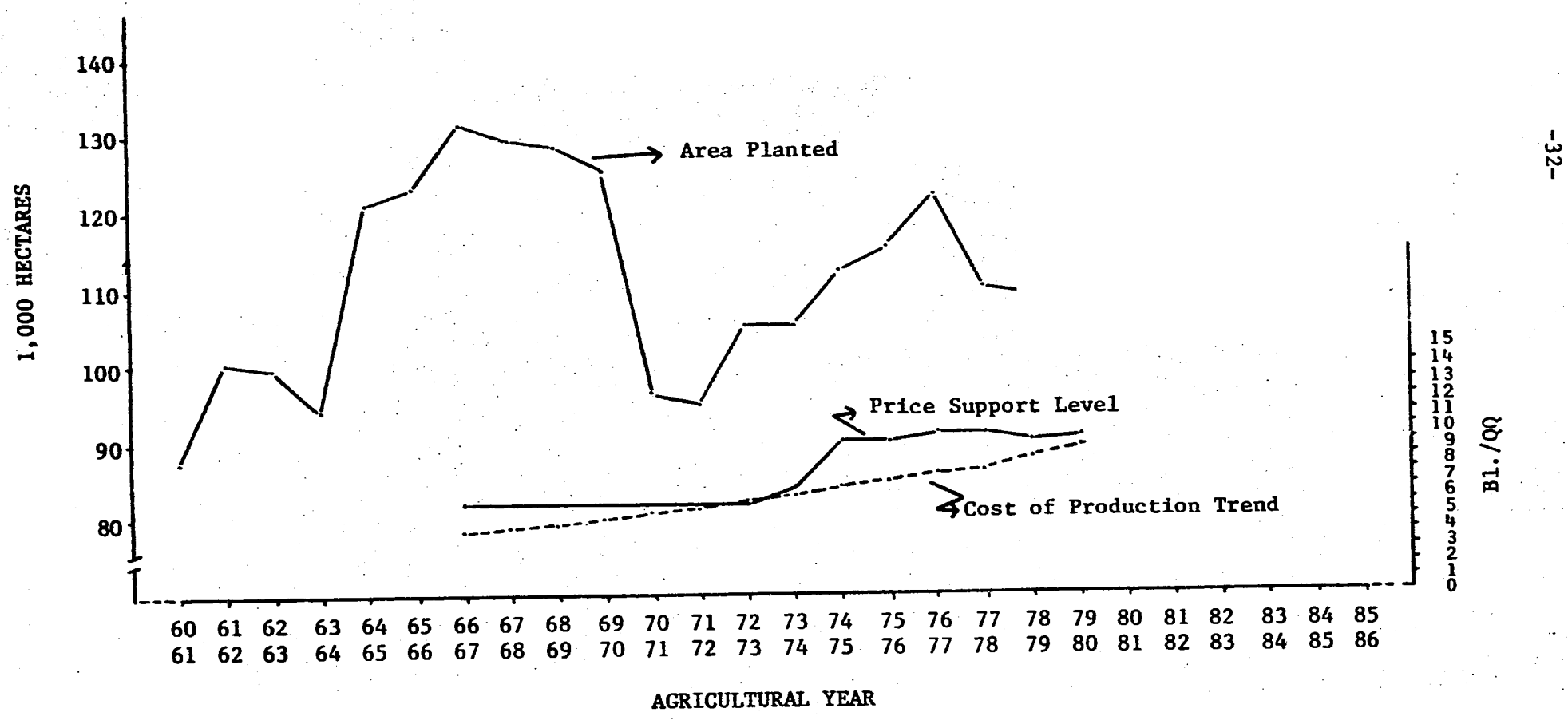
1. Rice Production

The first noticeable response to farm price supports is the impact of support prices upon area planted. Figure 3 illustrates this response. From a high of 131,500 hectares in 1966-67, area planted to rice fell to a low of 95,300 hectares in 1971-72. While weather and on-farm usage of rice has an important role in area planted, this downward trend in planting was

1/Table B-12, Appendix B.

FIGURE 3

COMPARISON OF AREA PLANTED, ROUGH RICE, TO PRICE SUPPORT LEVEL AND COST OF PRODUCTION



most likely a response on the producers part of a cost-price production squeeze. Cost of production steadily increased while support prices remained constant. The large support price increase in 1974-75 apparently encouraged the increase in area planted because a sufficient margin between production cost and price received made production profitable. The rate of increase in production costs rose rapidly in the latter 1970s. This has forced another cost-price squeeze upon producers with the result being a reduction in area planted.

Since approximately 60 percent of rice production is produced by large farms this type of response can generally be expected.

2. Corn Production

The same cost-price response, surprisingly, seems to occur in areas planted to corn. The time periods are different than rice but the same general pattern appears.

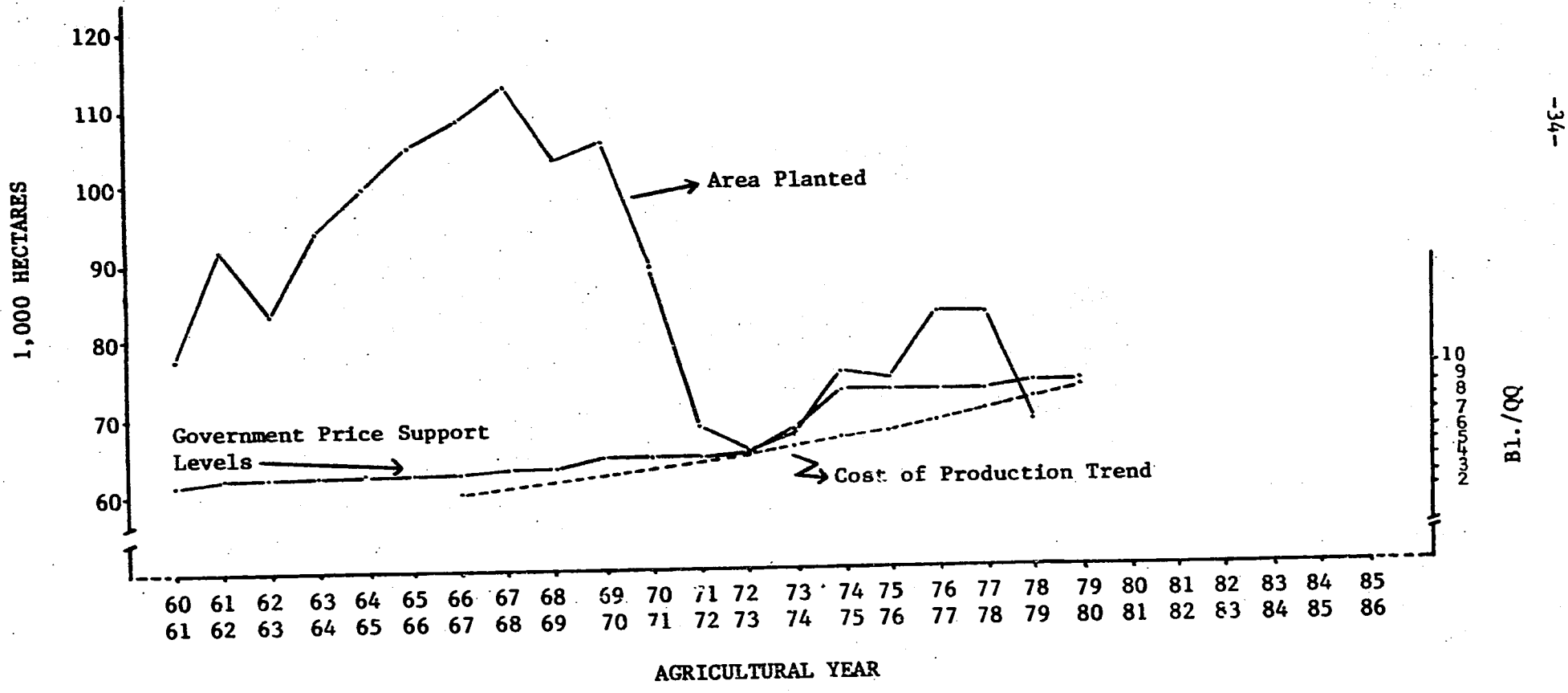
From a peak of 112,800 hectares in 1967-68, area planted to corn declined to a low of 65,700 hectares in 1972-73. Again, this downward trend in planting coincides with a narrowing of the production cost-price received margin. The increases in support price in 1973-74 and 1974-75 widened this margin. Planted area increased from its low point to a new peak which has the same percentage rise as rough rice planted area. However, area planted to corn did not regain a level near its previous high point in the manner that occurred in area planted to rice. This response relates to the amount of production produced by small farmers (90 percent) and therefore, response is not as great as for commercial producers in rough rice production. Figure 4 illustrates the movements of area planted, farm support price, and cost of production.

3. Grain Sorghum Production

No analysis can be undertaken for grain sorghum because of lack of data as well as newness of crop.

FIGURE 4

COMPARISON OF AREA PLANTED, CORN, TO PRICE SUPPORT LEVEL AND COST OF PRODUCTION



4. Marketable Quantities of Grain

No significant price impact could be discovered that influenced the levels of marketable quantities of grain as given in Tables 12, 13, and 14.

5. IMA Purchasing Levels

The relationship between farm support price and open market prices received by farmers has an impact on the level of purchases achieved by IMA. Figure 5 and 6 diagram the relationship between marketable quantities, IMA purchase levels, farm support price, and open market prices received by farmers for rough rice and corn, respectively.

While the level of marketable quantities impact significantly on IMA purchase levels, the price differential between farm support and farm-gate prices have had significant impact by accelerating purchasing levels.

In the case of rough rice, price differentials have a lagged effect, creating a larger impact in the second year than the first year of farm support price change. As the spread between farm support and farm-gate prices widen, the tendency is for the spread to accelerate the percentage of marketable quantities that IMA purchases.

The same basic response was discovered for IMA corn purchases. However, the response was more clearly defined during the latter half of the time period examined.

Lack of data prevents investigation of grain sorghum production and IMA purchases.

Future Grain Production Potentials

Forecasts of national production for rough rice, corn, and grain sorghum for 1980-81 through 1985-86 are shown in Table 15. These forecasts are based upon trend projections of past production adjusted for the impact of the recently upward revision in farm support prices of $14.00 and $10.80 per quintal for rough rice and corn, respectively.

