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Feasibility of a Grain Price Stabilization Program in Haiti

KSU
KANSAS STATE UNIVERSITY

FOOD & FEED GRAIN INSTITUTE
MANHATTAN, KANSAS 66506

REPORT SUMMARY

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Authors: Roe Borsdorf, Kathy Foster, and Ekramul Haque

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SUMMARY STATEMENT

Public-sector participation in the Haitian marketing system can occur in three areas: grain price stabilization, utilization of DARNDR bulk storage facilities, and data collection and analysis. A large number of possibilities exist as to the type of actions which the Government of Haiti could undertake in the general area of grain price stabilization. As set forth in the report, certain grain price stabilization actions involving direct intervention do not appear to be warranted at this time due to limiting factors.

FEASIBILITY OF A GRAIN PRICE STABILIZATION PROGRAM IN HAITI

Prepared by

Roe Borsdorf,
Kathy Foster,
and
Ekramul Haque

for the

AGENCY FOR INTERNATIONAL DEVELOPMENT
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Improvement of Postharvest Grain Systems

at the

FOOD AND FEED GRAIN INSTITUTE
Kansas State University
Manhattan, Kansas 66506

Charles W. Deyoe, Director

PREFACE

This technical report has been prepared for USAID/Port-au-Prince based on the scope of work attached in Appendix A. This report covers three general aspects of grain marketing in Haiti: possible price stabilization activities (including analysis of past price data), proposed data collection processes and requirements which will facilitate implementation of any price stabilization activities, and the utilization of DARNDR's bulk storage facilities.

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EXECUTIVE SUMMARY

Public-sector participation in the Haitian marketing system can occur in three areas: grain price stabilization, utilization of DARNDR bulk storage facilities, and data collection and analysis. These three areas are all interrelated in the sense that data collection and analysis is a necessary precedent to grain price stabilization actions, and options for the utilization of bulk storage facilities are related to any possible actions in the grain price stabilization area.

Grain Price Stabilization Activities

Price stabilization can be accomplished through the regulation of imports; the purchase, storage, and resale of domestically-produced commodities; or the development of the market system.

Governmental import restrictions currently exist for cereal grains and flour. These import restrictions could be reformulated to allow for the importation of predetermined quantities of basic cereals at established points in time. The basic objective of this approach is to dampen seasonal price rises, especially during years of production shortfalls. This approach would call for import regulation such that imported commodities would arrive in limited quantities at the appropriate times. However, it should be realized that such an objective is consumer-oriented and does nothing for the producer.

The second approach to grain price stabilization activities is public-sector purchase, storage, and resale of domestically-produced commodities. The prices for commodities in Haitian markets are highly correlated. Therefore, this type of price stabilization activity would have to be implemented on a countrywide basis, with the basic purchasing points being rural markets. The seasonal price patterns and the price/production relationships suggest that if the GOH intervened in the market, the seasonal price curves for normal production years would shift upward and the shape of the curves would change to resemble those for years of production shortfalls. Analysis of commodity prices does not reveal any evidence that marketers receive windfall profits, except in the case of production shortfalls and supply/demand imbalances in individual markets. There is the possibility that GOH intervention would create the opportunity for windfall profits for marketers since prices in the marketplace would begin to act like prices in production shortfall years.

The question may arise as to why the GOH could not simply purchase the commodities at a price above the low harvest price which would act as a farm support price, then release the commodities later in the season to moderate seasonal price increases. If this is the objective of price stabilization actions, four basic factors concerning moderation of seasonal price increases must be considered: (1) global supply/demand balance, (2) timing of stocks released, (3) quantity of stocks released, and (4) location of stocks released. Such intervention in the marketing system implies that the GOH agency responsible for price stabilization must have the manpower, talent, and facilities to perform such a function. This is not the case at the present time. It does not appear that grain price stabilization activities involving the intervention of the GOH in procurement, storage, and resale of cereals is warranted at this time. Seasonal price movements are not of the extreme to require such intervention,

nor are marketing margins excessive, in either spatial or temporal terms. Further, the lack of knowledge concerning the operation of the current market system precludes the development of any activities which might rationally fit into the system. In addition, the lack of understanding of production cost factors prevents the GOH from being able to determine appropriate prices for commodities.

The third basic approach to grain price stabilization is for the GOH to encourage the development of the market system. The activities designed to accomplish this are the creation of an appropriate storage system applicable to either individual farms or to village-level storage; the measurement of post-harvest losses both at the farm level and within the marketing system; and the collection and dissemination of market information to as many participants as possible within the system. The management of these activities should be assigned to DARNDR. The present capabilities of this agency are such that extensive organizational improvement will not be necessary, but additional resources will be required in order to allow it to successfully carry out the above activities. For futher information on grain price stabilization activities, see Sections I, III, and V.

Utilization of DARNDR Storage Facilities

Due to the inability of the GOH to effectively intervene in the market system by means of price stabilization actions involving the purchase, storage, and resale of commodities, any consideration that the existing bulk storage facilities can be used to support price stabilization activities is inadvisable. The recommended action is for DARNDR to sell the storage facilities in their current unfinished condition to interested parties in the private sector or the public sector. More information on facility utilization can be found in Sections IV and V.

Data Collection and Analysis

The direction towards establishment of a sound data collection mechanism is the correct position for the GOH. This effort should be expanded to include collection of marketing and postharvest loss data. At the same time, attention should be given to procedures by which DARNDR can improve its ability to analyze data and present the results of this analysis to decision-makers. Priority should be given to the collection, analysis, and dissemination of current information on supply, demand, and price; the analysis of cropping patterns, production costs, supply responses, and demand projections; and the analysis of marketing patterns and systems. The nation as a whole would benefit from the development of the capacity within the public sector to diagnose total food and fiber marketing system problems and to prescribe appropriate system-wide solutions. Sections II and V contain further details on data collection and analysis.

SECTION I

Grain Price Stabilization

The central policy issue in agriculture has long been that of price stabilization, or the policy of maintaining the price of a commodity at a certain level within the system. Government policy has often been aimed at establishing or maintaining prices for agricultural products that would not result if free market forces were allowed to determine the prices of these products. The objectives of such policies have been producer income support and stability, increases in production levels due to producer response to higher prices, consumer price protection, and moderation of chance fluctuations in prices.

The Government of Haiti (GOH) currently has no program of price stabilization for domestically-produced grain. There is no government intervention in this sector since all activities are handled by private enterprise. The purpose of the study team's work, as presented in the statement of work prepared by USAID/Port-au-Prince, is to present alternative strategies for grain price stabilization activities to be considered by the GOH. Before undertaking any actions in this area, it is essential that the GOH consider certain aspects and implications of price stabilization actions. The GOH should not attempt to introduce a grain price stabilization program without understanding the basic processes and potential outcomes.

Aspects

A policy of grain price stabilization implies three possible type of actions which may be taken: (1) a farm support price, (2) a maximum consumer price, and (3) a combination of a farm support price and maximum consumer price. These actions require the participation of the government in the purchase, storage, and sale of commodities whose prices are to be either supported or limited. In order to do this, the government must have the necessary facilities to purchase, store, and resell commodities. More importantly, it must have the organization, ability, and knowledge to perform such operations efficiently and effectively. The latter implies that the government must have a sound and comprehensive data collection system and an understanding of the marketing system into which it intends to insert itself.

Farm support prices are based on the concept of providing a sufficient price for a commodity so as to encourage production. If farmers are assured that there will be a market for their commodities at a profitable price, this can provide a powerful incentive for increasing agricultural production. Without this assurance, producers are not willing to invest in farm inputs, expend labor, and accept the risks involved in increasing their production. Thus the relationship between the price received by the farmer for his commodity and the cost of producing that commodity is crucial.

The rationale behind the fixing of a maximum consumer price is to hold food prices in line with consumer income and the ability to purchase food products. The expected result of such an action is the stabilization of prices throughout the system. Therefore, by fixing prices at the retail level, it is expected that no other price regulation measures will be necessary.

A combination of a farm support price and a maximum consumer price involves government establishment of a floor price and a ceiling price for a given commodity. The resulting margin between these two prices is fixed. Wholesalers, processors, and retailers thus have an administratively specified margin within which to operate.

The above price stabilization measures are generally designed to reduce random or recurrent price fluctuations due to chance influences or short-term cycles. Regardless of which intervention method a government selects, the most important factors are reliable data and information, knowledge about marketing procedures, and knowledge about production, marketing, and consumption patterns. Additionally, analysis must then be conducted to understand the underlying factors and linkages that operate in the market system. Without such, any expectation of success is futile.

Over the past two decades an increasing number of governments in developing countries have considered it necessary to intervene in the marketing system in order to deal with food problems. These interventions have been in the form of price setting, or the operation of price stabilization schemes. For most developing countries this has involved the establishment of state agencies to import and distribute grains, to purchase and resell domestically-produced grains, and in some cases to carry out rationing and subsidization schemes.

Implications

It should be recognized that price stabilization policy choices and implementation procedures are extremely critical matters. Confusion and vagueness often exist concerning the objectives to be achieved by policy choices. Conflicts arise as to whether the primary objective of price stabilization policy should be income stabilization, stabilization of prices within a given range, or price fixing. The problems with trying to select more than one of these goals for price stabilization policy is that high farm prices and low consumer prices are mutually exclusive. Therefore, a decision must be made at the outset of the program as to the ultimate objective of the policy. The mechanisms used to implement and achieve price stabilization objectives will vary greatly, according to the national institution responsible for the program and the nature of trade in commodities concerned.

Price stabilization policies can be applied at any level of the production and marketing chain: producer, wholesale and retail. However, intervention at any one level will inevitably have an impact on other levels above and below. For example, price stabilization policies leading to the establishment of uniform prices, irrespective of distance from the market or supply source, neglect fundamental transport and utilization considerations; adverse effects on quality are noticeable in many areas where competition is limited by institutional price fixing; and pressure to protect farmers from the effects of adverse price trends induces the government to provide subsidies.

The effects of a farm support price can vary with the type of farm population. Commercial farmers will generally react quickly to price changes, while subsistence farmers react more slowly over a number of seasons. In addition to the relationship between the cost of production and the price received for a given commodity, producers will also consider alternative production possibilities. If non-food products present a more favorable price situation,

this may result in a deterioration of the local food supply. Adverse affects can also result in food marketing channels since a reduction in the volume of product reduces business activity due to the fact that non-food commodities generally have their own marketing channels.

The setting of a maximum consumer price tends to depress prices farmers receive. Since marketers wish to maintain or increase their margins, they will attempt to pay a lower price to the producer if they can not sell the product above a given fixed price. A reduction in farm prices tends to discourage production due to the fact that it is not profitable to invest in inputs and labor. The result is therefore a scarcity of the product in the marketplace. This leads to a creation of gray or black markets. Someone who is willing to pay a higher price to the producer can sell the product to the consumer at a price above the fixed price. Consumers are willing to pay this price on the black market because the product may not be available at the fixed price in the regular market. A maximum consumer price can also cause a widening of marketing margins due to scarcity of the product, the ability of marketers to force down farm prices, and the lack of price competition when a product's price is fixed by government. Without price competition, less attention is given to marketing costs since marketers are concerned with forcing down the price paid to the supplier. The net result is that the market loses its pricing efficiency. Another result of the lack of price competition is a deterioration in the quality of the product that is available on the market. Since the price is fixed by the government, quality is no longer a factor and the consumer is forced to purchase the product at its fixed price regardless of its quality. Ultimately, therefore, both the producer and the consumer are losers under this type of scheme.

The administrative setting of both a farm support price and a maximum consumer price for a given product results in a fixed margin or resale price for all processors and wholesalers. This generally leads to increased average marketing costs and limited competitive adaption to producer and consumer preferences. This type of price stabilization action will lead to the development of gray or black markets, a decline in product quality, and the loss of pricing efficiency as noted above in the setting of maximum consumer prices. The essential disadavantage of this specific arrangement, particularly in low-income countries, is that merchants are prevented from offering low-cost services to consumers, even though most customers would like to have low-cost services available. Thus the government is sheltering local monopolies and hindering the more efficient merchants from expanding their output by cutting their margins and possibly making way for even greater economies.

While the moderation of chance fluctuations in prices to farmers and consumers can be a worthy objective under certain circumstances, it is dangerous to think that price stabilization will be always beneficial. Once producers, merchants, or consumers have experienced the comforts of stabilized prices or margins, especially where government subsidies are involved, most are reluctant to forgo such arrangements. Competitive pressures to introduce new methods and reduce costs are diminished, and market organizations tend to crystallize in forms that protect the inefficient and hinder the expansion of the more progressive and productive firms. Price stabilization schemes carry the inherent danger that resources will not move in accordance with the changing demands of society.

No sound role models exist on which to base government intervention actions. Many other countries have stabilization programs, but these programs are consistently characterized by inefficiency, low levels of effectiveness, chronic distortions of the marketing system as well as the production system, and extremely high levels of subsidization, which is costly to the government fiscal process. As price stabilization policy becomes more sophisticated or as it attempts to intervene more extensively in the marketing system, the need becomes more crucial for administrative measures, controls, and financial support to purchase commodities at a given price, to transport these commodities to areas of consumption, and to store the commodities until needed. However, even if the organizational, financial, and physical means can be made available to implement the price stabilization policy, it remains to be seen whether the results achieved by the policy under consideration justify the costs of such far-reaching intervention actions. Perhaps alternative ways of approaching the problem of price irregularities in the marketplace would be more effective.

Alternative Approaches

Rather than direct intervention into the marketing system, there are alternative forms of action which governments can pursue to reduce price fluctuations in the marketplace.

If the objective of government policy is to increase farm prices, two different areas can be addressed. The first is to restrict imports of the commodity in question. By doing this, the supply of the commodity will be reduced, and this in turn will cause an increase in the price of domestically-produced commodity. The second area is the development of the ability of farmers to store their products on the farm and thus be able to take advantage of seasonal price increases. Together with this program, a credit system and a price information system will enhance the small farmer's ability to store commodities. The credit system relieves the farmer of cash flow constraints, and the price information system helps the farmer determine the most profitable time to sell his product.

If the objective of government policy is to prevent excessive prices to the consumer, the main course of action is one of liberalization and regulation of imports so as to release commodities on the markets in an effort to dampen high prices due to scarcity of supply.

If the objective is to moderate low producer prices at harvest and high consumer prices during the off-season, a combination of import regulations and improvements in on-farm storage can be implemented to achieve price goals. In addition, specific activities can be introduced to facilitate marketing operations. One such activity is the creation of a market news service to provide information on prices to consumers, producers, and marketers. In this way, all participants in the marketing system have access to the same information and can make better judgments concerning sales and purchases. Another activity is the development of quality standards for products which dictate that high-quality goods should command higher prices. A third action would be to assure credit at a reasonable cost to marketers in an attempt to reduce marketing costs. Finally, infrastructure could be strengthened by providing adequate wholesale and retail market space to be leased to the private sector. If operating costs can be reduced by these actions, the market becomes more price-efficient.

Even though these actions do not constitute a direct intervention into the market, they still require that the government have access to data on price, production, consumption, and market flows, as well as an understanding of the marketing system. The government can not act in isolation and hope to have a positive impact on prices.

SECTION II

Data Collection and Analysis

As previously stated in Section I, before implementing a grain price stabilization program, accurate data must be available on all aspects of production, consumption, prices, and market flows. Knowledge of losses occurring in the system is also helpful. The collected data must then be analyzed in order to determine relationships between factors existing in the system and the underlying causal agents. This will allow the policy actions to focus on relevant areas where there is a potential for positive impact.

The current status of data collection in Haiti can be described as abominable. Agricultural production data, as exemplified by the data for corn, rice, and millet/sorghum in Annex B, appear to be merely observational guesses. Consumption data do not seem to exist in any form. No organized process exists to collect data on production or consumption. While market price data have been collected, this has not been an ongoing activity as evidenced by the many gaps in the data sets. Data on postharvest losses are limited to a few studies and do not represent a reliable overview of the situation. It is evident that data collection and analysis needs have not been addressed in the past.

Data Requirements

The study team considers that the collection of data on production, in the form of cultivated area and yields, should be given the highest priority in the proposed data collection process under the ongoing ADS II Project. If the data are to be meaningful for analysis and planning purposes, estimates of production must be limited to geographical units no larger than one department. Estimates based on larger geographical units, such as the government planning regions (two to three departments each), will jeopardize the use of estimates for analysis and planning. Analysis involving large geographical units means that accurate relationships can not be determined between production and consumption, or production and price.

While production estimates are of first priority, they are not the only prevalent need. To be able to use production estimates in a meaningful analytical process, consumption and marketing data must be readily available. Although the percentage of crop production moving into the market system has been stated as 25 percent, in reality no known figures exist to support this assumption. To determine consumption levels, market flows, and farmgate prices in the production sector, household budget surveys and household marketing surveys must become part of the data collection process. In addition, household budget surveys should be carried out in the urban sector during the same data collection period so that these results can later be used to corroborate market flows.

Conducting such a series of production/consumption surveys would lead to the collection of data on consumption levels, market flows, and farmgate prices. However, the mere fact of conducting the surveys is no guarantee that answers will be provided as to the effects of price on supply response. In order to obtain this information, the data collected must be carefully analyzed and interpreted.

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Review of Sampling Designs

Based on the preceding production and consumption data requirements, and considering the need to minimize sampling errors, non-sampling errors, and operational constraints, the study team recommends the list frame proposed by Cuevas and Magill. However, there are some specific factors not sufficiently addressed within the list frame proposal. One is the process of collecting yield data on an inter-crop production system. The proposed system for collecting production information on a farm basis will probably enumerate production in a sufficient manner. However, yields determined on the basis of production and estimated land area are not satisfactory for analytical and planning purposes. Therefore, yield data should be collected by a sampling procedure which is designed to specifically sample yields. Another factor is the reference period for the survey. Since cropping patterns seem to be continuous under normal weather conditions, the idea of conducting limited surveys will not allow data to be collected on all crops planted throughout the year. Instead, specific data collection periods will need to be identified to coincide with the production periods according to location across the country.

If the methodology and operating system being developed for this data collection activity will not continue to exist after the end of the ADS II Project, then efforts being put forth for their development are futile. If the GOH can not fund continuation of the process, the process should either be abandoned now and the funds allocated to more productive endeavors, or the donor agency should commit itself to continuing this activity after the end of the ADS II project. Data covering a short time period of collection work, even if extremely accurate, have no great value for analytic and planning procedures.

Market Data

One data collection requirement that has not yet been given consideration is the need for market information on prices, volumes, and flows. This data collection process will need a totally different design from the design being considered for the collection of production and consumption data. Market information will have to be collected within the organized markets of Haiti, not by sporadic one-time surveys but rather as a continuous process which will measure the movements in prices and quantities of commodities.

Postharvest Loss Data

The measurement of postharvest losses in cereals also requires a different design from that of production and consumption data collection. Postharvest loss measurements can not be included in the measurement of quantities produced and consumed. This is because postharvest losses must be separated into on-farm losses and market system losses. Quantitative losses must be measured through accurate weighing procedures over the period of storage, not by interview survey techniques. Quality losses must be assessed by persons knowledgeable in grain quality, by means of visual inspection of commodities at specific time points.

Losses vary by crop, production year, type of pests, length of storage time, conditioning and storage procedures, processing methods, transportation modes, rates of consumption, and climate. Given this enormous variability, reliable

statistics regarding the type, location, causes, and degree of postharvest grain losses are difficult to obtain. However, these statistics are necessary if postharvest losses are to be reduced.

Data Analysis

Once the data have been collected, the next step is to determine the process that will be used to analyze the data and present it to decision-makers in a usable format. Although a large quantity of price data exists (see Borsdorf and Foster), little attention has been given to the analysis of such data. The analytical work that has been done has been sporadic and without coordinated effort. Even though existing price data sets are incomplete and of low quality, far more analysis could have been attempted than what was actually done.

The only way for policy-makers to arrive at sound decisions concerning policy actions in agriculture is through the analysis of agricultural data. This analysis will provide answers to questions concerning the relationships between production, market flows, and prices. It can also determine how price shifts in one commodity will affect supply responses for other commodities. The end result of analysis is the ability to make intelligent choices which are arrived at through the knowledge thus obtained.

SECTION III

Analysis of Commodity Prices

The analysis of commodity prices is undertaken in an effort to present alternative strategies to the GOH concerning grain price stabilization actions. This analysis involves the examination of historical price patterns, domestic production levels, market relationships, and market margins.

Data Quality

An examination of the market price data for cereals and beans compiled by Borsdorf and Foster reveals a data collection effort by diverse GOH agencies. Most data sets are incomplete because of the discontinuation of data collection by those responsible for doing so, and the inability of the study team to locate data which had previously been collected. Conflicting series of average annual prices have not been reconciled. No comment can be made on the statistical quality of the price data sets since collection and estimation procedures are unknown. A review of available data sets suggests that the procedure used to construct price averages is the simple average of samples collected. Without the raw data, sample distribution can not be tested so as to assure that the simple average price is representative of actual market prices.

Farmgate or actual prices received by producers have never been measured. Market flows are not known. As previously stated, the production data available are incomplete and of poor quality. With such faulty production data, any resulting work on price/production relationships may be meaningless.

Analytic Approach

In view of the data constraints set forth above, a specific analytic approach was devised in order to address the question of price stabilization policy actions. Four primary price movement factors were considered: (1) the long-term trend, (2) seasonal price movements, (3) production disturbances which are extremely high seasonal price movements caused by a decline in production, and (4) supply/demand shifts which are changes in the amount of supply flowing into markets to meet demand at any given point in time. The latter factor is exposed to many market constraints, such as imperfect knowledge and infrastructure deficiencies. However, since market flows are unknown, it is not possible to address this aspect of the marketing system and its effect on prices.

Four major crops were analyzed: corn, rice, millet/sorghum, and red beans. A proxy price series was constructed from various data sets available in order to have a long enough price series to represent historical movements. This proxy price series is based on the Port-au-Prince market since the longest and most complete data sets were available for this market. To test the reliability of this constructed time series, the original data sets for Port-au-Prince have been measured against other markets to determine if price movements are correlated and thus indicate a significant degree of relationship between markets.

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Long-Term Price Trends

Figures 1 through 5 present the average monthly prices for 1968 through 1984 for five commodities: corn, all rice, superior rice, millet/sorghum, and red beans. These figures also illustrate the long-term price trends for these commodities. For the most part, price movements for cereal grains (Figures 1-4) have followed the same basic patterns over this time period. Price movements for beans (Figure 5), however, have been far more erratic than those for cereal grains. All commodities show evidence of severe peaks in the average monthly prices at different periods in these time series. These peaks indicate that severe production declines in mid-1974 through mid-1975, mid-1976 through mid-1977, and 1980 through mid-1981 caused drastic increases in prices due to decreased availability of supply.

The long-term trends of average monthly prices for both cereal grains and beans are somewhat similar over the 1968-1984 time period. For all five commodities, the price trends between 1968 and 1972 are either flat or show a slight upward incline. This indicates a stability in average annual prices for this period. After 1972, however, price trends either rose dramatically to a new flat trend or began a steeply-inclined upward trend. This change in direction of price trends at this period in time coincides with (1) an increase in world prices of agricultural commodities due to a decline in total production of cereal grains and legumes, and (2) the beginning of a large increase in worldwide inflation brought on by the decline in production coupled with other economic factors.

The long-term trend for corn after 1972 is illustrated in Figure 1. The trend moves abruptly upward in 1973 and remains flat until 1978. Thereafter the trend moves upward at a significantly steep rate. However, considering the 1983 and 1984 prices, it appears that if no production disturbances occur to affect prices over the next few years, the price trend will level out at this plateau and remain a flat trend.

The long-term trend for rice is diagrammed in Figures 2 and 3. The trend shifts from a slight upward tendency to a steep upward movement that results in a near tripling of prices within a period of 11 years. As with corn, 1983 and 1984 prices for rice indicte that in the absence of production disturbances, the price trend may shift to a flat line.

The long-term trend for millet/sorghum is shown in Figure 4. As seen in the other commodities, the price trend for millet/sorghum shifts dramatically upward in 1973 to a new trend. In contrast to the other commodities, however, the price movements in 1983 and 1984 do not give a strong indication that an expected plateau in the price trend will occur.