FIGURE 5

ROUGH RICE: MARKETABLE QUANTITIES, GOVERNMENT PURCHASES, SUPPORT PRICE LEVELS, AND FARM GATE-PRICE

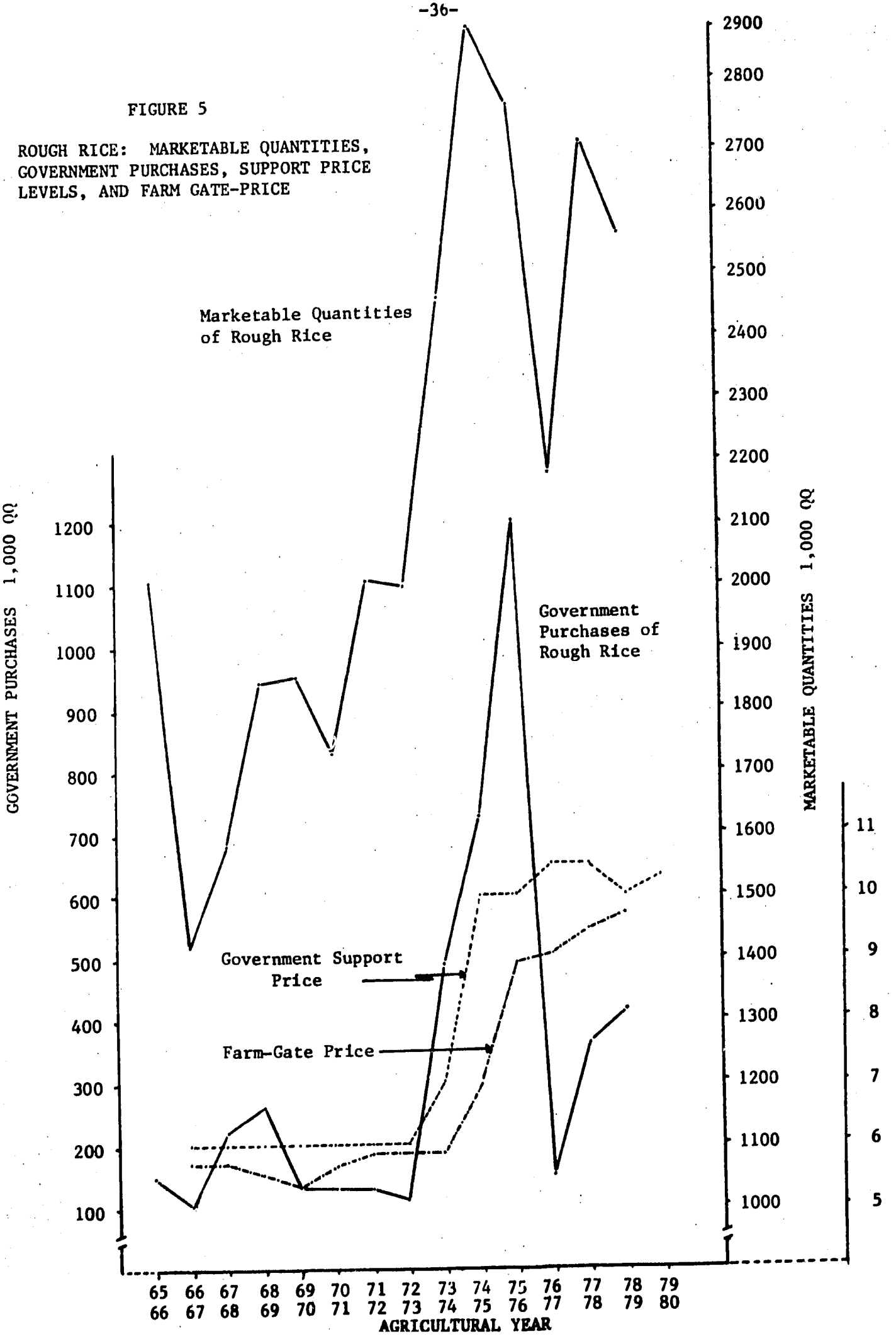


FIGURE 6

CORN: MARKETABLE QUANTITIES, GOVERNMENT PURCHASES, SUPPORT PRICE LEVELS, AND FARM-GATE PRICE

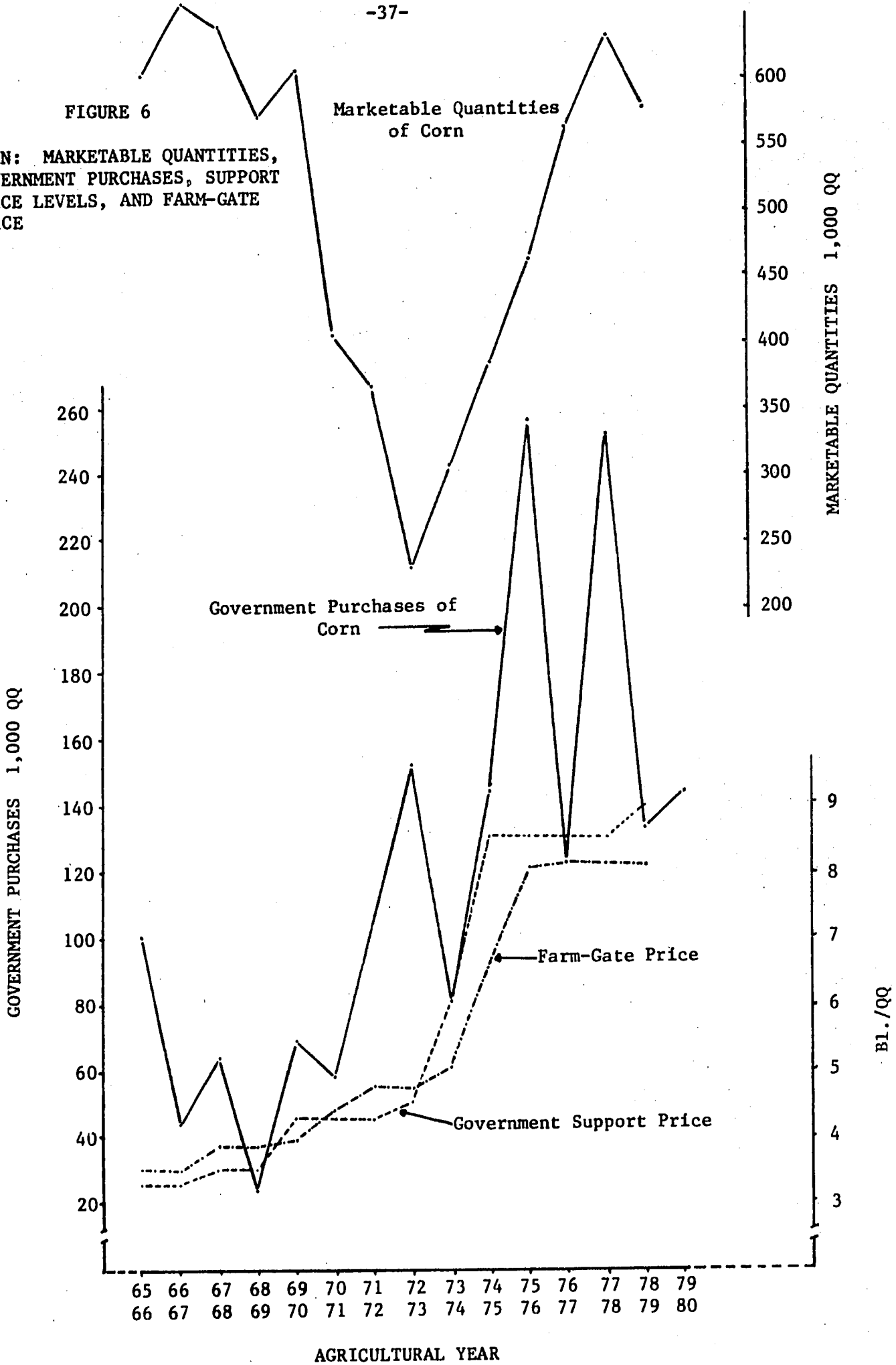


TABLE 15

FORECAST OF GRAIN PRODUCTION
1980-81 to 1985-86
(1,000 QQ)

Year	Rough Rice	Corn	Grain Sorghum	Total
1980-81	4,440.0	1,350.2	871.6	6,661.8
1981-82	4,600.0	1,490.1	999.3	7,089.4
1982-83	4,950.0	1,477.6	1,088.6	7,516.2
1983-84	5,045.0	1,473.8	1,165.2	7,684.0
1984-85	5,140.0	1,455.4	1,229.1	7,824.5
1985-86	5,238.0	1,437.0	1,292.9	7,967.9

The forecasts for rough rice and corn are diagrammed in Figures 7 and 8 which illustrate both the historical trend and forecast of production.

Because of the previously discussed impact of farm support prices upon area planted to rice and corn, it is expected that, based on cost-price reactions over time, the planted area cycle will be repeated. Therefore, the historical trend of production was adjusted to reflect the impact of the change in support prices upon area planted and subsequent production increases.

There is a distinction between rice and corn. While there exists an upward historical trend in rice production, the reverse is true for corn production. Due to the nature of corn production, price support levels alone are not likely to alter the overall trend.

As shown in Figure 9, a quadradic curvi-linear trend was developed for grain sorghum as a forecast because the relative newness of the crop prevents the construction of a forecast based on the impact of price and production cost. No further analysis with available data could be undertaken.

The forecast of production by province for the target year 1985-86 is given in Table 16.

Forecast of Marketable Quantities

Nationwide forecasts of marketable grain quantities for 1980-81 to 1985-86 are summarized in Table 17. These quantities represent 69 percent of rough rice production, 33 percent of corn production, and 100 percent of grain sorghum production.

Expected marketable quantities of rough rice show an accordingly upward trend dictated by forecasted production ranging from 3,068,000 quintals in 1980-81, to 3,619,000 quintals in 1985-86. Expected marketable quantities for corn, however, reflecting its downward production trend over time, are expected to be 438,600 quintals in 1980-81, increase to 490,800 quintals in 1981-82, and decrease over time to 469,800 quintals in 1985-86. Finally, due