The long-term trend for red beans is illustrated in Figure 5. It follows the same basic change from a nearly flat trend in 1978 to a steeply-inclined trend over the remaining time period.

Although the basic trends for these commodities are similar, one distinction should be pointed out in the case of corn. While the trends for the other commodities are upwardly inclined beginning in 1973, the corn trend remains flat until 1978. This reaction suggests that millet/sorghum production may have had a dampening effect on corn prices by acting as a substitute cereal.

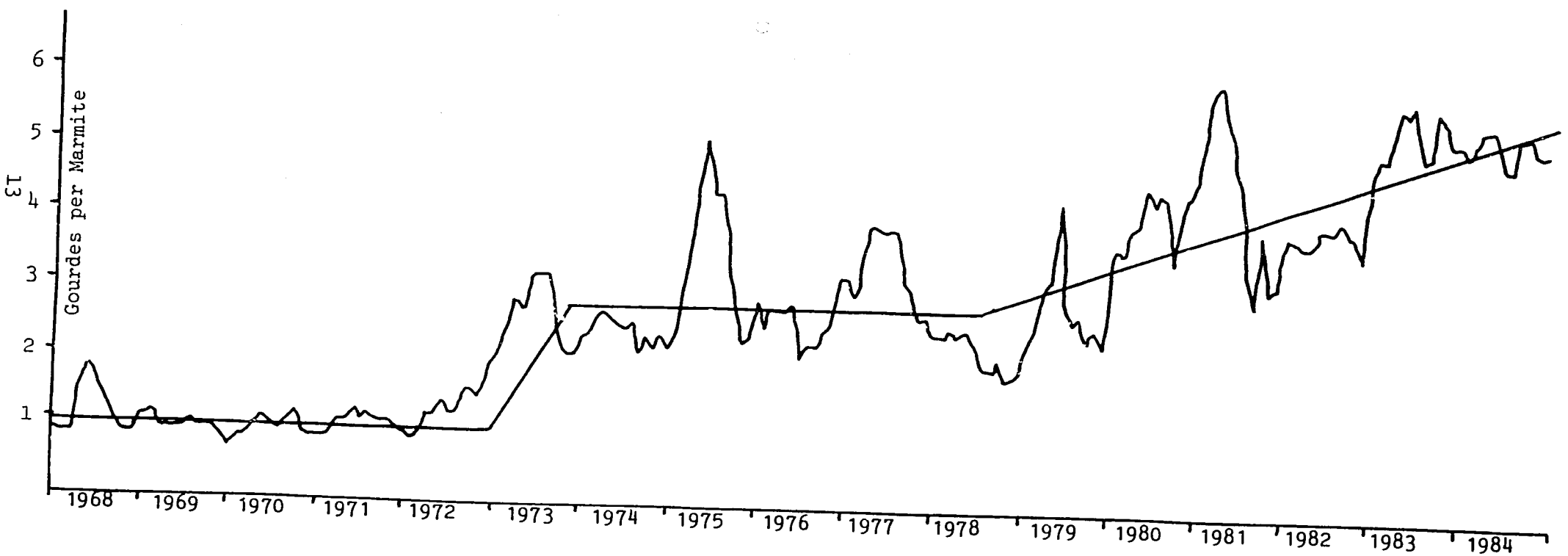

Figure 1. Corn, Average Monthly Prices with Trend, Port-au-Prince

Source: Table 25, Appendix B

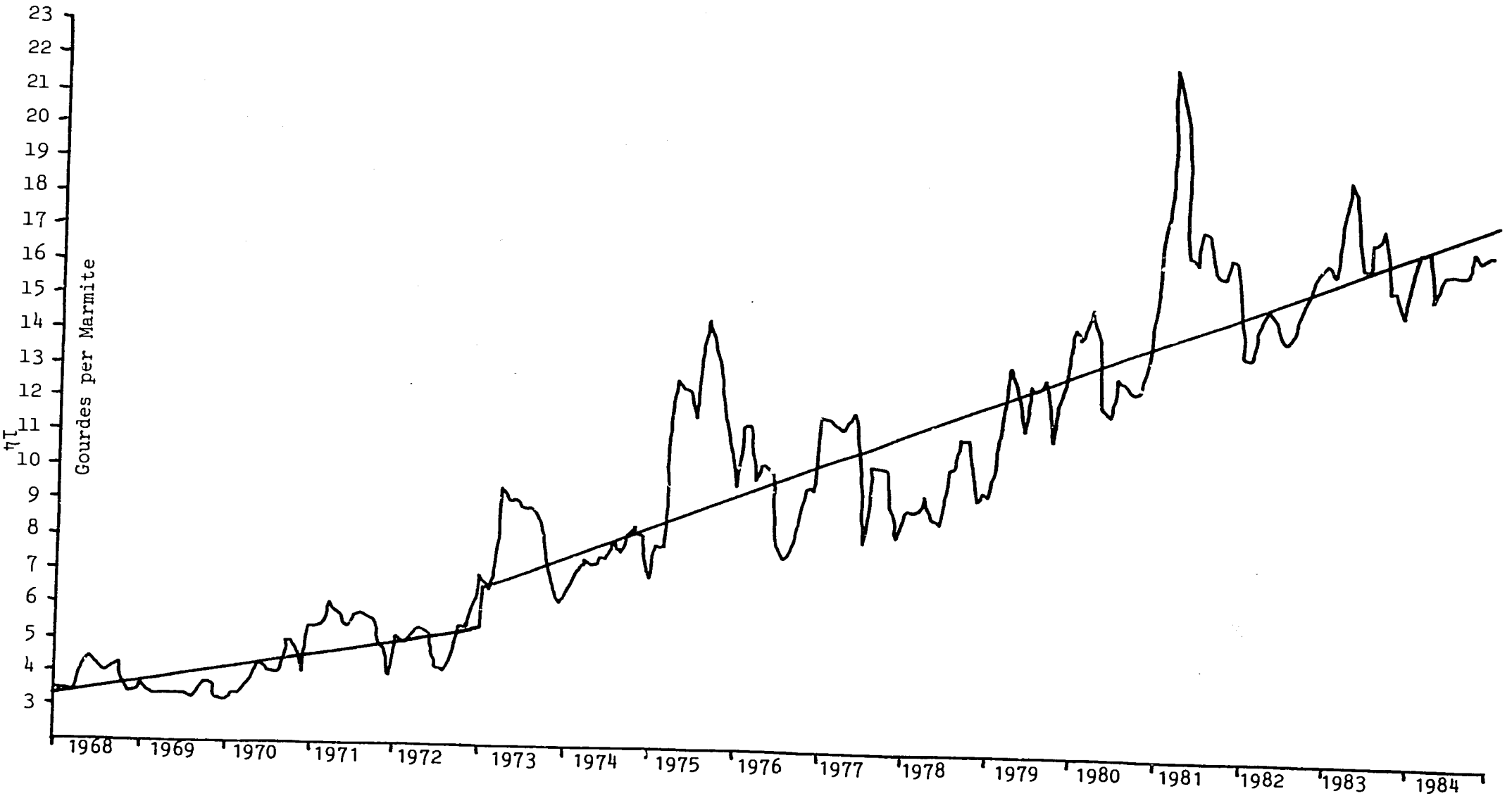

Figure 2. Superior Rice, Average Monthly Prices with Trend, Port-au-Prince

Source: Table 25, Appendix B

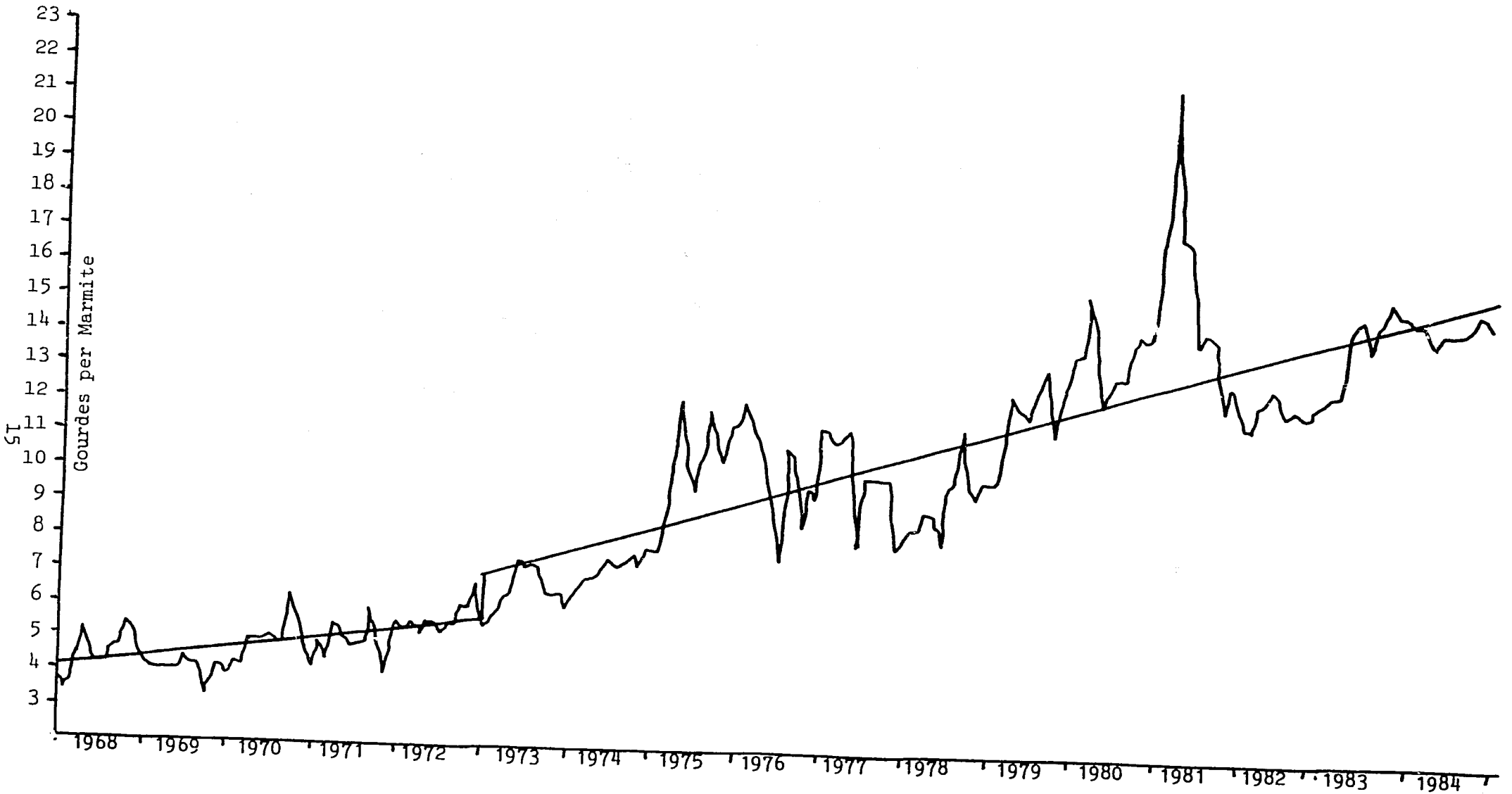

Figure 3. All Rice, Average Monthly Prices with Trend, Port-au-Prince

Source: Table 25, Appendix B

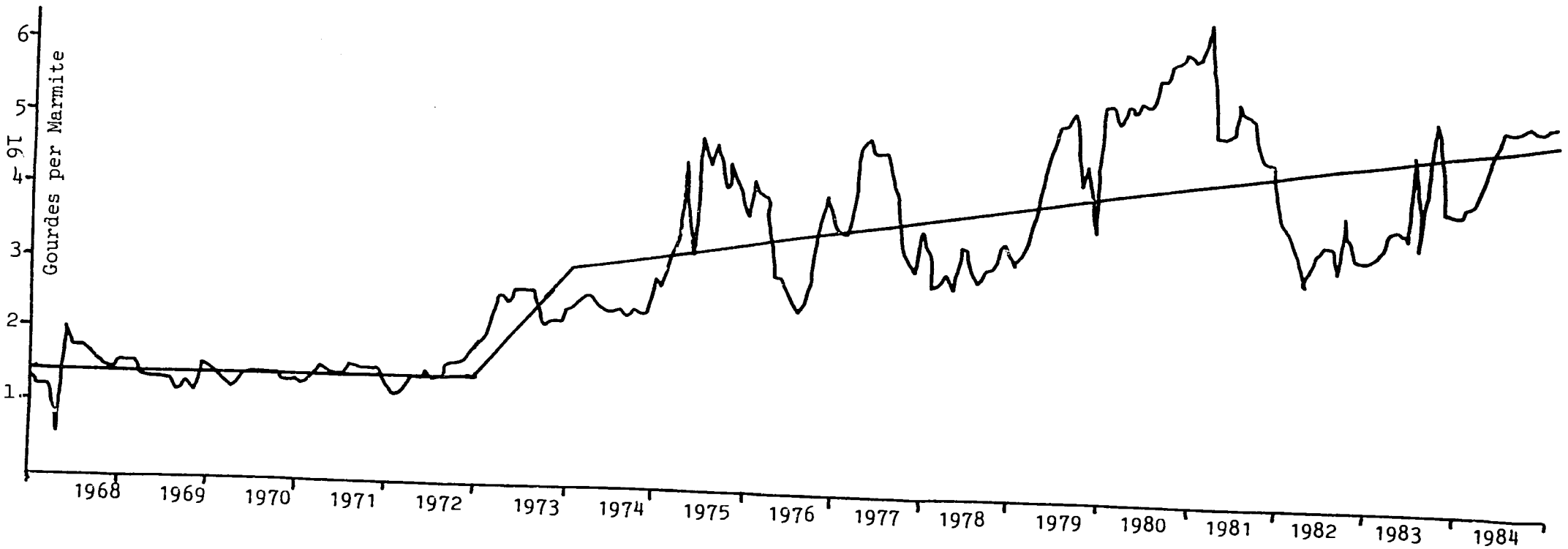

Figure 4. Millet/Sorghum, Average Monthly Prices with Trend, Port-au-Prince

Source: Table 25, Appendix B

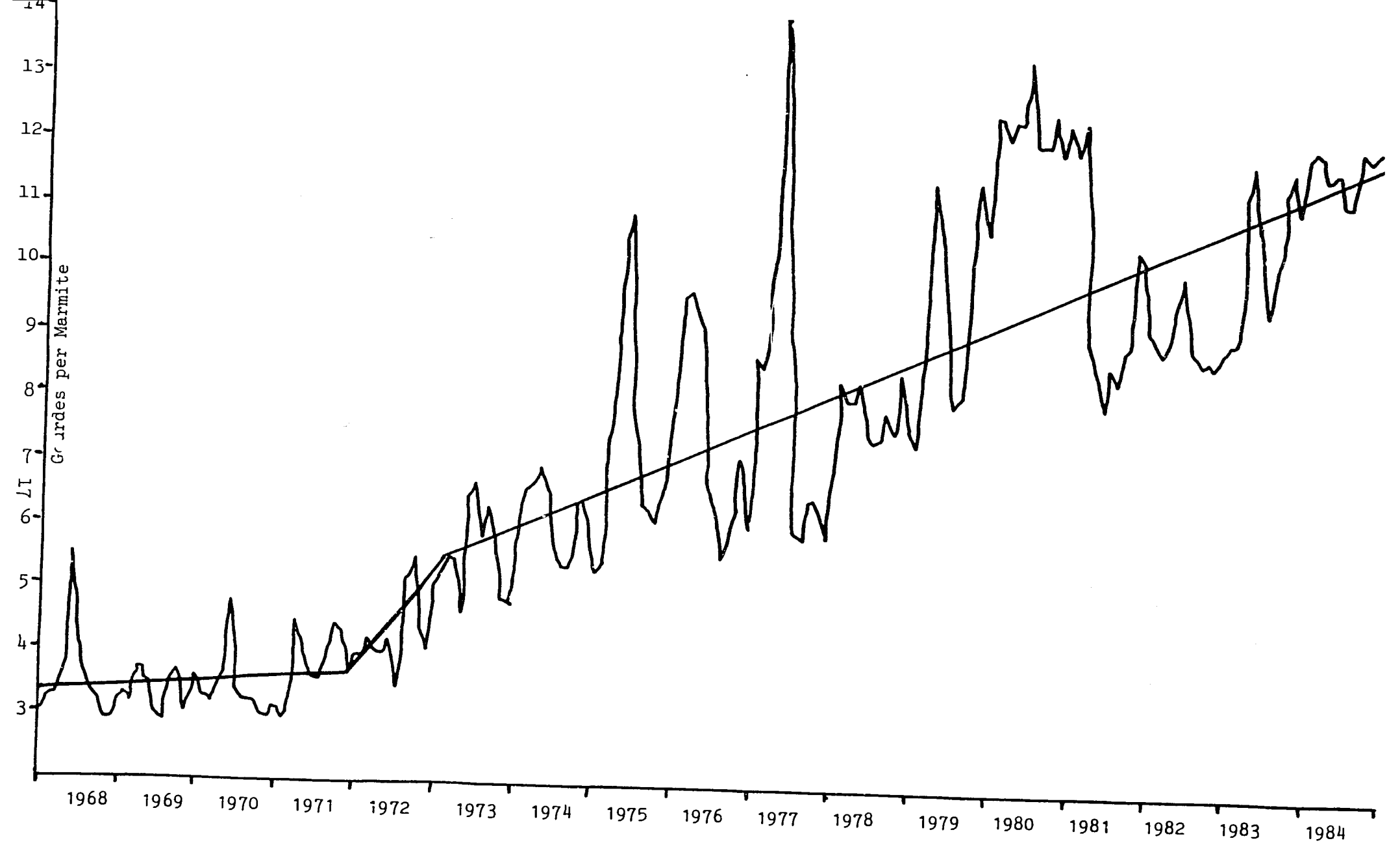

Figure 5. Red Beans, Average Monthly Prices with Trend, Port-au-Prince

Source: Table 25, Appendix B

The correlations between corn and millet/sorghum prices (Table 24, Appendix B) are not only significant but also extremely high until 1976, which is the same time period in which corn showed a flat price trend. The correlation between prices after 1981, while still significant, is substantially lower. This further suggests that millet/sorghum, while not as preferred a cereal as corn, may have acted as a strong substitute for corn in the Haitian diet from 1972 to 1978, but that due to population pressures and increasing consumer preferences, this relationship was not sustained after this time.

A comparison of the inclined price trends of the five commodities, as described in Table 1, reveals a high degree of similarity. This is especially true for corn and millet/sorghum when the flat trend for corn in 1973-1978 is taken into consideration.

When the trends are deflated into real price terms, it is found that producer prices for corn, millet/sorghum, and beans have increased in real terms. Producers of rice have not fared as well, since the price for their commodity has slightly decreased in real terms.

The rate of price increase due to inflation is identical for each of the commodities. These results indicate that the constructed proxy price series accurately depicts the actual situation and therefore can be considered as a reliable source of information.

Market Relationships

An extensive network of markets of various types and sizes exists to handle all the domestically-produced food crops being sold in Haiti. These markets are organized and operated by the private sector with no government intervention.

Table 1

Average Annual Rate of Increase of Long-Term Trends
1972-1984

(Percent)

	In Current Prices	In Real Prices[1]	Rate Increase Due to Inflation
Corn	13.7	4.5	9.2
Millet/Sorghum	10.4	1.1	9.3
All Rice	8.6	-0.6	9.2
Superior Rice	9.2	-0.04	9.2
Red Beans	9.7	0.5	9.2

[1]Based on CPI deflator, Table 1, Appendix B.

The market system in Haiti can be described as a vertical system in which the marketers generally specialize in a given route or geographical area which encompasses a given set of markets. Rather then searching out new market or price opportunities, these marketers prefer to establish lasting relationships with buyers and sellers within this given set of markets.

This vertical system causes certain problems in the analysis of market relationships. In order for any analysis to yield sufficiently high correlations to indicate market integration, trade must generally be uni-directional. This means that products must continually flow towards larger markets. Because of the manner in which the marketers operate in Haiti, there is no evidence of uni-directional trade. In addition, since market flows are unknown, there is no way to relate one market to another based on market flows, and no way to determine if any two given markets should be more highly correlated than others.

Previous studies (as noted in the references) are inconclusive on the question of whether a high degree of market price correlation exists in Haiti. Market relationships were tested by regressing Port-au-Prince market price series against other market prices series by specific data set. The markets from which price data were available for regression analysis are shown in Figure 6. The resulting correlations between markets are presented in Tables 13 through 23 in Appendix B. Only 11 correlations out of 166 derived from the regression of Port-au-Prince time series against other market price series were insignificant, or 7 percent. Those correlations which were not significant were mostly brought about through the availability of only short time series (small numbers of observations) for analysis.

While a large percentage of the correlations were significant, there is a wide variation in the degree to which the Port-au-Prince market is correlated to other markets. The wide variation is due to data gaps (missing data and unequal time series within a specific set), the geographical relationship of markets to the Port-au-Prince market, and the specific time series being analyzed.

A higher degree of correlation between the Port-au-Prince market and other urban markets is shown in the later time series (1977-81) than in the earlier time series. When plotted, all regressions between the Port-au-Prince market and other urban markets show a nearly identical linear relationship and a very narrow range of price difference between markets. An examination of the graphical location of this narrow price range reveals that 50 percent of the other urban markets have slightly higher prices than Port-au-Prince for corn, rice, and millet/sorghum, while the remaining 50 percent have slightly lower prices. This price pattern does not hold true for red beans, however, where the indication is that the prices on the Port-au-Prince market are always higher than on the other urban markets. Although price differences exist between the Port-au-Prince market and other urban markets, at no point is it indicated that average price differences are greater than 20 percent for any commodity. These results imply that each urban market can be considered as an individual end market whose aim is to support the needs of the population served by that urban market.

The price correlations between the Port-au-Prince time series and the time series for regional and semi-rural markets present a more narrow range of

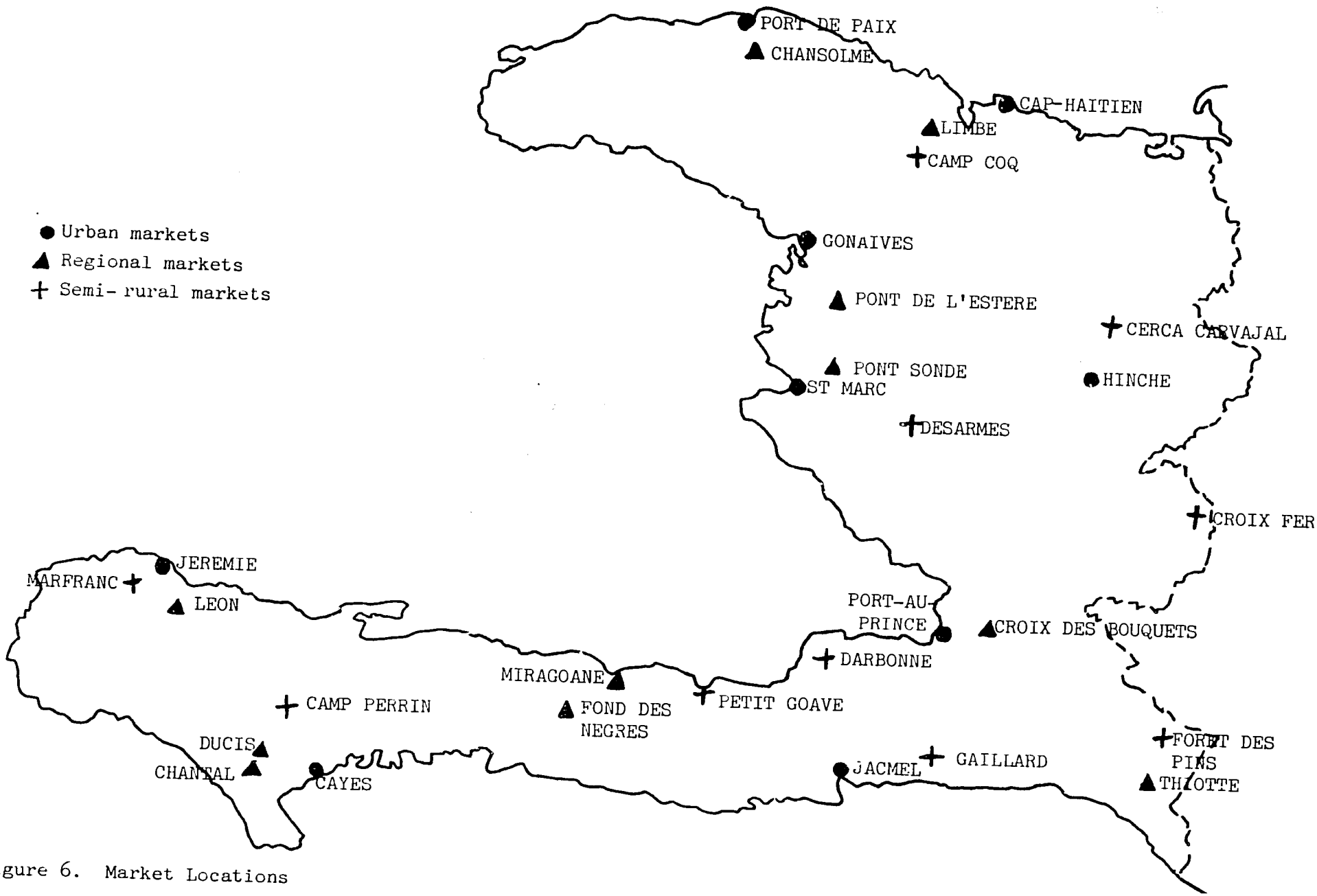

Figure 6. Market Locations

correlations than was exhibited between Port-au-Prince and other urban markets. The plotted regressions, while for the most part showing nearly identical linear relationships, are more widely dispersed than in the case of the urban markets. In numerous cases, the regressions illustrate that average prices for corn and millet/sorghum will be higher in the regional and semi-rural markets than in Port-au-Prince, while the reverse is true for rice and red beans. This result is in accord with the variation in prices logically to be expected, since corn and millet/sorghum are staples in the rural areas and therefore may command a higher price in rural markets. Rice and beans will command higher prices in urban markets where consumers are willing and able to pay the higher price associated with these products. Average price differences between the Port-au-Prince market and the regional and semi-rural markets illustrated by these regressions do not exceed 25 percent.

The only market flow information available is that presented by Duplan (1974). These limited market flows for the Port-au-Prince market show that most of the products are moving into the Port-au-Prince market from regional and semi-rural markets which show the highest correlation with the Port-au-Prince times series. The Port-au-Prince market is also more highly correlated with outlying regional and semi-rural markets that are located within nearby geographical areas having an adequate road infrastructure linking them to Port-au-Prince.

Two predominant factors can be identified in the market price relationships in Haiti. First, all urban markets can be considered as individual markets, and the existing correlations indicate that the markets have nearly identical long-term price trends and general seasonal price movements. Secondly, close relationships exist between the Port-au-Prince market and the regional and semi-rural markets. Although wide price variations exist in plotted regressions due to the geographical location of outlying regional and semi-rural markets, the correlations indicate that similar patterns exist in long-term price trends and seasonal price movements for all markets.

Seasonal Patterns

Seasonal price movements result from the fact that production occurs at one or more specific periods in the year, while consumption of the commodities produced is constant throughout the year. Products that are sold at the time of harvest or shortly thereafter command relatively low prices due to a supply which exceeds the demand for that product in the marketplace. As the year progresses, prices in the marketplace for a given commodity will increase due to the need to cover marketing costs (storage, risk-bearing, carrying costs) and also due to the fact that demand begins to outweigh supply.

The harvest periods for different crops are diagrammed in Figure 7. Average monthly prices and corresponding crop harvesting periods for corn, all rice, superior rice, red beans and millet/sorghum are illustrated in Figures 8 through 12. These figures clearly indicate that there are seasonal variations in price, and that such variations will change from year to year in the general pattern and intensity of movement. The seasonal movement of prices is a recurring phenomenon and one that is closely linked to the harvest period.

More important to the understanding of this aspect of price movements is the need to determine average seasonal price movements, the rates of change during