FIGURE 7

FORECAST OF ROUGH RICE PRODUCTION

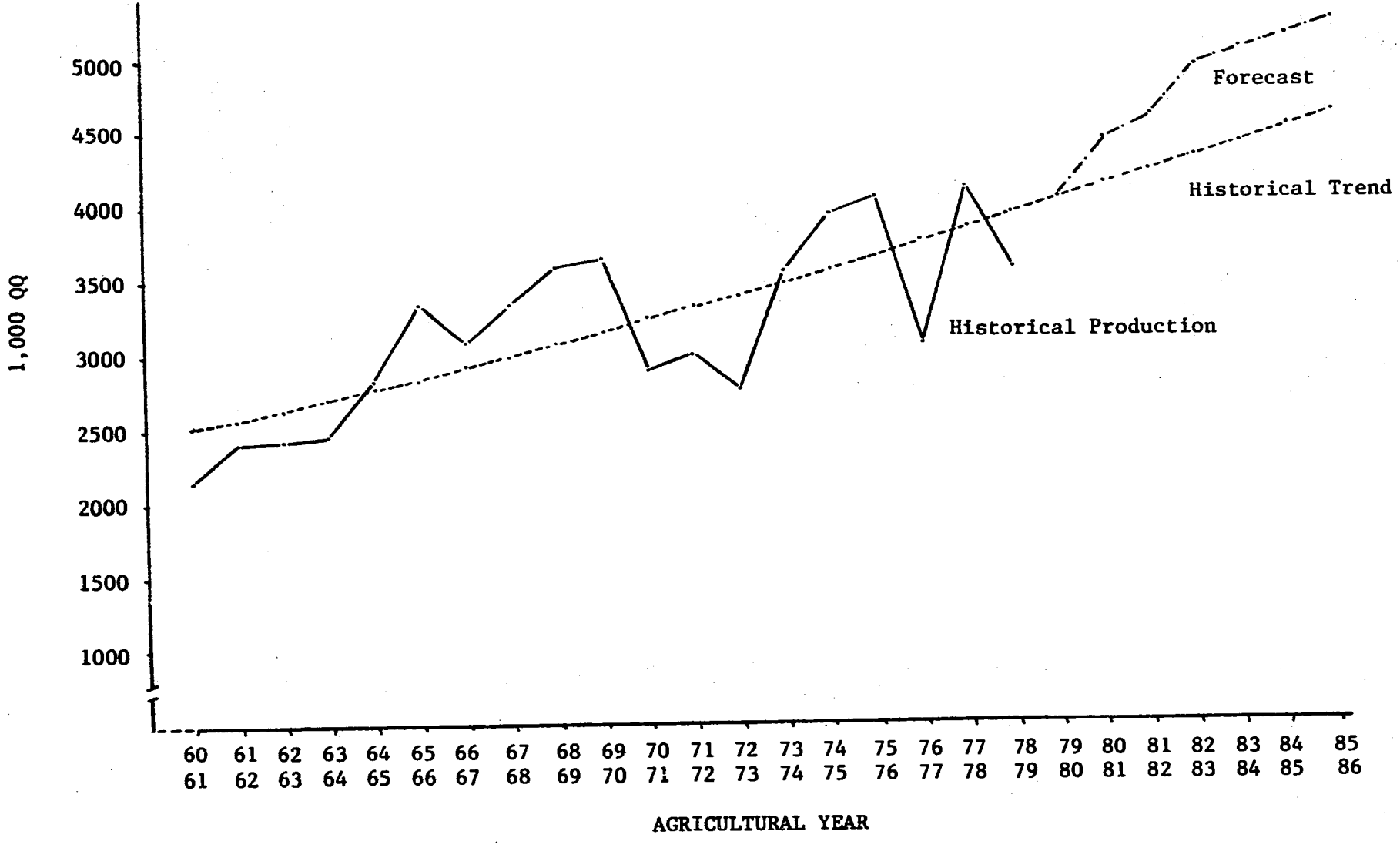


FIGURE 8

FORECAST OF CORN PRODUCTION

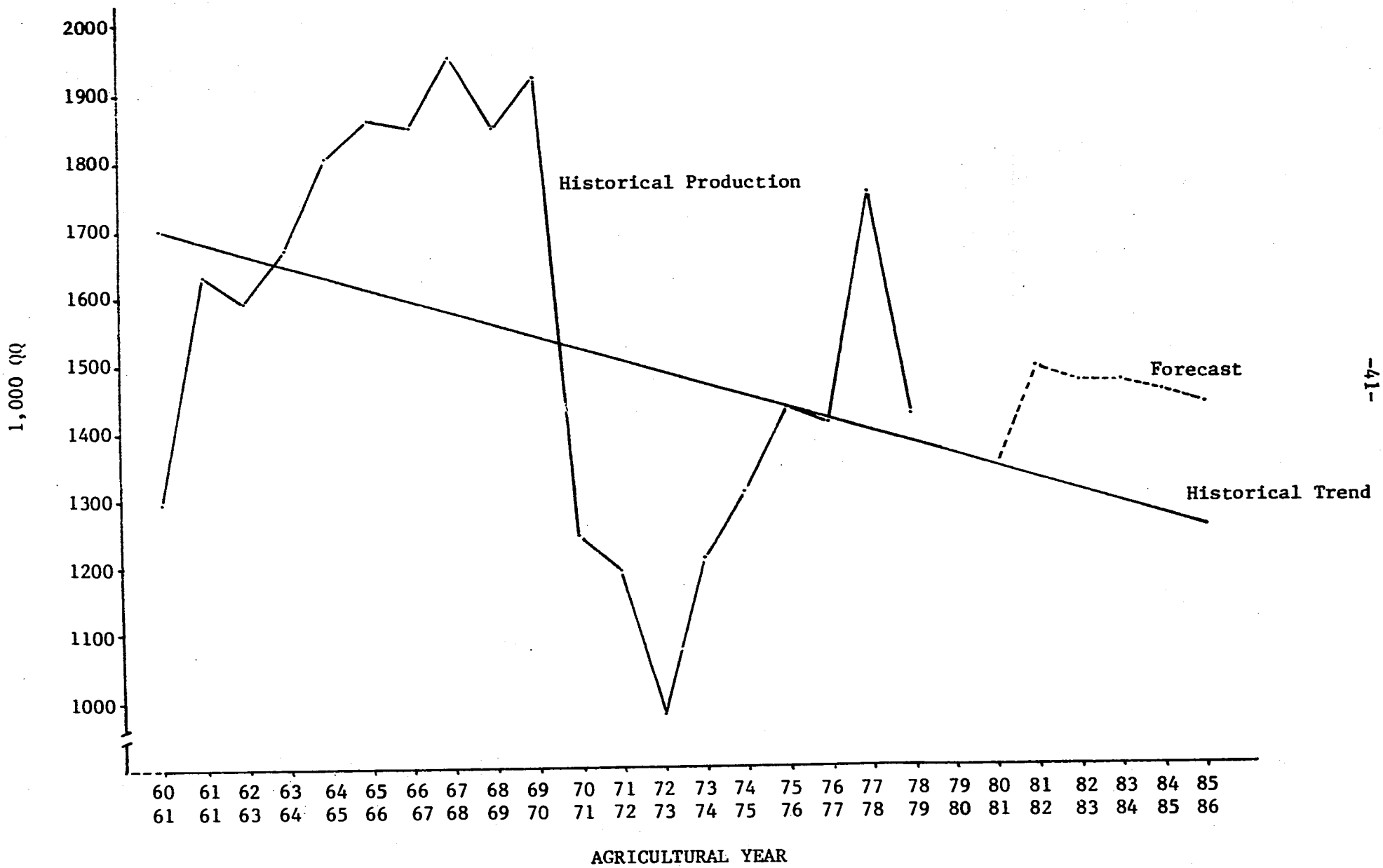


FIGURE 9

FORECAST OF GRAIN SORGHUM PRODUCTION

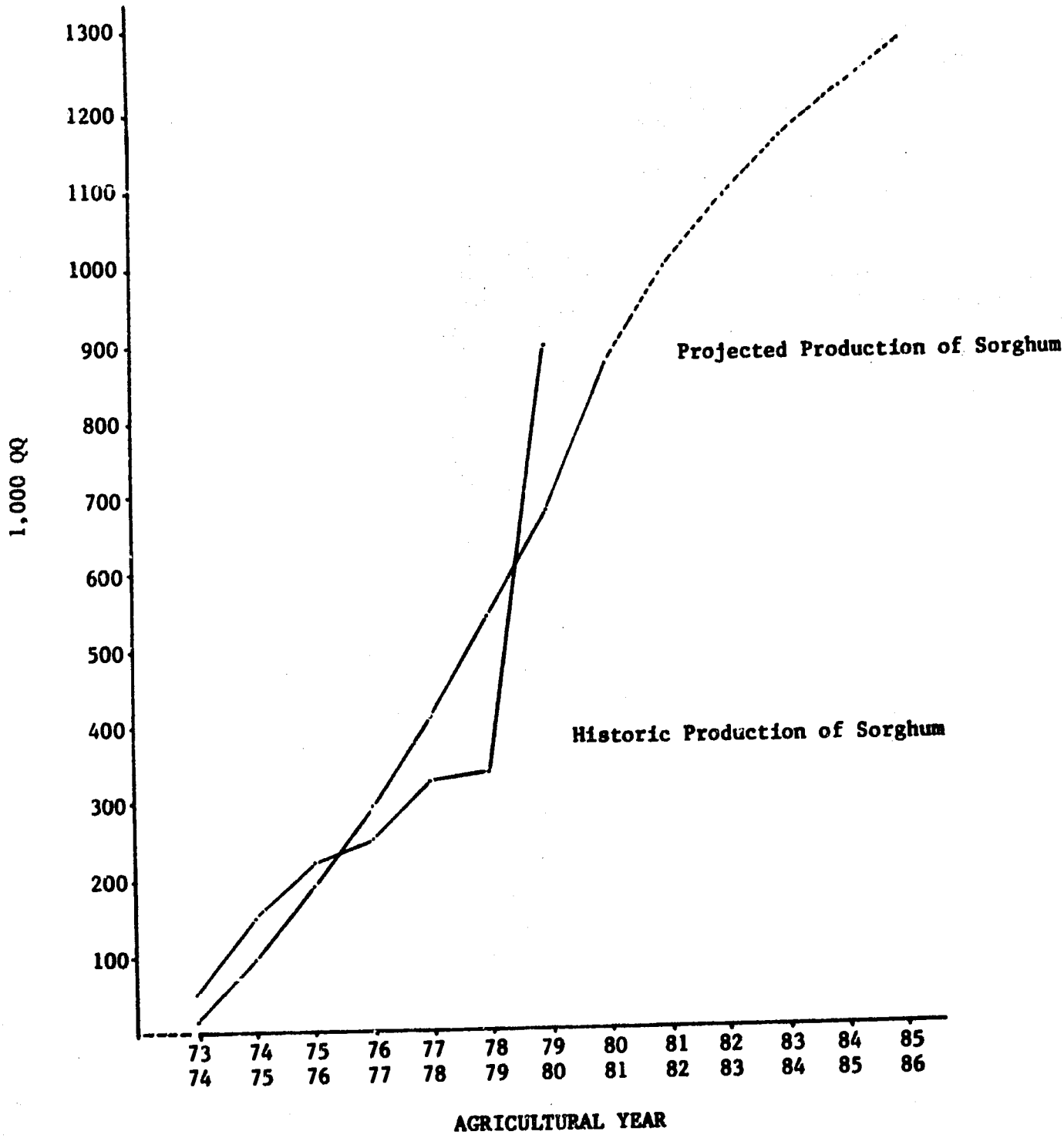


TABLE 16

FORECAST OF GRAIN PRODUCTION BY PROVINCE

1985-86

(1,000 QQ)

Province	Rough Rice	Corn	Sorghum	Total
Bocas del Toro	81.7	8.1		89.8
Chiriqui	2,573.4	250.0	673.9	3,497.3
Veraguas	501.7	203.3	10.0	715.0
Herrera	228.3	182.8	90.7	501.8
Los Santos	305.5	389.2	405.1	1,099.8
Cocle	1,147.0	101.9	58.0	1,306.9
Panama	293.4	134.4	55.2	483.0
Colon	44.2	55.1		99.3
Darien	62.8	112.2		175.0
TOTAL	5,238.0	1,437.0	1,292.9	7,967.9

TABLE 17

FORECAST OF MARKETABLE QUANTITIES OF GRAIN
1980-81 to 1985-86
(1,000 QQ)

Year	Rough Rice	Corn	Grain Sorghum	Total
1980-81	3,068.0	435.6	871.6	4,375.2
1981-82	3,179.0	490.8	999.3	4,669.1
1982-83	3,420.0	483.9	1,088.6	4,992.5
1983-84	3,486.0	484.4	1,165.2	5,135.6
1984-85	3,552.0	477.1	1,229.1	5,258.2
1985-86	3,619.0	469.8	1,292.9	5,381.7

to its utilization, forecast marketable quantities for sorghum are expected to equal its forecast production and increase over time to 1,252,900 quintals in 1985-86.

Forecast of marketable quantities by province for target year 1985-86 are summarized in Table 18. Slightly over 50 percent of all marketable quantities are predicted to come from the province of Chiriqui alone. Furthermore, about 90 percent of all marketable quantities of grain are expected to be available in the provinces of Chiriqui, Veraguas, Herrera, Los Santos, and Cocle.

Forecast of Potential IMA Purchases

The forecast of potential national purchases by IMA, 1980-81 through 1985-86, for rough rice, corn, and grain sorghum are shown in Table 19. The forecast reveals that potential purchases for all grains will peak at 1.9 million quintals in 1981-82 and decline slowly thereafter to 1.4 million quintals in 1985-86.

The forecast of potential purchases for IMA is based upon historical price impacts that influenced IMA purchasing in the mid to late 1970s as well as the level of marketable quantities of grains.

Rough rice and corn forecasts were tested against forecasts of open market purchases by millers. If expected production response raised marketable quantities to forecasted levels, the forecasts of potential IMA purchases for rough rice and corn are significantly reliable (error range $\pm$ 15 percent).

Forecasts of potential sorghum purchases have a wide variance in forecast of potential purchases of $\pm$ 50 percent.

The basic assumption underlying these forecasts of potential purchases is that IMA must have available and adequate storage capacity, as well as adequate management of storage capacity, to achieve such purchase levels. Past purchasing patterns were distorted because of the lack of adequate storage and IMA's inability to maintain and properly dispose of large inventories.

TABLE 18

FORECAST OF MARKETABLE QUANTITIES OF GRAIN BY PROVINCE

1985-86

(1,000 QQ)

Province	Rough Rice	Corn	Grain Sorghum	Total
Bocas del Toro	61.7	4.8		66.5
Chiriqui	2,116.4	87.0	673.9	2,877.3
Veraguas	298.6	27.7	10.0	336.3
Herrera	44.7	33.6	90.7	169.0
Los Santos	123.2	165.5	405.1	693.8
Cocle	756.0	17.7	58.0	831.7
Panama	175.7	35.5	55.2	266.4
Colon	12.5	20.2		32.7
Darien	30.2	77.8		108.0
TOTAL	3,619.0	469.8	1,292.9	5,381.7

TABLE 19

FORECAST OF POTENTIAL IMA PURCHASES OF GRAIN
1980-81 to 1985-86
(1,000 QQ)

Year	Rough Rice	Corn	Grain Sorghum	Total
1980-81	686.6	160.0	203.1	1,049.7
1981-82	1,348.4	311.1	232.8	1,892.3
1982-83	1,172.5	164.2	253.6	1,593.0
1983-84	1,020.1	157.2	271.5	1,448.8
1984-85	966.0	152.1	286.4	1,404.5
1985-86	925.9	147.8	301.2	1,374.9

Two important areas of the forecast are (1) potential purchases in the 1985-86 target year and (2) the on-coming high peak in potential purchases during 1981-82.

Forecast of potential purchases by region are detailed in Table 20 for the target year 1985-86.

Indicated Storage Requirements

Calculated annual nationwide grain storage requirements for future IMA operations, excluding and including grain sorghum purchases and sales, are summarized in Tables 21 and 22, respectively.

Because of the non-availability of ending balances for the year 1979-80, these storage requirements are calculated with a zero beginning balance. Storage requirements are based upon need to correctly store and handle carry over balances since the past characteristics of IMA operations strongly indicate that such future action will be of major importance.[1/]

Since zero beginning balances and carry over storage approach were used, it must be emphasized that the indicated storage needs in Tables 21 and 22 are the minimum necessary storage requirement.

Assuming total current effective capacity remains the same, and if total potential purchases are achieved over the long run, IMA's grain storage deficit is calculated to reach 662,500 quintals without grain sorghum in target year 1985-86 and 941,300 quintals if grain sorghum purchases and sales are included.

Assuming a 15 percent decline in IMA's grain purchases would lower the calculated storage deficit to only 563,100 quintals without grain sorghum during the target year 1985-86, and to 800,100 quintals with grain sorghum purchases and sales. Therefore, expected grain storage deficit remain at high levels.

1/Peak load storage needs are calculated in the subsequent subsection.

TABLE 20

FORECAST OF POTENTIAL IMA PURCHASES OF GRAIN BY REGION

1985-86

1,000 QQ

Region	Rough Rice	Corn	Grain Sorghum	Total
Panama, Darien, Bocas del Toro	95.3	108.6	20.0	223.9
Chiriqui	101.5	7.3	251.5	360.3
Veraguas	100.7	9.0	1.2	110.9
Cocle, Los Santos, Herrera	628.4	22.9	28.5	679.8
TOTAL	925.9	147.8	301.2	1,374.9

TABLE 21

INDICATED IMA STORAGE REQUIREMENTS AND DEFICITS NATIONWIDE

Rough Rice and Corn Only

1980-81 to 1985-8

(1,000 QQ)

Year	Potential Purchases of Rice and Corn 1/	Calculated Sales of Rice and Corn 2/	Resulting Carry Over 2/	Calculated Deficit of Storage 3/
1980-81	846.6	266.2	579.8 4/	+566.6
1981-82	1,659.5	169.5	2,069.8	-923.4
1982-83	1,386.7	1,692.0	1,764.5	-618.1
1983-84	1,177.3	1,930.0	1,011.8	134.6
1984-85	1,118.1	1,045.0	1,084.9	61.5
1985-86	1,073.7	349.7	1,808.9	-662.5

1/Does not include potential grain sorghum purchases.
2/Based on historical purchase to sale ratio.
3/Assumes current effeective grain storage capacity availability only.
4/Annual carry over assumes zero initial inventory for 1980-81.
+ = excess storage capacity
- = deficit storage capacity

TABLE 22

INDICATED IMA STORAGE REQUIREMENTS AND DEFICITS NATIONWIDE

All Grains

1980-81 to 1985-86

(1,000 QQ)

Year	Potential Purchases of Rice, Corn, Sorghum	Calculated Sales of Rice, Corn, Sorghum 1/	Resulting Carry Over 1/	Calculated Storage Deficits 2/
1980-81	1,049.7	330.1	719.6 3/	+426.8
1981-82	1,892.3	193.3	2,418.6	-1,272.2
1982-83	1,593.0	2,016.5	1,995.1	-848.1
1983-84	1,448.8	2,375.1	1,068.8	+77.6
1984-85	1,404.5	1,312.6	1,160.7	-14.7
1985-86	1,374.9	447.9	2,087.7	-941.3

1/Based on historical purchase to sale ratio.
2/Assumes current effective grain storage capacity availability only.
3/Annual carry over assumes zero initial inventory for 1980-81.
+ = excess storage capacity
- = deficit storage capacity

However, a more compelling finding is IMA's near-term (1981-82 and 1982-83) calculated storage requirements for grain. Assuming current effective storage capacity and if potential purchases and sales are achieved, then the deficit of grain storage capacity is calculated to reach 923,400 quintals in 1981-82 and 618,100 quintals in 1982-83 without grain sorghum. This deficit is liable to exceed 1 million quintals with grain sorghum purchases and sales in 1981-82 with a decline of this deficit to 841,000 quintals in the following year.

The implications for near-term operations of IMA regarding adequate and sufficient grain storage capacity cannot be exaggerated. For example, as illustrated in Table 23, should IMA succeed in purchasing amounts of grain not exceeding levels purchased in the mid to late 1970s, such volumes, without increasing actual effective storage capacity, will lead to recently experienced similar shortages of storage. Such shortages of storage will in turn lead to recurring high losses, excessive handling costs, and reduce IMA's already limited ability to function as an institution.

Location of Storage Facilities

Calculated carry over storage requirements by region have been summarized in Table 24. These needs are a proration of total national indicated requirements for carry over based on Table 21.

The region most needing additional carry over storage capacity is Azuero and Cocle. The regions of Chiriqui and Veraguas have near equal needs. The indicated needs for Panama, Darien and Bocas del Toro do not exceed current effective carry over storage capacity for these provinces.

In addition to this calculated minimum level for carry over storage capacity, there is a need for additional storage concerned with the operations in purchases and sales of grains. For example, as shown in Figure 10, the purchases and sales of rough rice in the province of Veraguas do not occur

TABLE 23

INDICATED IMA STORAGE REQUIREMENTS AND DEFICITS NATIONWIDE

Purchases and Sales Not Exceeding Past Cycle

All Grains

1,000 QQ

Year	Purchases of Grains	Sales of Grains	Carry Over Stock	Storage Surplus or Deficit
1980-81	870.6	273.8	596.8	+549.6
1981-82	1,609.7	164.4	2,042.1	-895.7
1982-83	498.2	630.6	1,909.7	-763.3
1983-84	720.3	1,180.8	1,449.2	-302.8
1984-85	528.4	493.8	1,483.8	-337.4
1985-86	571.0	186.0	1,868.8	-722.4

Note: These calculations assume zero beginning inventory for 1974-75.

TABLE 24

CALCULATED IMA SURPLUS AND DEFICIT GRAIN STORAGE CAPCITY BY REGION[1/]

Rough Rice and Corn Only

1981-82 and 1985-86

(1,000 QQ)

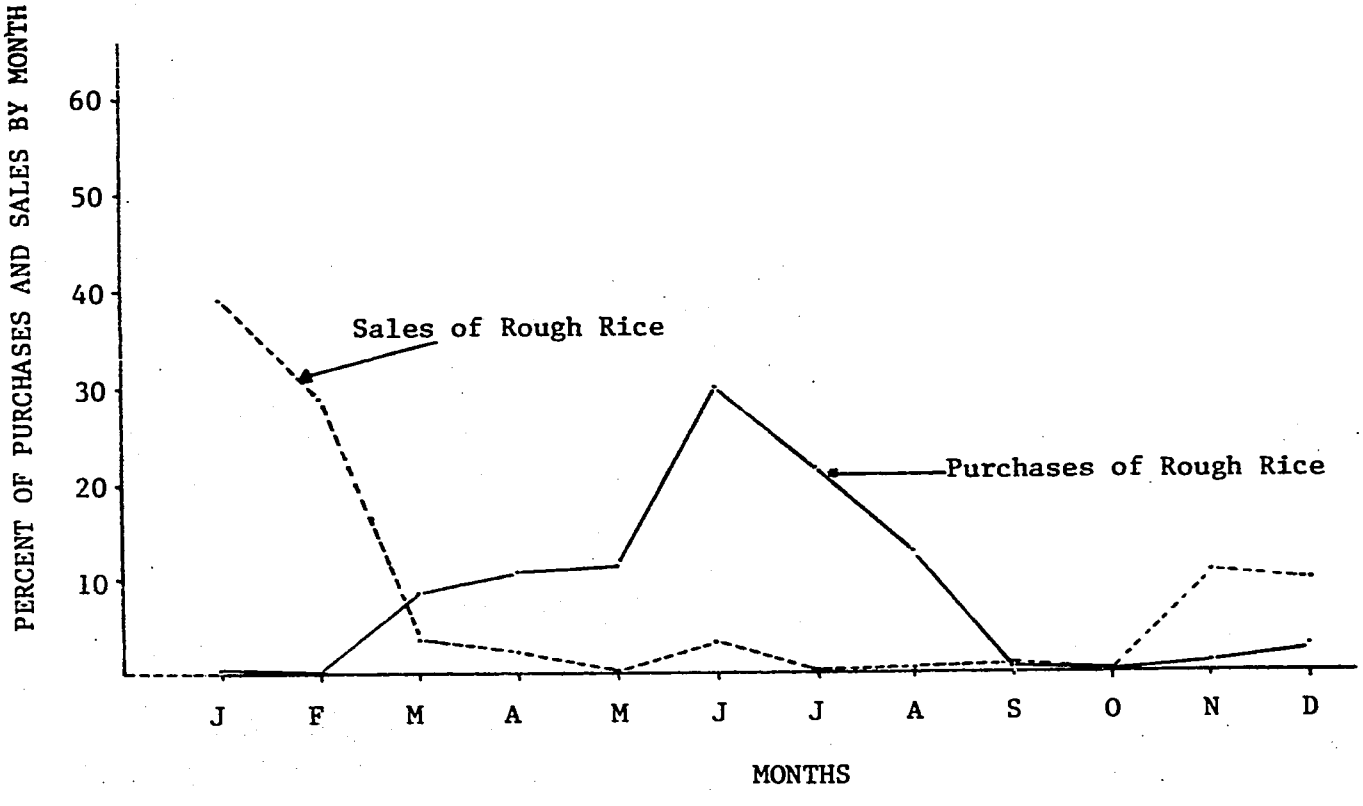
Year	Panama, Darien, Bocas del Toro	Chiriqui	Veraguas	Cocle, Los Santos Herrera	Country Total
		A. CALCULATED CARRY OVER			
1981-82	393.2	209.8	211.6	1,255.2	2,069.8
1985-86	376.7	200.2	202.0	1,030.0	1,808.9
		B. CURRENT EFFECTIVE STORAGE CAPACITY			
1981-82	512.0	88.0	50.4	496.0	1,146.4
1985-86	512.0	88.0	50.4	496.0	1,146.4
		C. SURPLUS AND DEFICIT STORAGE			
1981-82	+118.8	-121.9	-161.2	-759.1	-923.4
1985-86	+135.3	-112.2	-151.6	-534.0	-662.5

1/Does not include potential purchases and sales of grain sorghum by IMA.

FIGURE 10

RATE OF PURCHASES AND SALES OF ROUGH RICE IN THE PROVINCE OF VERAGUAS

Average for 1975-76 to 1979-80



at the same rate throughout the year. Similar figures could be graphed for every grain and province. As a result of these differences between purchases and sales, additional peak seasonal capacities are required to handle excesses of purchases over sales during certain months of the year. These additional peak capacities above and beyond additional carry over capacities are summarized in Table 25.

Similar to the indicated carry over needs, the region of Azuero and Cocle have the highest peak capacity requirements. However, the region of Chiriqui requires more than twice the peak requirement needed for the region of Veraguas.

Finally, total additional storage requirements to cover minimum needs for carry over and peak storage are summarized by region in Table 26. Again, while the region of Azuero and Cocle show the highest combined needs, the regions of Chiriqui and Veraguas show near equal total storage needs.