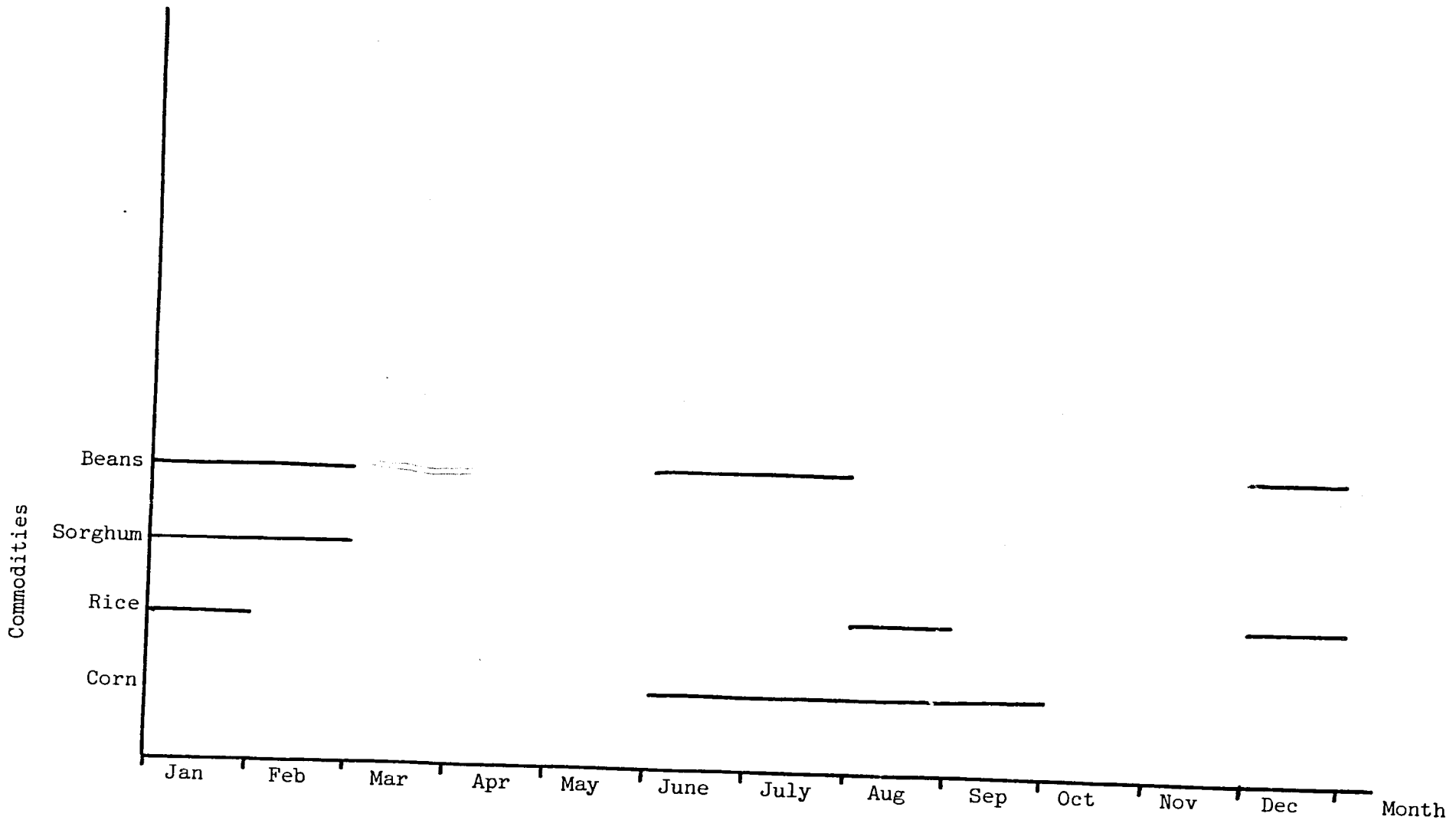

Figure 7. Harvest Periods by Crop

Source: DARNDR

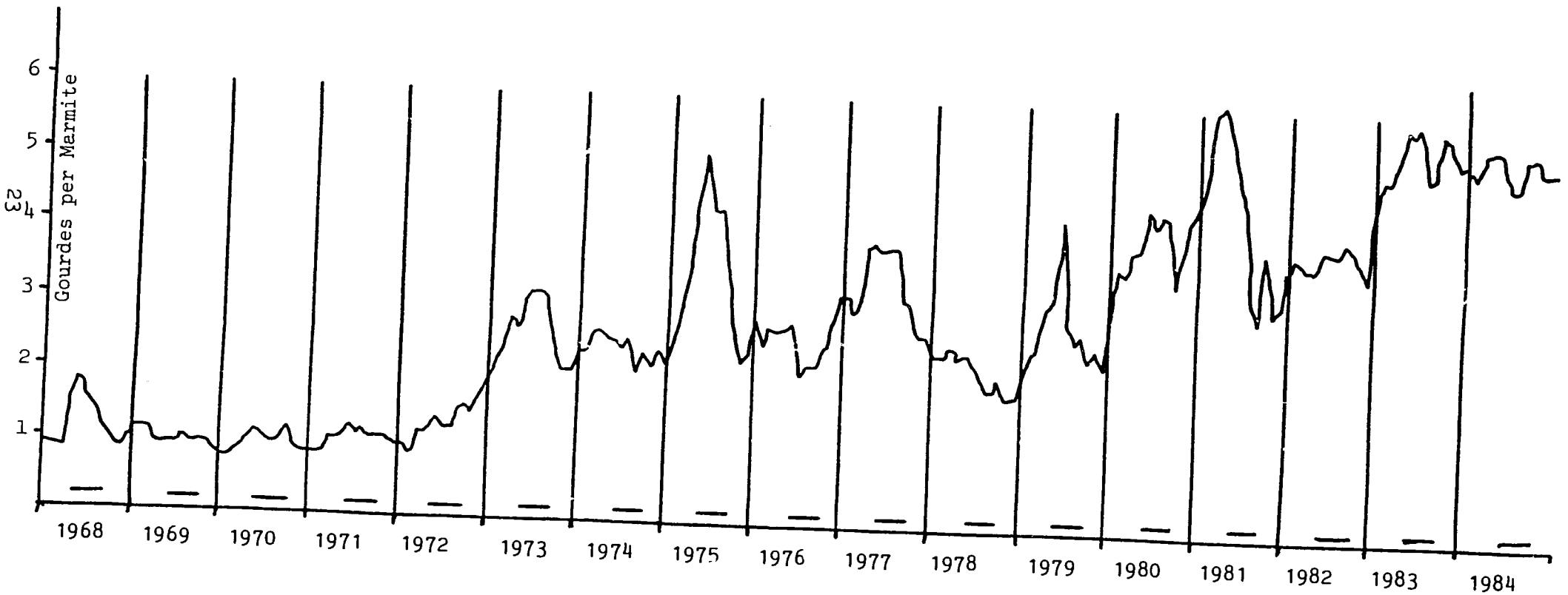

Figure 8. Corn, Average Monthly Prices and Harvest Period, Port-au-Prince

Source: Table 25, Appendix B

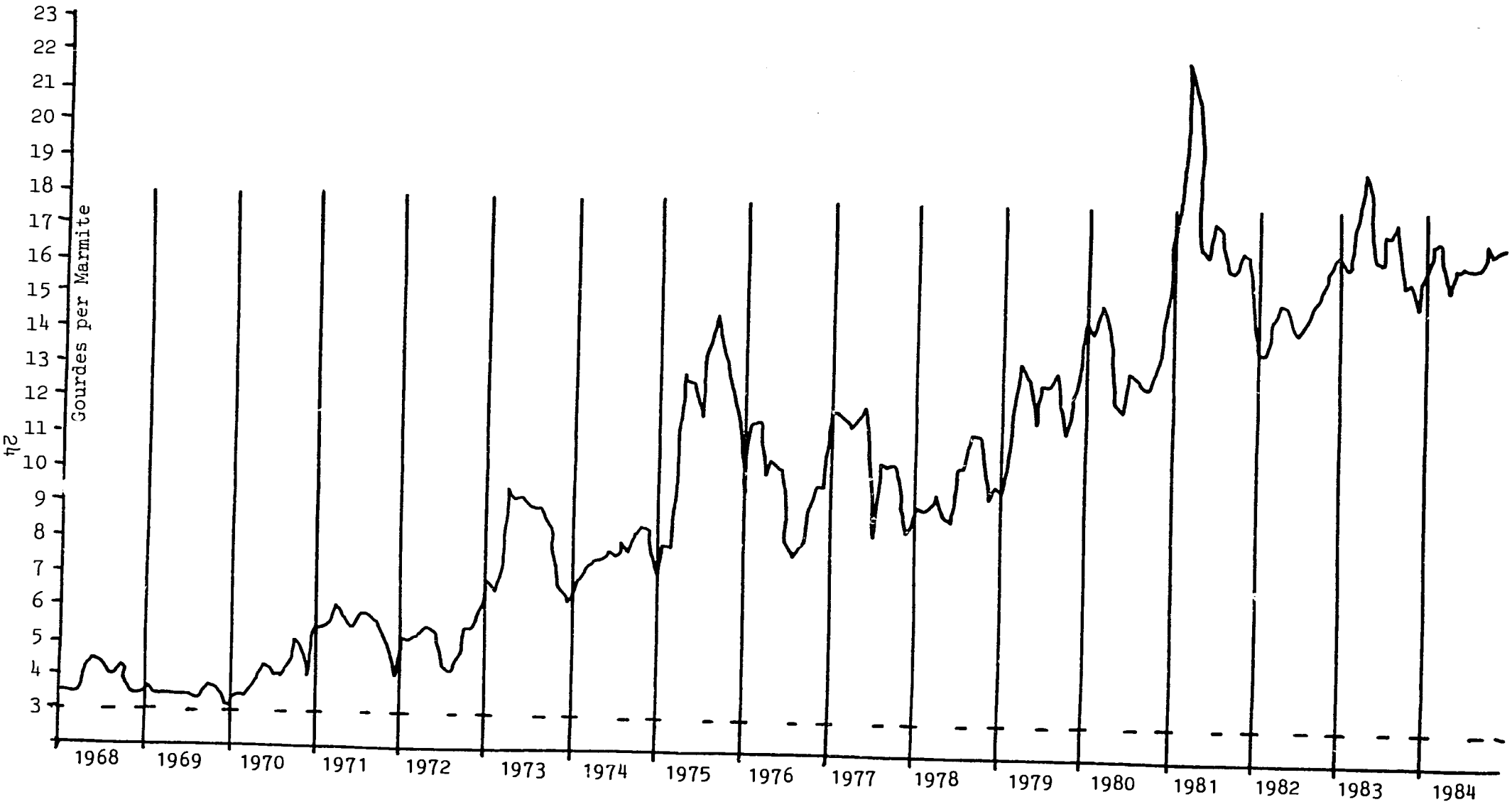

Figure 9. Superior Rice, Average Monthly Prices and Harvest Period, Port-au-Prince

Source: Table 25, Appendix B

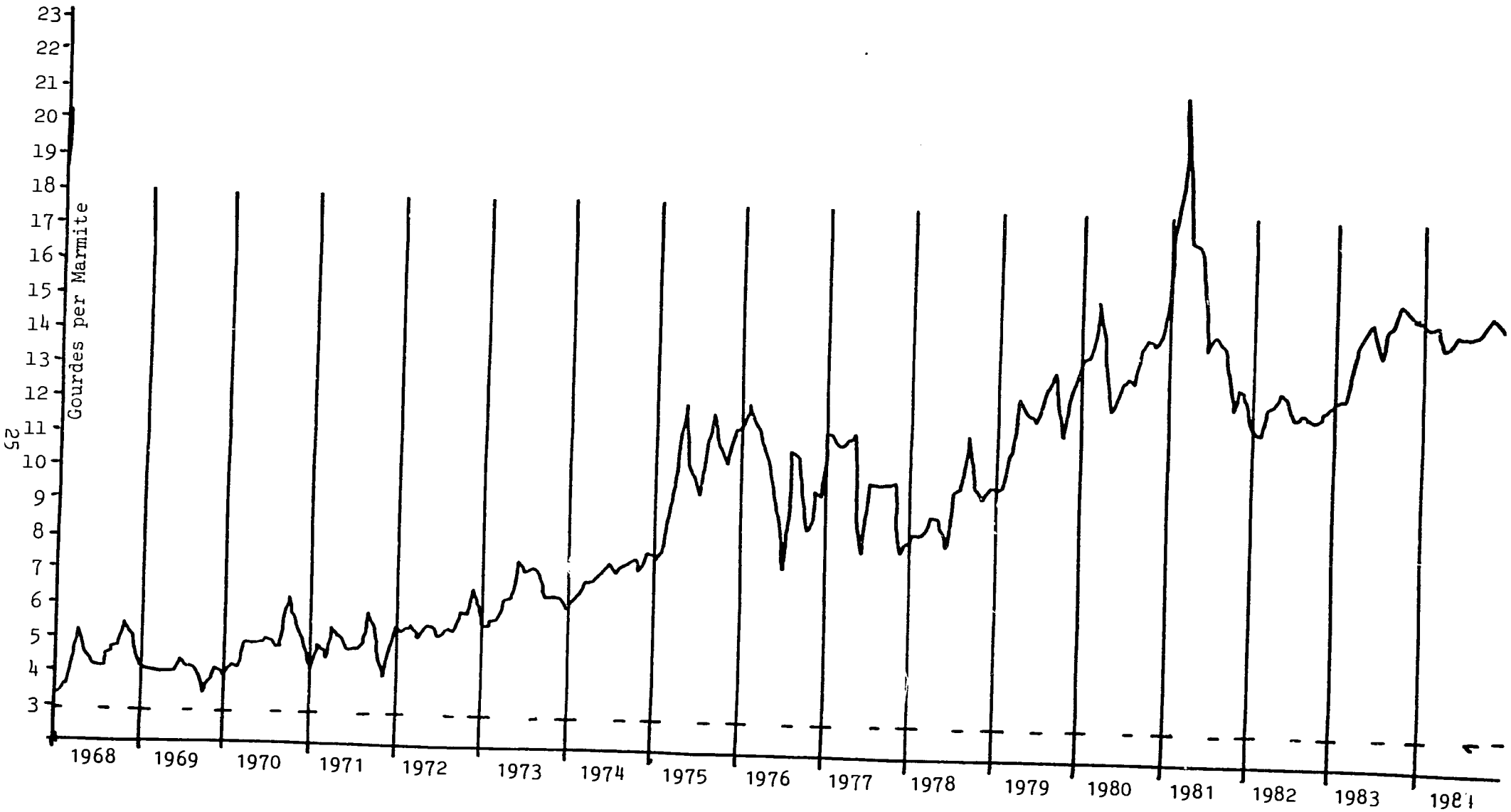

Figure 10. All Rice, Average Monthly Prices and Harvest Period, Port-au-Prince

Source: Table 25, Appendix B

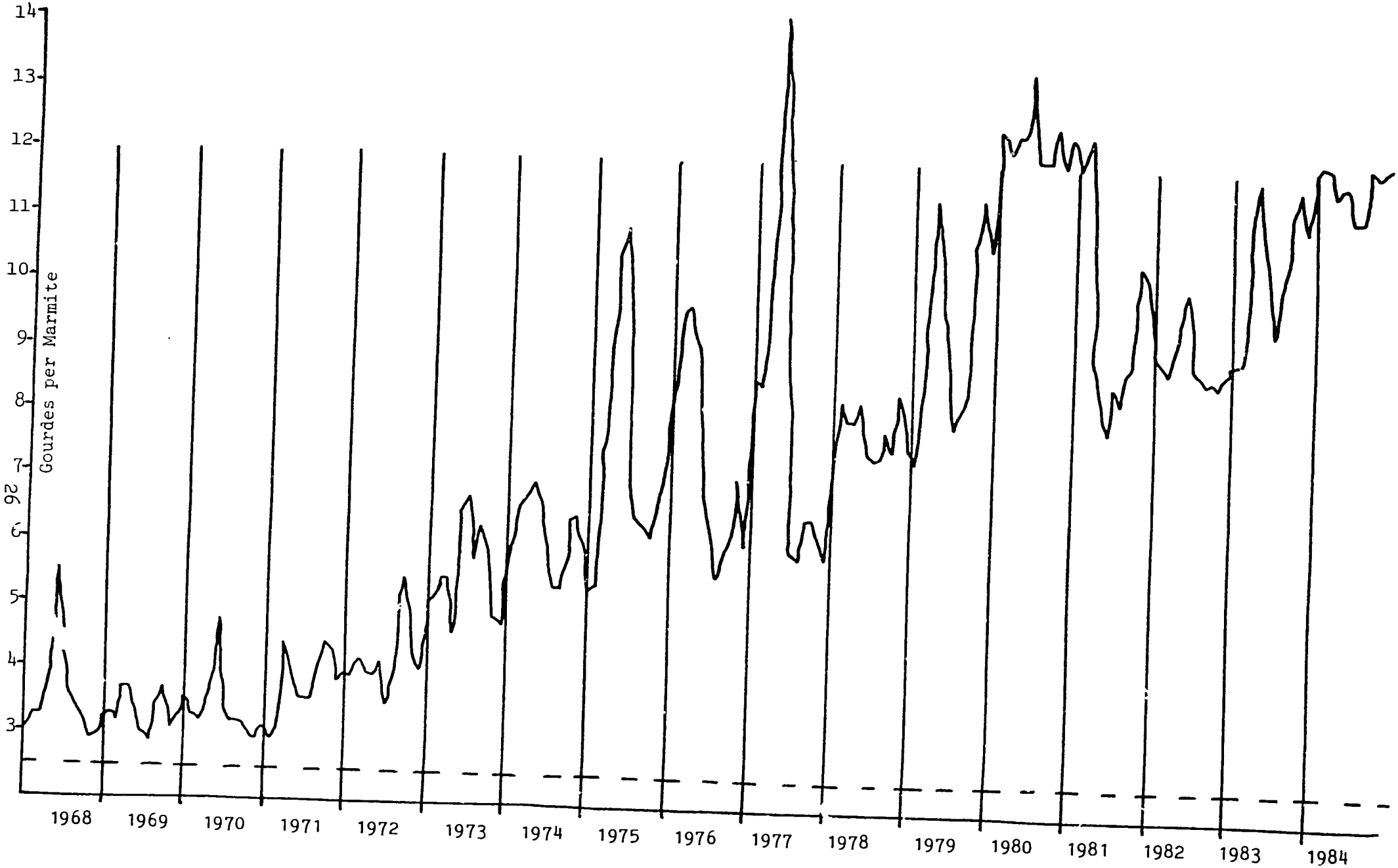

Figure 11. Red Beans, Average Monthly Prices and Harvest Period, Port-au-Prince

Source: Table 25, Appendix B

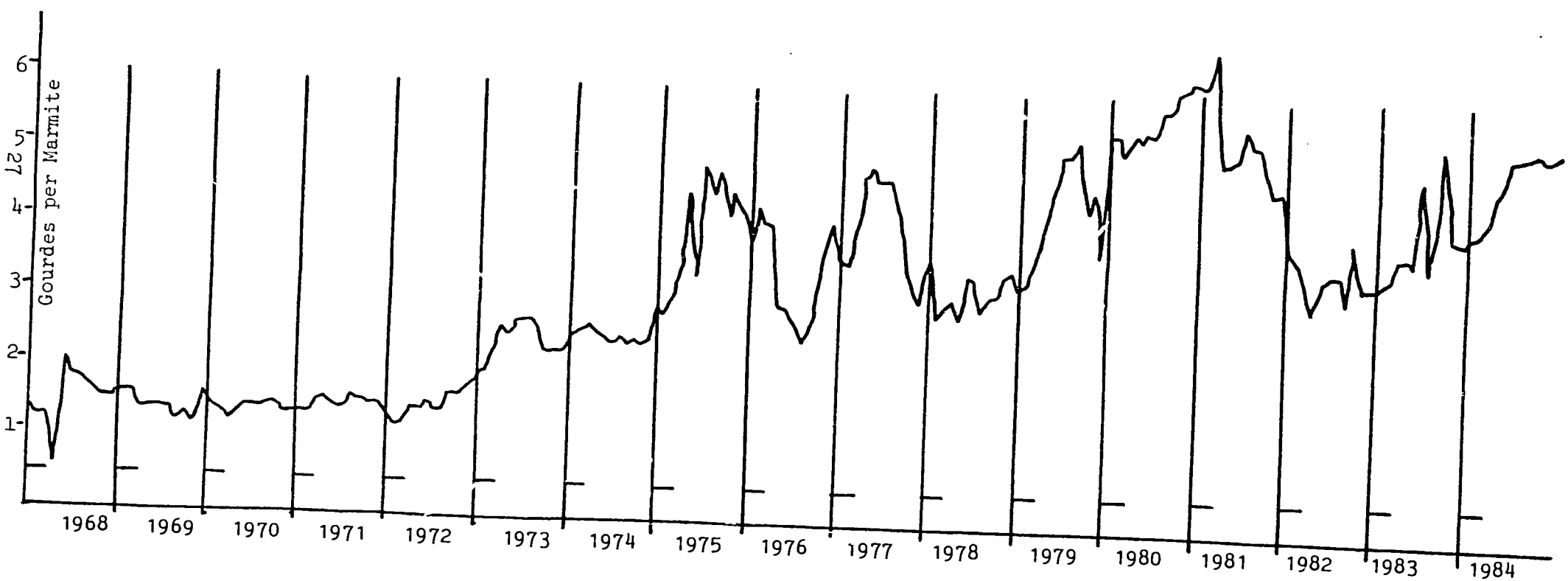

Figure 12. Millet/Sorghum, Average Monthly Prices and Harvest Period, Port-au-Prince

Source: Table 25, Appendix B

so-called normal seasons and the comparable rates of change during periods of deficit production. The measurement of seasonal movements will allow the determination of (1) margins between price lows and price highs, (2) the time sequences between these lows and highs, (3) the rate of increase in seasonal price movements, and (4) the differences between years of normal production and years of production shortfalls. These measurements will provide for a comparison of marketing margins and costs over time and allow appraisal of possible impacts on price movements if the GOH inserts itself into the marketing system with a price support program.