Summary of Storage Needs

The above stated future needs for additional carry over and peak storage requirements have been the result of the following:

1. Forecasts of future production, marketable quantities, and potential purchases by IMA reveal additional requirements in carry over storage capacity.

2. In order to achieve its price stabilization objective, IMA will require additional peak capacity storage.

3. These needs are accentuated by the impact of increased price support levels on grain production and subsequent increased level of purchases by IMA.

4. These are basic minimum storage requirements since initial carry over inventories were not available and grain sorghum was not considered in these calculations.

TABLE 25

FUTURE EFFECTIVE PEAK STORAGE CAPACITY REQUIREMENTS BY REGION

Rough Rice and Corn Only

1985-86

(1,000 QQ)

	Chiriqui	Veraguas	Cocle, Los Santos Herrera	Total
Rough Rice	40.5	17.2	260.7	318.4
Corn	2.7	1.0	22.2	25.9
TOTAL	43.2	18.2	282.9	344.3

TABLE 26

CALCULATED FUTURE TOTAL STORAGE REQUIREMENT BY REGION

Rough Rice and Corn

1985-86

(1,000 QQ)

Chiriqui	Veraguas	Cocle, Los Santos Herrera	Country Total
155.4	169.8	816.9	1,142.1

As shown in Figure 11, the market flow of grain will reach 4,550,000 quintals by 1985-86. This flow is directed toward the deficit area of Panama with its high concentration of urban dwellers.

Given the expected flows of Figure 11 and the potential marketable quantities by region, as well as IMA's potential purchases, first priority should be given to constructing a storage facility in the region of Chiriqui, second priority to Azuero-Cocle, and final priority to Veraguas.

This positioning seems adequate since it intersects the heavy grain flows as they move from surplus to deficit areas of the country. Such positioning will also tend to minimize inventory movement of grains.

Planned Facilities

In view of limited availability of funds and urgent need for the construction of these storage facilities, the following criteria are used as a basis for decision.

1. Due to current and future storage needs (carry over and peak requirements), current storage facilities must be kept in place.

2. Near future storage construction should be aimed at alleviating storage deficits where most needed.

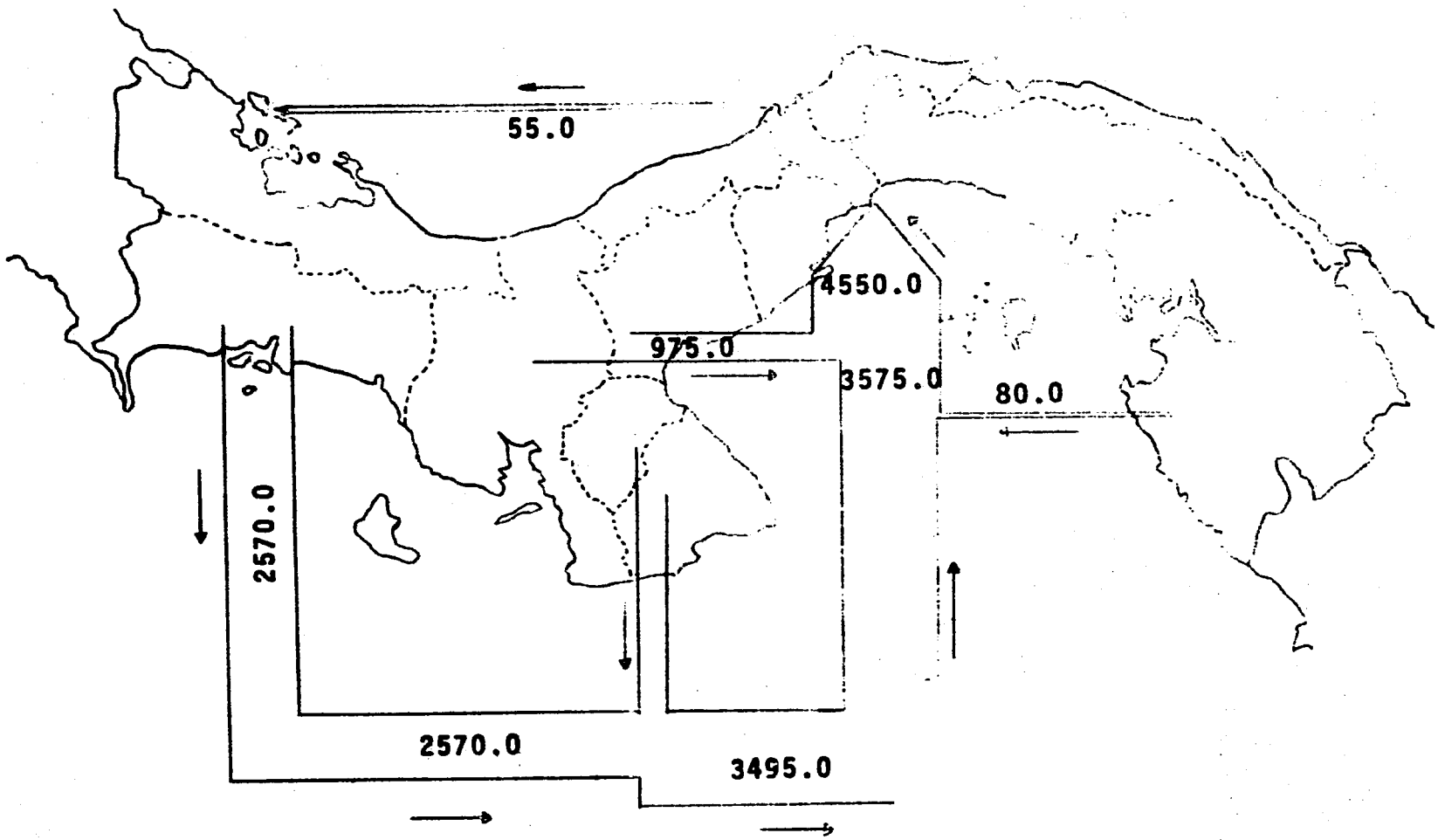
3. These recommendations are based on the assumption that these planned facilities will be built with future expansion capabilities.

Due to the increasing importance of grain production and increases in marketable quantities, it is recommended that a facility of 150,000 quintals be built in the region of Chiriqui. Expected high peak storage requirements in this region make it essential for proper price stabilization activities. Due to insufficient funds, it is further recommended that for "maximum" benefit, the remainder of those funds be committed to building the biggest possible grain storage facility (approximately 250,000 quintals) in the region of Azuero-Cocle.

FIGURE 11

CALCULATED FLOW OF GRAINS, 1985-86

1,000 QQ



Replacement Storage Capacity Needs

The requirements for additional storage capacity described previously in this section, do not take into account the need to replace storage capacity not suitable for grain, rehabilitation needs of certain storage facilities, and whether or not certain rental facilities should be replaced by government-owned facilities.

Of total current effective storage capacity available to IMA, 52 percent fits the above categories. In the province of Chiriqui and Veraguas, 110,000 and 13,000 quintals of storage space need to be replaced. In the provinces of Cocle and Panama, 120,000 and 185,000 quintals of storage space need to be either replaced or totally rehabilitated for proper medium- to long-term storage.

In terms of IMA's operations and the need to reduce waste and loss, it is imperative that facilities in need of replacement be replaced as soon as possible. For the same reasons, facilities in need of further rehabilitation should be rehabilitated within the shortest period of time possible.[1/] Finally, the facility rented by IMA at Tocumen should be either brought up to proper standards or replaced by the correct type of storage facility.[1/]

1/Depending on cost analysis of replacement versus rehabilitation.

SECTION IV

BENEFITS OF PROPOSED STORAGE FACILITIES

The computation of a benefit-cost analysis for proposed USAID funded facilities must be based upon assumptions and expected reactions because the data base for accurate calculation of benefits is either limited or entirely deficient.

Waste and Loss Reduction

As explained in Section II, waste and losses are due to a combination of several factors involving the need for (1) more and adequate grain storage facilities, (2) additional staff and technical personnel as well as improved management practices, and (3) additional technical and marketing training of IMA's personnel.

Given concurrent and previous of application of items (2) and (3) above, the reduction on waste and losses attributable to the new storage facilities are calculated as follows:

Assuming an annual turnover ratio of one for each proposed grain storage facility, grain waste and loss reduction was calculated on the expected annual proportion of rice and corn to be handled by each facility. It was also assumed that these facilities would be operational by 1982-83. Under these assumptions, a range of loss reduction for rice of 10, 15, and 20 percent and 8 and 10 percent for corn was calcualted. Current budgeted handling costs used by IMA per quintal of rice and corn was assessed to the quantities of rice and corn attributable to the loss reduction.

The calculated annual benefits attributable to this range of loss reduction in rough rice and corn are summarized in Table 27. Total annual benefits range from a conservative total savings of Bl. 604,533.50 for a reduction of losses by 10 percent in rough rice and 8 percent in corn, to

TABLE 27

CALCULATED ANNUAL BENEFITS ATTRIBUTABLE TO LOSS REDUCTION

(Bl.)

Commodity		Assumptions #1 Losses Reduced to (%)	#1 Savings (Bl.)	#2 Losses Reduced to (%)	#2 Savings (Bl.)	#3 Losses Reduced to (%)	#3 Savings (Bl.)
Rough Rice	29	9	1,123,446.2	14	828,366.4	19	561,724.6
Corn	15	5	53,502.4	7	42,808.9	7	42,808.9
TOTAL	-	-	1,176,948.6	-	871,175.3	-	604,533.5

Bl. 1,176,948.60 annually, for a reduction of losses by 20 percent and 10 percent in rough rice and corn, respectively.

Storage and Handling Costs

Actual storage and handling costs of IMA operations are unknown. Lack of cost accounting prevents analysis of storage and handling costs. The only available data are budgeted operational costs per quintal as follows:

	1979/80 (Bl.)	1980/81 (Bl.)
Rough Rice	1.66	1.80
Corn	1.18	1.23
Grain Sorghum	1.48	1.59

There is no way to ascertain whether or not these budgeted costs are realistic or even actually close to true operational costs of storage and handling.

Since there is no way to benchmark storage and handling costs by facility type, expected cost reductions are based upon known average differences between bagged and bulk grain storage procedures.

In the case of the planned facilities, expected cost reduction, under the necessary handling procedure of bag to bulk to bag, would be 12.5 percent. This assumes sound performance in managing these facilities.

Based upon the calculated ratio of rough rice to corn handled and stored, savings in operational costs should average 21 cents per quintal. For the 400,000 quintals capacity to be built, annual cost reduction in handling and storage would therefore amount to Bl. 84,000 annually.

Rental Versus Ownership

As previously discussed in Section II, rental of any type of facility that would duplicate the proposed facilities, which are designed for correct handling and storage of grain, is not feasible. Only flat warehouse space is

available for storage. That warehouse space not only lacks basic allied equipment, but is usually poorly located and of insufficient quality to be considered for grain storage unless no other alternative exists.

The construction of sound grain storage facilities produces an additional benefit in that it negates the necessity of renting flat warehouse space to store the amount of grain that constructed facilites will contain.

The savings in the case of proposed facilities will amount to Bl. 104,000 annually, based upon a rental cost factor of Bl. 0.35 per quintal per year.

Benefit-Cost Analysis

Table 28 details investment cost and benefits for calculation of a direct rate of return on the investment cost of planned facilities.

Investment cost is based on construction of 400,000 quintals of bulk grain handling and storage capacity. The amount of capital available under the USAID loan limits proposed construction to two facilities. Previous construction costs (1979) were escalated by an inflation factor of 15 percent annually. As a result, where 500,000 quintals of capacity were previously planned for construction, only 400,000 can currently be built under the capital limitations.

The benefits, as shown in Table 28, are generated in the prior subsections of this section.

The direct rate of return, using discounted cash flow analysis, for the cost and benefits in Table 28 is 13.0 percent. This uses assumption number one for reduction in waste and losses, which is considered achievable under correct management of facilities.

Assumption number two for waste and loss reduction reduces the direct rate of return to 8.75 percent, while assumption number three dictates a rate of return of 6.0 percent.

TABLE 28

CALCULATED INVESTMENT COST AND BENEFITS

Planned Grain Storage Facilities[1/]

In Balboas

Year	Period	Investment Cost	Benefits		
			Waste and Loss Reduction	Reduced Handling and Storage Costs	Rental Space Avoidance
1980-81	0	7,447,500			
1981-82	1				
1982-83	2		1,176,949[2/]	84,000	140,000
1983-84	3		1,176,949	84,000	140,000
1984-85	4		1,176,949	84,000	140,000
1985-86	5		1,176,949	84,000	140,000
1986-87	6		1,176,949	84,000	140,000
1987-88	7		1,176,949	84,000	140,000
1988-89	8		1,176,949	84,000	140,000
1989-90	9		1,176,949	84,000	140,000
1990-91	10	-4,468,500[3/]			

1/USAID loan.
2/Based upon loss reduction assumption #1.
3/Calculated salvage value.

Summary

There is no doubt that the largest benefit to investment in new facilities is conservation of commodities and the reduction of waste and losses. It is not unrealistic to expect that these reductions would assist in achieving at least a 13.0 percent return on investment for any new storage constructed. In the case of rehabilitation of specific facilities, the rate of return on this type of investment should be at least double the rate calculated for new facilities. Underlying these expectations is the assumption that the institutional capacity of IMA will be at a level of performance which leads to good management of facilities as well as marketing.

SECTION V

CURRENT INSTITUTIONAL SITUATION

Regulatory actions by the GOP in the marketing of agricultural products goes back to the 50s when the Economic Development Institute (Instituto de Fomento Económico, IFE) was created with the objective of price stabilization and market regulation of food and agricultural products. Its efforts were concentrated in the marketing of rice and corn (annually importing necessary quantities to cover deficits).

In 1970 the Department of Agriculture (Ministerio de Agricultura y Ganaderia) created a special institution in order to regulate the marketing of perishable products.

In January of 1973 the Department of Agricultural Development (Ministerio de Desarrollo Agropecuario, MIDA) was created to direct all policy matters in the agricultural sector. A new National Board of Agricultural Marketing (Dirección Nacional de Mercadeo Agropecuario, DNMA) was established within MIDA to combine IFE and the program of perishable products into one unit.

Complete integration of the last reorganization was achieved in December 1975. Under law 70 the Agricultural Marketing Institute was created (Instituto de Mercadeo Agropecuario, IMA) with the same objective and functions of its predecessor. Furthermore, IMA as an institution was given financial, administrative and functional autonomy.

Objectives of IMA

According to article 2° of law 70, through which IMA was created, the following objectives were established:

a. Promote the improvement of marketing systems for agricultural products.

b. Carry out marketing policies as formulated by MIDA.

c. Guarantee an internal and external market for the national agricultural production at profitable prices.

d. Organize, modernize, and control the marketing channels for national agricultural production.

e. Regulate the supply of national agricultural products and imports in the internal market in order to satisfy its needs.

f. Protect and harmonize the interest of producers and consumers in the marketing process.

Structure of IMA

The basic internal structure of IMA is shown in Figure 12.[1/] Guided by an Executive Committee, the responsibilities of operations rests with the General Manager. Legal Council and Internal Audit is provided at this level by respective staff. Four main Directorates, those of Administration, Planning, Finance, and Operations, operate and report in line to the General Manager. Key departments are given under each Directorate with the exception of International Marketing which is responsible directly to the General Manager. Finally, not shown on Figure 12, are the different sections of each department and the Regional Directorates which are part of the Directorate of Operations.

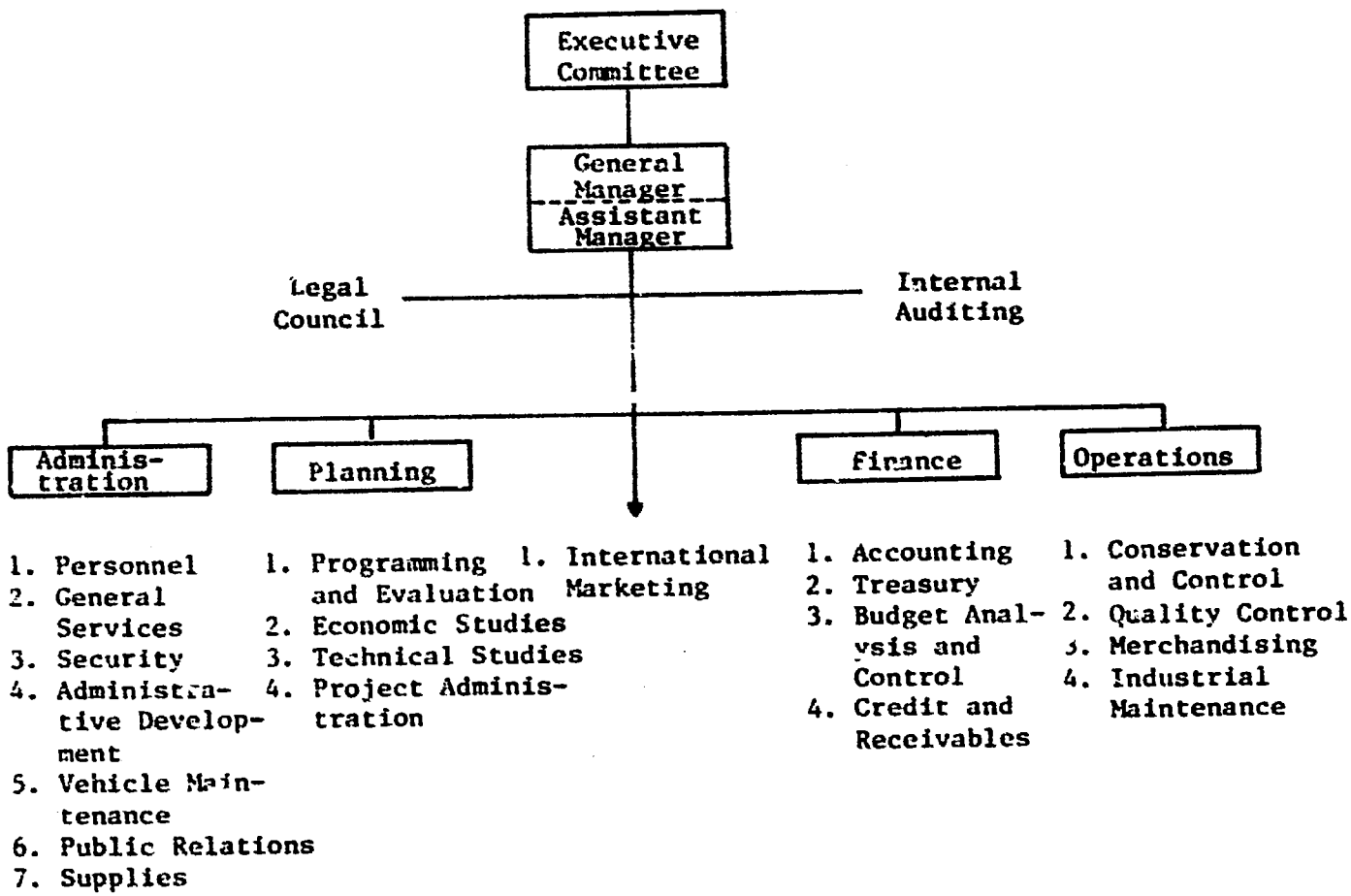
A. The Executive Committee

The basic functions of the Executive Committee are those of a Board of Directors. It guides the implementation of marketing policy decisions and acts as the overall management body of IMA. This ranges from the adoption of measures necessary to solve problems occurring in the area of agricultural product marketing and determining the investment projects of the institution, to authorizing contracts with a value of more than Bl. 50,000.00.

1/For a detailed structural chart, refer to source 24. The material contained in this section has been condensed from that source. Emphasis has been put only on those items relevant to this appraisal.

FIGURE 12

STRUCTURE OF IMA ORGANIZATION



Finally, its membership is designed to provide necessary communications and linkages with other government institutions involved in the agricultural sector. Its members are:

1. The Secretary of Agriculture, serving as President of the Executive Committee.
2. The Director of Agricultural Production of MIDA.
3. The Director of Sectoral Planning of MIDA.
4. The Director of the Office of Price Regulation.
5. The Manager of the Office for Agricultural Development.

B. General Manager

The General Manager represents the highest authority within IMA. He is responsible for carrying out the policy decisions as formulated by the Executive Committee to which he is directly accountable for IMA's performance.

C. Assistant Manager

The Assistant Manager is responsible for assisting the General Manager and carrying out any other responsibility delegated to him by the General Manager. Furthermore, he is responsible for coordinating the activities of the four Directorates.

D. Legal Council

The Legal Council is subordinated directly to the General Manager and his responsibilities consist of giving legal advice to the Institute in matters concerning it.

E. Internal Audit

The Internal Audit unit is directly subordinate to the General Manager. Its basic objective is to provide efficient and qualified control of the Institute activities.

F. Administration

The basic responsibility of the Directorate of Administration is the internal management of IMA. The basic objectives consist of organizing, directing, obtaining, and controlling the services and administrative requirements needed by other entities in IMA such as personnel, general services, equipment and office supplies purchases, and structural and procedural development in order to efficiently use human, physical, and system resources at the lowest possible cost.

G. Planning

There are three basic objectives of the Directorate of Planning. First, establish the requirements for the preparation, organization, evaluation and control of all activities required in the annual plan of operations. This is to be done with the cooperation of the other Directorates of IMA. Second, assist the General Manager in the development of the master plan for the integral development of the Institute in the medium- and long-term. Finally, the Directorate of Planning is also responsible for carrying out a series of technical studies and other marketing research activities which are designed to help IMA carry out its responsibilities as a facilitating institution in the area of agricultural production and marketing. Therefore, the key to the success of IMA as a facilitating institution are the functions and subsequent activities to be performed by four departments within the Directorate of Planning. Though their individual responsibilities do vary, they have a common goal which is the generation of vital information through assembly, research, and studies, both technical and market oriented to enable IMA in fulfilling its responsibilities to the highest degree possible. Subsequently, relevant and adequate internal and external information must be made available.

H. Finance

The Directorate of Finances has three basic objectives. First, to carry out and control all accounting and financial operations undertaken by the Institute. Second, to guarantee, efficiently and rationally, every financial transaction that the Institute may carry out. Thirdly, to provide to different levels of decision making within the Institute, the necessary analytical information which will allow them to carry out their financial transactions efficiently.

Some of the functions and activities of the different departments which make up the Directorate of Finance are highly essential in terms of their responsibilities and results. They are not only vital for control, but also necessary for the departments within the Directorate of Planning and Operations to be able to carry out their assigned responsibilities.

I. Operations

The Directorate of Operations represents IMA's merchandising unit. Its major objectives consist of buying, storing, selling, and distribution of relevant agricultural products. As such, it acts as the executing agent and carries out the internal marketing activities as formulated by IMA's marketing policy.

Some of the general functions assigned to the Directorate of Operations and its departments are vital in terms of the responsibilities of Directorate of Planning and Finance.

Areas to be Strengthened

The assessment of the current status and recognized needs presented in this section represent the study team's interpretation of information and first-hand field observations. The priority needs for enhanced analytical capability to support marketing policies and operational activities, as well as improvement of technical aspects of grain storage and preservation, are given on the following page.

1. Technical Procedures of Grain Storage and Preservation

Though the experience and technical training of IMA's personnel in the area of grain storage, preservation and handling during the last five years has contributed to improvements in this area, full advantage of the technical training received so far has not taken place. Hampered by, among other things, lack of proper resources when needed, certain basic principles of sound storage have not been implemented. These range from lack of bird screens on vented walls, easy access by rodents to storage area, lack of proper sanitation, preventive maintenance of facilities, poor stocking procedures and inadequate fumigation. There also seems to exist a gap between technical advice provided by internal and external sources and subsequent implementation by administrative and technical personnel. This seems to be the case since all technical advice presented in this report has been documented several times before.