The average seasonal price patterns are divided between price patterns in years without production shortfalls (so-called normal years) and price patterns for years following production shortfalls. Figures 13 through 17 illustrate average seasonal price patterns for corn, all rice, superior rice, red beans, and millet/sorghum based on the Port-au-Prince proxy price time series. Each of these commodities has its own unique seasonal pattern which is directly related to the harvest periods indicated in the figures.

In the case of corn, Figure 13, a seasonal peak occurs at the beginning of the harvest period in June, and prices decline thereafter to a low in December and January, some two months after the end of harvest. The average seasonal price increase is 25 percent above the market price lows in years of normal production. In years with production shortfalls, the price increase is not only higher, but also increases at a more rapid rate with highs being 45 percent above market lows.

Figures 14 and 15 depict seasonal price movements for rice. All rice and superior rice both have relatively the same basic patterns of two high periods and two low periods per year, related to the two production seasons. Although the patterns are generally the same, each has a unique shape of price movement in the rate of use and decline. The percentage of increase in the price rise is substantially below that for corn. In normal years there is a 10 percent rise in the two months following the December-January harvest. After the August harvest, however, prices for all rice increase to slightly over 20 percent above market lows, while the price for superior rice climbs only 10 percent. Price increases in years of production shortfall are 30 percent above market lows.

Seasonal price patterns for red beans are illustrated in Figure 16. In normal years, prices show a slight increase of 10 percent after the December-February harvest, with a more substantial increase of 15 percent after the June-July harvest period. However, production shortfalls create a dramatice shift in price, with an increase of slightly over 45 percent after the December-February harvest period. The price reaches its peak in May and rapidly declines during the summer harvest period, followed by another increase of 20 percent above market lows.

Figure 17, containing seasonal price patterns for millet/sorghum, shows a relatively slight increase in price after harvest for normal years. Years of production shortfall shift the price increase upwards to slightly over 30 percent of market lows within 2-3 months after harvest. This pattern remains more or less at the same level until slightly before the next harvest.