2. Grain and Cost Accounting as Related to IMA's Grain Operations

The importance of adequate, timely, and exact grain and cost accounting procedures of IMA's successful operation cannot be exaggerated. Recently, IMA employed the consulting services of Cooper's and Lynbrand/ Chandeck and Bosquez regarding the implementation of a grain and cost accounting system. Field observations and talks with IMA personnel suggest that the devised system is, with the exception of normal monthly shrink adjustments, quite adequate for IMA's operational needs. However, this system has not been fully implemented. Therefore, all the basic information for needed internal data regarding grain operations and associated costs is at hand but not easily available when needed. The unavailability of this internal information by IMA's management for control, planning, coordinating, and budgeting purposes reflects on its performance.

However adequate this grain and cost accounting system might be, its usefulness is greatly undetermined by the following observations. First, lack of standardized weight for bags of rough rice and other grains will hamper the system's ability to exactly track true movements of grains. Second, first-in/first-out method of inventory rotation is not a general practice, therefore, impacting on the grain accounting system's ability to account for true losses. Third, thorough physical inventories are taken every quarter, these inventories are hampered by the lack of standardized sack weight. Therefore, subsequent book adjustments of inventories at hand are tenuous at best. Fourth, inadequate stock rotation (some rough rice in inventory was four years old) and recent difficulties in bringing stock on hand to manageable levels has hampered the grain and cost accounting system to perform as designed. Finally, apparent lingering unfamiliarity with the new system has delayed its implementation.

The above observations regarding the level of implementation of the grain and cost accounting system, as well as related operational weaknesses impacting on the system, has made its use to IMA's management and staff rather limited for the purposes of management needs as well as marketing, technical and operational analysis.

3. Technical, Marketing and Economic Policy Analysis as Related to IMA's Objectives

The following functions needing strengthening or implementation are keys to IMA's performance as a facilitating institution for price stabilization. Most if not all are concentrated in the Directorate of Planning, more specifically, in the department of programming and evaluation, economic, and technical studies.

However, strengthening these functions or adding new ones as suggested on the next page will be in vain unless these departments are staffed with

an adequate number of properly trained professionals. The few economists and technical experts presently employed in these departments cannot possibly cope with the required studies that management of an institution such as IMA requires in order to achieve a performance level as per its objectives.

It must be kept in mind that essential information (data) required by these functions will have to be provided by internal and external sources. It is beyond the scope of this study to analyze the current availability, quality and timeliness of such information. Following are some functions that should be strengthened and/or implemented.

a. Periodic analysis and timely dissemination of current market prices, quantities, stocks, and flows.

b. From crop surveys, develop analysis of data, preparation and timely dissemination of crop forecasts, and related outlook affecting market supplies.

c. Analysis of demand conditions, preparation and timely dissemination of outlook reports on demand and utilization of basic grains.

d. Analysis of factors affecting production costs of grains by regions and size of farms.

e. Analysis and projection of shifts in cropping patterns affecting the location and concentration of agricultural production.

f. Analysis and projection of shifts in demand factors and development of demand projections by commodity and market.

g. Analysis of factors affecting farmer's production response and estimation of supply response to alternative price and non-price incentives, including impacts of competition of agricultural inputs.

h. Analysis of marketing functions, channels, costs, and margins for agricultural commodities and processed products.

i. Analysis of market organization, structure, conduct, and performance for agricultural marketing and processing industries.

j. Analysis of physical and institutional infrastructure affecting the development and performance of marketing systems for agricultural products.

k. Analysis of existing and alternative technologies in agricultural marketing and processing industries, including internal and external factors restricting efficiency.

l. Analytical concepts and procedures reflecting changing structural relationships in the markets and marketing systems for Panamanian agricultural products.

m. Short-, intermediate- and long-term projections of the impacts and results of established policies and programs on markets and marketing systems for agricultural products.

n. Identification of major impediments and constraints limiting the effectiveness of the existing marketing system, and development of promising alternative policies and programs for removing these impediments.

o. Analysis of probable results of promising alternative policies and programs for improving existing marketing systems.

p. Monitoring, reporting and evaluation of agricultural price policy and marketing programs.

While all functions mentioned above are believed to be important to IMA's level of effectiveness, their individual degree of necessity and recurrency varies. Also, competence required and complexity of analysis increased beyond function k. (except function o.) for which simulation needs are higher.

The basic functions of supply and demand analysis and those factors affecting levels of supply by region or type of farm, and levels of demand by type of consumer or income levels are keys to IMA's short-term and medium-term performance. Occurrences of shifts in demand and supply will impact

significantly on medium- to long-term planning and performance. Those functions reflecting simulation of variables are necessary to "predetermine" results of policy changes prior to implementation of new policies. Also, the analyses of market structure and conduct, as well as institutional and physical infrastructures, will help determine their effect on marketing systems for agricultural products and therefore give guidance to possible improvements.

SECTION VI

IMPROVING INSTITUTIONAL PERFORMANCE

The conclusion and recommendations in this sector are intended as guidelines for the development of plans and action implementations to build further competence within IMA. Thereby, improving those functional areas which are clearly in need of development or improvement.

A portion of these guidelines have been previously brought forth in other documents over the past five years with the result being mostly one of inaction.

Technical Procedures of Grain Storage and Preservation

Given the findings in Section V, the first action required in this area is that of eliminating management deficiencies dealing with the communication - implementation gap between technical advice and in-line personnel in charge of operational management.

At least four of IMA's personnel have been trained by the FFGI, KSU, in basic knowledge of grain handling and storage. That trained personnel are in charge of facilities is not reflected in the manner in which the facilities are operated.

Since there is known to be a basic source of knowledge within the institution, it is apparent that this knowledge is not being properly utilized. Therefore, this managment deficiency must be corrected in conjunction with the necessary planning for personnel requirement and training for the planned USAID funded grain storage facilities.

The planned facilities will require recruiting and training of new personnel. It is recommended that IMA take advantage of consultancy advice and services. That with the aid of consultancy advice, a work plan be developed to hire and train personnel, develop and implement training programs in

operation of facilities, and to develop and initiate a sound maintenance program for the new facilities. That such consultancy advice be retained and utilized throughout the implementation of the above plan and for at least one year after the initial beginning of operations of the new facilities.

It is further suggested that this consultancy advice be used to resolve the communications - implementation gap of placing available technical advice into action. This would take the form of achieveing improved managment efficiency in terms of better coordination and communication that would lead to management's prompt implementation of technical advice provided by internal (within IMA) and external sources, and management's consulting with their trained technical personnel.

Grain and Cost Accounting as Related to IMA's Grain Operations

It is strongly recommended that immediate attention be given to full implementation of the grain and cost accounting system prepared and introduced by Cooper's and Lynbrand/Chandeck and Bosquez. Concurrently, with the immediate full implementation of the grain accounting system, speedy implementation of standard sack weight for grain bagging procedures for physical inventory purposes.

That implementation of the grain accounting system be subsequently followed by implementation of a management information system to provide for the regular and timely flow of data generated by the grain accounting system to management and the Directorates of Planning and Operations.

The implementation of the cost accounting system should include the development of cost centers by facility as well as cost centers by product. The resulting output being again reported through a management information system to management and the Directorate of Planning on a regular and timely basis.

Technical, Marketing, and Economic Analysis of the Grain Marketing Sector

Recommendations for enhancing the analytical competence to support IMA's operations and marketing programs, policies, and procedures are set forth with respect to the needed functions described in Section V.

The FFGI team fully supports the initiative taken by IMA in the area of post-harvest loss analysis. While recognizing that this and other suggested actions will require a large amount of funding, these types of actions are required if the grain marketing system in Panama is to further develop to benefit producers, processors, merchants, and consumers alike.

IMA's Directorate of Planning, which is charged with the tasks in this area, must first develop a long-range plan for growth and action to determine the process and timing of developing superior competence.

This plan must be strongly supported by upper management. It should encompass the areas of (1) adequate staffing of personnel, (2) training programs for staff development, (3) a set of priority studies in technical, marketing and economic areas, and (4) coordination with other Directorates within IMA so as to provide for the analytical needs of those areas, as well as the timely undertaking of studies and return of output so that problems may be quickly attacked and solved.

The FFGI team wishes to emphasize that the analytical needs are very large in the case of the grain marketing sector in Panama.

In vew of initial staff limitations, given the development of a sound plan, that in addition to technical studies involving IMA's internal handling and storage of grains and post-harvest grain losses, a priority be given to studies encompassing items, c., d., e., f., and g., as given in Section V. These would have direct impact upon IMA's grain purchasing and sales operations.

IMA may wish to avail itself of consultancy advice to formulate the plan as well as to assist in preparation of the first series of studies given previous priority. This should be viewed as using consultancy advice as a training tool to improve staff performance, not as a device to do the studies without staff participation.

Possible Implications of Improving Institutional Performance

Improving institutional performance will not only reduce current high levels of waste and losses as well as operating costs. It could have a large impact upon the total grain marketing sector if properly directed.

Currently, IMA has little or no coordination with the private grain sector with the exception of commodity sales. If IMA were to correct its managerial and analytical deficiencies, it has a unique opportunity to provide facilitating functions for private grain sector development in the future

Control of marketing margins means control of marketing costs as well as profits. The reduction of marketing costs and the ability to extend this expertise to the private sector as a facilitating function should be goal of such an institution as IMA.

APPENDIX - ROUGH RICE DATA

TABLE A-1

PRODUCTION OF FIRST-CROP RICE BY PROVINCE IN PANAMA 1960-1980
(1,000 Quintals, Rough Rice)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										1,796.6
1961-62										2,016.9
1962-63	3.3	557.5	541.6	233.1	265.7	197.9	200.1	52.4	69.3	2,120.9
1963-64	5.0	563.4	535.5	255.0	272.0	170.1	201.5	60.1	102.3	2,164.9
1964-65	15.0	586.7	631.7	322.7	327.9	182.0	233.8	80.4	109.8	2,490.0
1965-66	7.9	772.7	918.1	344.3	207.6	295.8	252.2	77.1	134.0	3,009.7
1966-67	8.0	655.4	786.8	279.7	259.8	260.2	327.4	77.2	152.9	2,807.4
1967-68	7.8	898.4	859.1	256.8	241.1	265.6	231.3	67.9	143.5	2,971.5
1968-69	4.2	868.0	802.9	355.8	256.8	462.9	192.7	67.2	121.2	3,131.7
1969-70	5.6	1,190.4	741.0	245.1	247.9	514.0	147.6	55.5	121.2	3,268.3
1970-71	3.5	961.5	377.6	123.0	136.5	604.1	127.4	29.8	24.0	2,387.4
1971-72	3.5	973.1	368.3	125.3	135.6	650.6	125.9	34.8	24.0	2,441.1
1972-73	5.5	1,215.2	378.0	84.9	118.6	443.2	95.1	28.3	22.2	2,391.0
1973-74	5.5	1,226.3	418.3	142.9	202.5	756.4	210.6	33.3	23.5	3,019.3
1974-75	5.4	1,532.6	428.0	169.5	149.5	885.2	257.9	48.1	22.2	3,498.4
1975-76	5.4	1,523.4	483.9	177.0	190.7	915.2	328.9	50.0	22.2	3,696.8
1976-77	185.2	1,131.9	410.2	147.0	187.7	478.9	184.3	53.2	56.5	2,834.9
1977-78	48.6	1,281.7	514.2	240.8	321.3	580.9	372.7	54.3	79.8	3,494.3
1978-79	22.6	1,339.6	410.1	172.4	226.1	431.2	248.1	53.8	50.1	2,954.0
1979-80										

TABLE A-2

PRODUCTION OF SECOND-CROP RICE BY PROVINCE IN PANAMA, 1960-1980

(1000 QUINTALS, ROUGH RICE)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										321.2
1961-62										384.0
1962-63	2.8	82.2	64.4	17.7	47.9	19.6	55.6	7.4	-	297.6
1963-64	2.9	74.2	32.0	11.4	66.9	20.6	70.7	1.7	5.0	285.4
1964-65	2.9	90.8	57.6	34.7	66.6	17.6	51.2	2.4	2.4	326.2
1965-66	1.4	105.9	22.6	15.8	58.1	23.1	95.0	2.4	5.4	329.7
1966-67	1.0	111.8	27.4	10.2	27.5	16.6	81.2	1.6	4.1	281.4
1967-68	1.2	137.1	34.0	15.4	29.2	30.3	103.6	1.2	3.8	355.8
1968-69	1.2	249.6	30.8	20.4	23.0	52.0	80.7	1.2	3.8	462.7
1969-70	1.2	178.1	20.0	15.0	34.0	45.9	75.5	1.2	3.8	374.7
1970-71	0.7	258.0	19.6	13.1	41.3	68.2	17.0	0.8	2.3	421.0
1971-72	0.7	404.3	32.1	14.5	28.1	52.0	28.0	-	2.3	562.0
1972-73	0.3	296.1	13.4	7.6	21.9	16.3	12.5	-	1.5	369.6
1973-74	0.3	447.7	7.0	13.1	23.7	36.5	24.8	0.7	1.5	555.3
1974-75	0.4	221.2	19.6	5.6	26.8	108.5	50.2	0.2	1.5	434.0
1975-76	0.4	199.0	13.4	17.8	48.3	63.4	33.6	0.8	1.5	378.1
1976-77	5.4	222.2	23.0	11.8	33.8	24.7	28.4	0.2	0.5	350.0
1977-78	33.8	287.1	58.9	31.9	65.5	89.7	27.1	12.3	4.1	610.4
1978-79	16.6	386.7	29.2	22.2	68.5	74.1	28.5	0.1	-	625.9
1979-80										

TABLE A-3

TOTAL PLANTING OF RICE BY PROVINCE IN PANAMA, 1960-1980

(1,000 Hectares)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61	0.4	21.0	24.8	8.0	11.7	8.7	9.9	2.5	1.7	88.7
1961-62	0.4	23.2	27.8	8.4	12.4	11.3	11.9	3.2	1.9	100.5
1962-63	0.6	21.9	29.1	8.6	12.8	10.9	10.5	3.1	2.2	99.7
1963-64	0.6	20.6	19.3	9.1	17.2	6.1	12.5	3.7	3.9	94.1
1964-65	1.0	25.1	30.4	13.0	15.3	12.4	15.8	4.0	3.7	120.8
1965-66	0.6	26.9	27.5	11.7	14.9	14.9	17.0	4.1	4.5	123.1
1966-67	0.6	27.1	36.9	11.9	13.6	14.4	17.0	5.0	5.1	131.5
1967-68	0.6	27.9	37.9	10.4	12.4	14.3	16.9	4.1	4.6	129.2
1968-69	0.4	28.2	32.0	12.4	12.7	19.5	15.6	3.9	3.9	128.6
1969-70	0.5	31.4	30.9	10.1	11.9	20.2	13.1	3.7	3.9	125.7
1970-71	0.7	28.4	21.0	6.9	8.8	20.2	7.7	2.1	1.3	96.1
1971-72	0.7	29.8	19.7	6.0	8.0	19.0	8.6	2.2	1.3	95.3
1972-73	0.8	32.2	22.2	6.0	8.6	21.6	10.1	2.2	1.5	105.2
1973-74	0.8	34.8	20.2	5.8	8.9	20.6	10.0	2.1	1.6	105.4
1974-75	0.8	34.8	20.8	6.2	8.7	26.1	11.0	2.3	1.5	112.2
1975-76	0.8	34.0	22.0	7.9	9.4	24.2	13.0	2.5	1.5	115.4
1976-77	2.9	34.8	21.6	8.1	14.2	21.9	14.8	2.5	1.6	122.3
1977-78	2.0	28.7	20.8	8.4	12.5	20.1	12.2	2.7	2.2	110.0
1978-79	1.5	29.7	18.8	6.4	9.9	18.4	9.8	2.3	1.9	99.1
1979-80										

TABLE A-4

PLANTINGS OF FIRST-CROP RICE BY PROVINCE IN PANAMA, 1960-1980

(1000 HECTARES)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	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	0.4	26.1	30.0	9.5	10.2	18.6	9.0	3.6	3.8	111.2
1970-71	0.5	22.6	19.7	6.3	6.8	17.8	6.3	1.9	1.2	83.1
1971-72	0.5	21.3	18.6	5.3	6.5	17.8	6.7	2.2	1.2	80.1
1972-73	0.7	26.6	21.6	5.2	7.5	20.8	8.6	2.2	1.4	94.6
1973-74	0.7	25.7	19.7	5.2	7.6	19.7	9.0	2.1	1.5	91.2
1974-75	0.8	29.0	20.3	5.6	7.3	23.2	9.2	2.3	1.5	99.0
1975-76	0.8	29.5	21.6	6.7	7.4	22.7	11.0	2.5	1.5	103.5
1976-77	2.7	28.2	20.4	6.9	11.8	21.0	13.8	2.5	1.6	108.8
1977-78	1.0	23.2	19.5	7.4	10.4	18.3	11.1	2.3	2.0	95.2
1978-79	1.0	22.9	17.6	5.6	8.1	16.8	9.0	2.3	1.9	85.6
1979-80										

TABLE A-5

PLANTINGS OF SECOND-CROP RICE BY PROVINCE IN PANAMA, 1960-1980

(1000 HECTARES)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	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	0.1	5.3	0.9	0.6	1.7	1.6	4.1	0.1	0.1	14.5
1970-71	0.2	5.8	1.3	0.6	2.0	1.4	1.4	0.2	0.1	13.0
1971-72	0.2	8.5	1.1	0.7	1.5	1.2	1.9	0.0	0.1	15.2
1972-73	0.1	5.6	0.6	0.8	1.1	0.8	1.5	0.0	0.1	10.6
1973-74	0.1	9.1	0.5	0.6	1.3	0.9	1.6	0.0	0.1	14.2
1974-75	0.0	5.8	0.5	0.6	1.4	2.9	1.8	0.0	0.0	13.2
1975-76	0.0	4.5	0.4	1.2	2.0	1.5	2.1	0.0	0.0	11.9
1976-77	0.2	6.6	1.2	1.2	2.4	0.9	1.0	-	-	13.5
1977-78	1.0	5.5	1.3	1.4	2.1	1.8	1.1	0.4	0.2	14.8
1978-79	0.5	6.8	1.2	0.8	1.8	1.6	0.8	0.01	0	13.5
1979-80										

TABLE A-6

TOTAL HARVESTED HECTARES OF RICE BY PROVINCE IN PANAMA
(1.000 Hectares)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
1970-71										
1971-72										
1972-73										
1973-74										
1974-75										
1975-76										
1976-77	2750	30190	17610	5570	8000	19220	10190	2390	1260	97160
1977-78	1540	27970	19420	8720	12120	19770	11150	2470	1980	105140
1978-79	1000	29120	16830	6590	9270	17800	8910	2090	1750	93360
1979-80										

TABLE A-7

HARVESTED HECTARES FIRST-CROP RICE BY PROVINCE IN PANAMA
(Hectares)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
1970-71										
1971-72										
1972-73										
1973-74										
1974-75										
1975-76										
1976-77	2510	24620	16520	4940	6910	18500	9320	2360	1240	86920
1977-78	890	22470	18200	7320	10120	18080	10310	2120	1800	91310
1978-79	550	22420	15660	5860	7480	16310	8180	2080	1750	80290
1979-80										

TABLE A-8

HARVESTED HECTARES SECOND-CROP RICE BY PROVINCE IN PANAMA
(Hectares)

YEAR	BOCAS DEL TORO	CHIRIQUE	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
19 -71										
19. 2										
19[illegible]3										
1973-74										
1974-75										
1975-76										
1976-77	240	5570	1090	630	1090	720	870	30	20	10240
1977-78	650	5500	1220	1400	2000	1690	840	350	180	13830
1978-79	450	6700	1170	730	1790	1490	730	10	0	13070
1979-80										

TABLE A-9

YIELD OF RICE BY PROVINCE IN PANAMA, 1960-1980

FIRST AND SECOND CROP

(QUINTALS PER HARVESTED HECTARES, ROUGH RICE)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
1970-71										
1971-72										
1972-73										
1973-74										
1974-75										
1975-76										
1976-77	69.3	44.9	24.6	28.5	27.7	26.2	20.9	22.3	45.2	32.8
1977-78	53.5	56.1	29.5	31.3	31.9	33.9	35.9	27.0	42.4	39.0
1978-79	39.2	59.3	26.1	29.5	31.8	28.4	31.0	25.8	28.6	38.3
1979-80										

TABLE A-10

YIELD OF FIRST-CROP RICE BY PROVINCE IN PANAMA, 1960-1980

(QUINTALS PER HARVESTED HECTARE, ROUGH RICE)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
1970-71										
1971-72										
1972-73										
1973-74										
1974-75										
1975-76										
1976-77	73.8	46.0	24.8	29.8	27.2	25.9	19.8	22.5	45.6	32.6
1977-78	54.6	57.0	28.3	32.9	31.7	32.1	36.1	25.6	44.3	38.3
1978-79	41.1	59.8	26.2	29.4	30.2	26.4	30.3	25.9	28.6	36.8
1979-80										

TABLE A-11

YIELD OF SECOND-CROP RICE BY PROVINCE IN PANAMA, 1960-1980

(QUINTALS PER HARVESTED HECTARES, ROUGH RICE)

YEAR	BOCAS DEL TORO	CHIRIQUI	VERAGUAS	HERRERA	LOS SANTOS	COCLE	PANAMA	COLON	DARIEN	COUNTRY TOTAL
1960-61										
1961-62										
1962-63										
1963-64										
1964-65										
1965-66										
1966-67										
1967-68										
1968-69										
1969-70										
1970-71										
1971-72										
1972-73										
1973-74										
1974-75										
1975-76										
1976-77	22.5	39.9	21.1	18.7	31.0	34.3	33.4	6.7	25.0	34.2
1977-78	52.0	52.2	48.3	22.8	32.8	53.1	32.3	35.1	22.8	44.1
1978-79	36.9	57.7	25.0	30.4	38.3	49.7	39.0	10.0	0	47.9
1979-80										

TABLE A-12

ROUGH RICE PRODUCTION BY FARM SIZE[1]
1000 QQ

Agricultural Year	Small Farms	Large Farms
71-72	1201.1	1802.0
72-73	1026.3	1734.3
73-74	1357.5	2217.1
74-75	1310.0	2266.4
75-76	1549.8	2525.1
76-77	1301.8	1883.1
77-78	1792.9	2311.8
78-79	1368.7	2211.2

[1]Large Farms larger than (by province) B.D.T. 5 Ha., Cocle 10 Ha., Colon 5 Ha., Chiriqui 20 Ha., Darien 10 Ha., Herrera 10 Ha., Los Santos 10 Ha., Panama 10 Ha., Veragus 10 Ha.

TABLE A-13

RICE IMPORTS

STATISTICS AND CENSUS SOURCE

Year	Quantity (QQ)
1960	218
1961	52,126
1962	82,164
1963	82,373
1964	93,746
1965	5,057
1966	1,467
1967	46
1968	59
1969	153
1970	129
1971	496,634
1972	122,475
1973	2,969
1974	2,723
1975	1,350
1976	567
1977	135
1978	387

IMA SOURCE

Year	Quantity (1000 QQ)
1960-61	0.8
1961-62	82.3
1962-63	126.5
1963-64	132.2
1964-65	144.8
1965-66	12.7
1966-67	9.8
1967-68	2.8
1968-69	1.2
1969-70	11.0
1970-71	2.6
1971-72	772.1
1972-73	191.2
1973-74	13.8
1974-75	4.2
1975-76	2.1
1976-77	0.9
1977-78	0.4
1978-79	