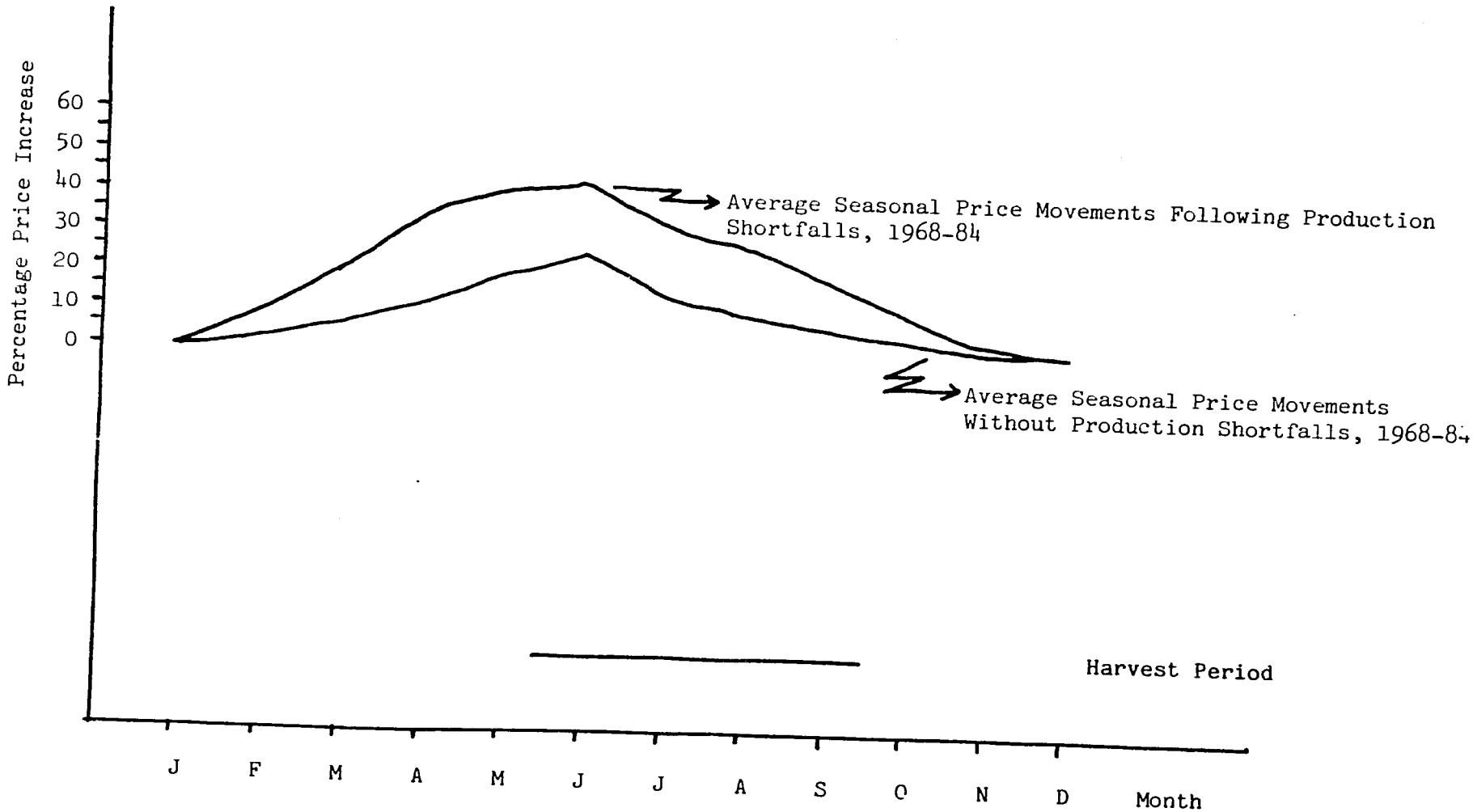

Figure 13. Corn, Seasonal Price Patterns, Port-au-Prince

Source: Table 25, Appendix B

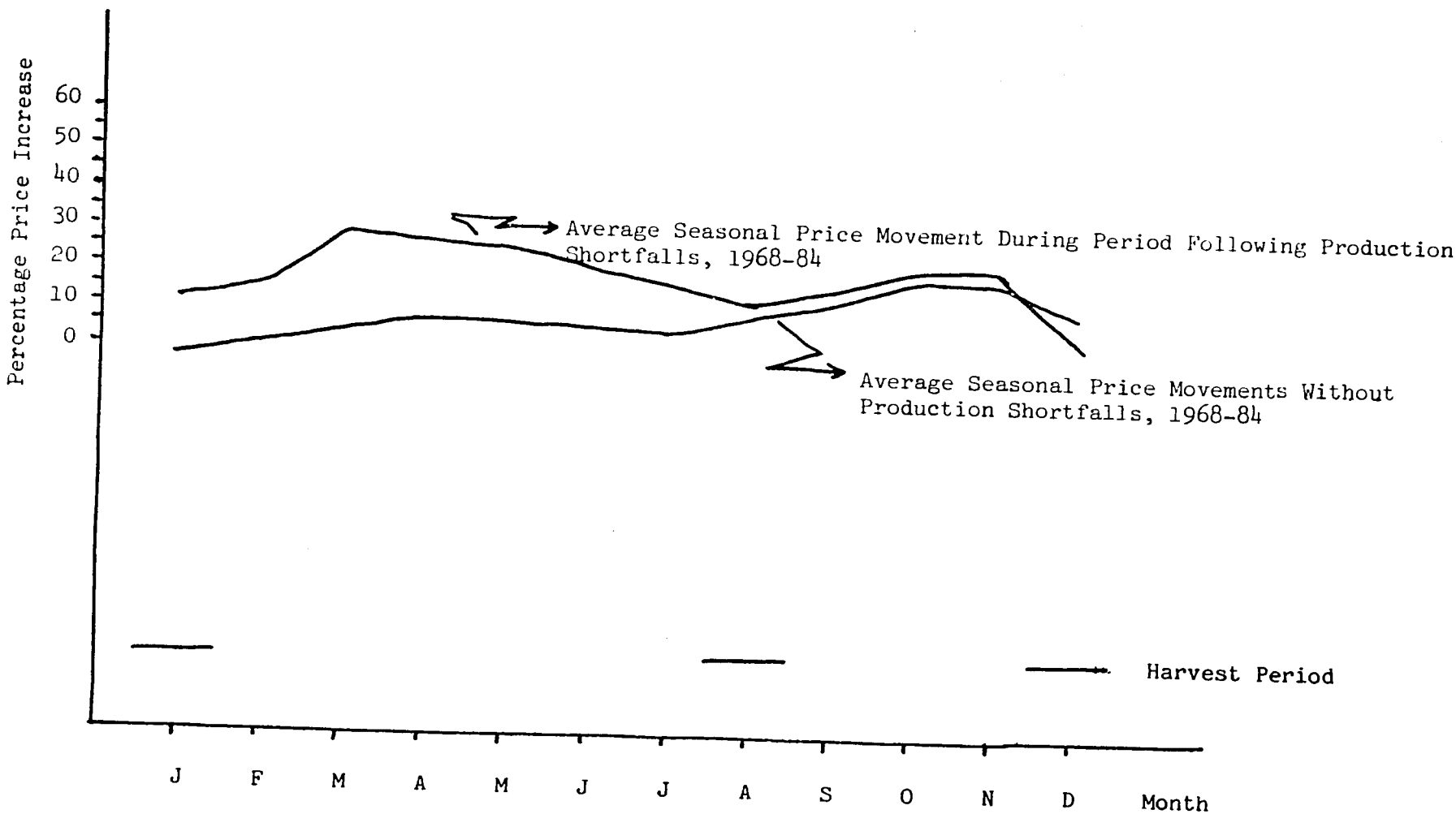

Figure 14. All Rice, Seasonal Price Patterns, Port-au-Prince

Source: Table 25, Appendix B

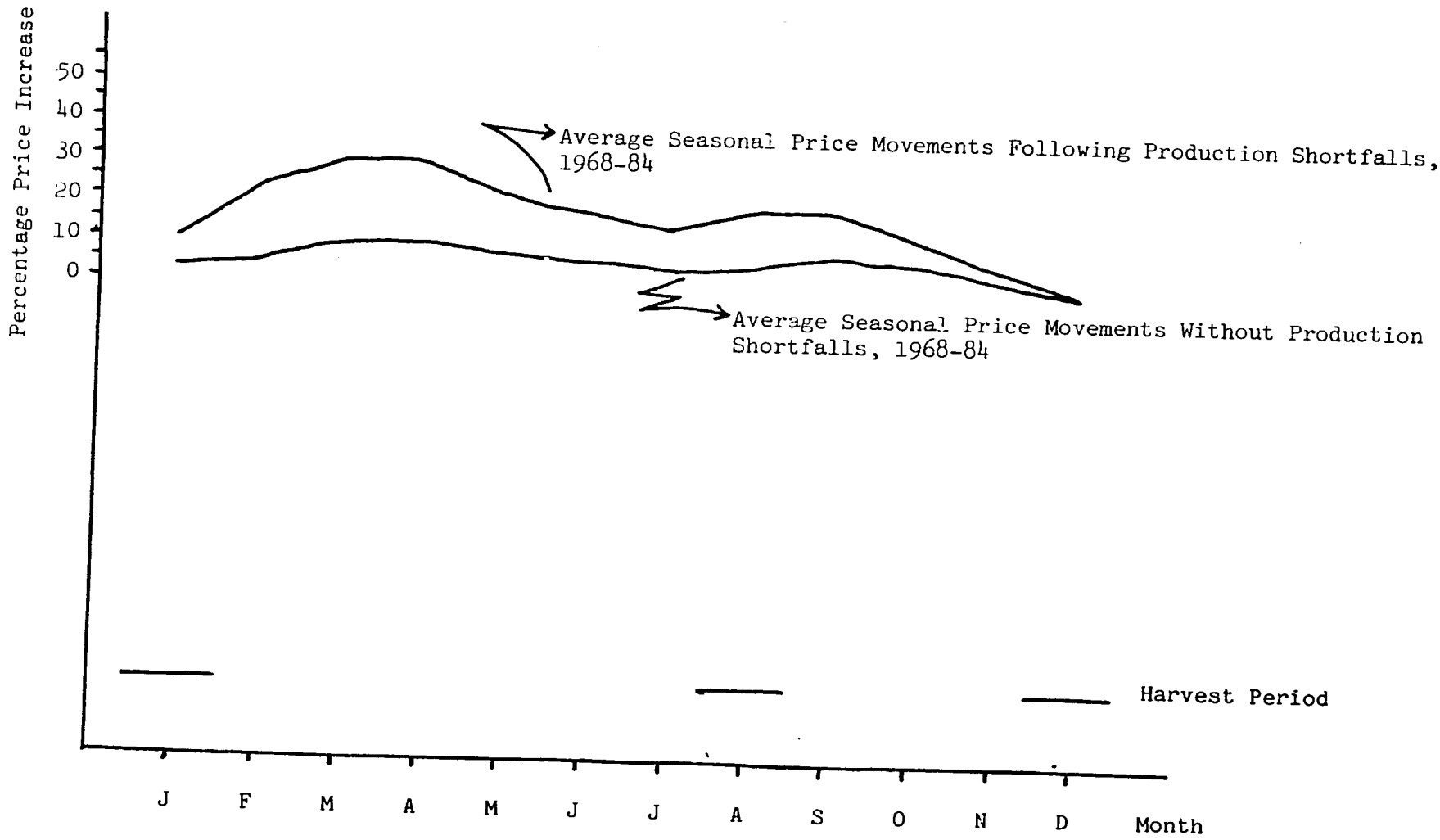

Figure 15. Superior Rice, Seasonal Price Patterns, Port-au-Prince

Source: Table 25, Appendix B

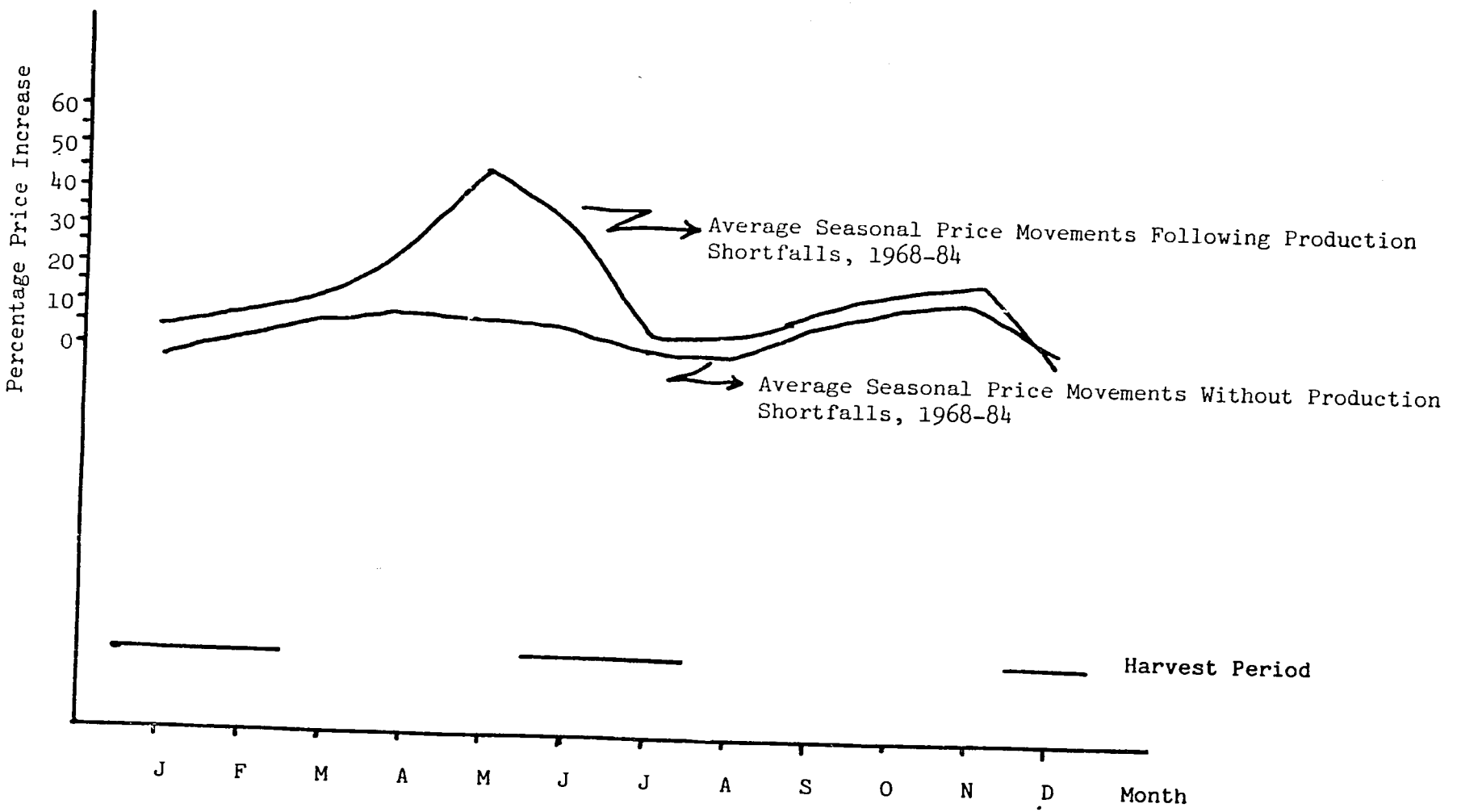

Figure 16. Red Beans, Seasonal Price Patterns, Port-au-Prince

Source: Table 25, Appendix B

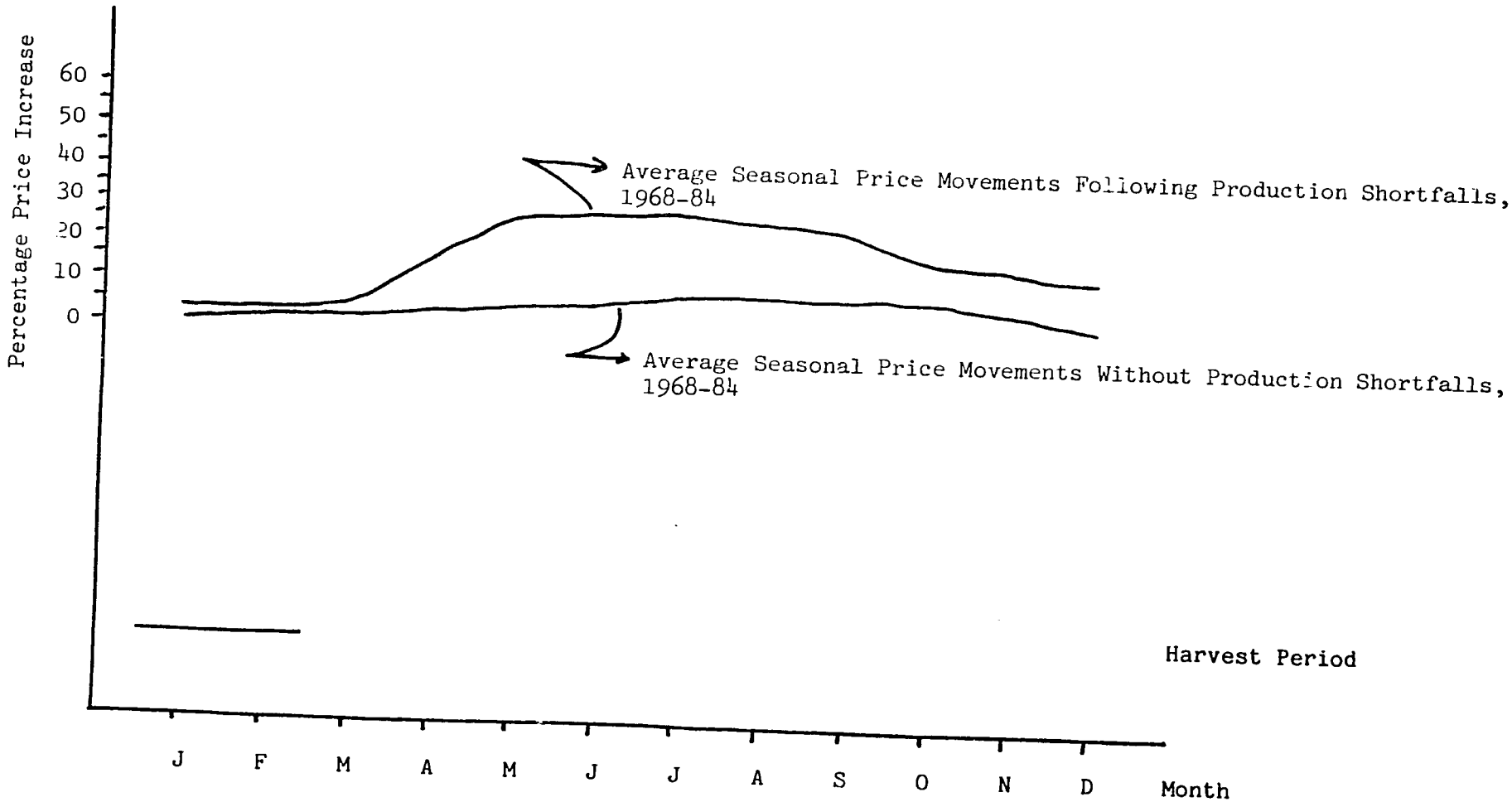

Figure 17. Millet/Sorghum, Seasonal Price Patterns, Port-au-Prince

Source: Table 25, Appendix B

An analysis was conducted on the prices of these commodities in the semi-rural markets[1] to determine if (1) the same general seasonal patterns held true, and (2) the degree of seasonal price increase was nearly the same as for the Port-au-Prince market. The results are presented in Figures 18 through 21.

In the case of corn, Figure 18, seasonal price movements show the same general patterns as for Port-au-Prince, but the degree of price increase is substantially higher. This is especially true for years of production shortfall, where prices increase to nearly 75 percent above the market lows. The greater degree of price increase in the semi-rural markets is most likely due to the fact that imports of corn into Port-au-Prince may dampen price increases, and that Port-au-Prince appears to be a more price-competitive market. It should be noted that there is a price lag difference of one month between semi-rural markets and Port-au-Prince, which is as to be expected given market flows which allow new corn to show up sooner in semi-rural markets than in Port-au-Prince.

Price movements for superior rice, illustrated in Figure 19, show the same double curve as for Port-au-Prince seasonal movements. Price movements track quite closely with Port-au-Prince, with the exception of prices following the December-January harvest period being slightly higher in normal years and slightly lower in years of production shortfall. This illustrates that rice can be considered a commercial crop rather than a subsistence crop.

Seasonal price movements for red beans in the semi-rural markets are shown in Figure 20. These price patterns follow the same basic pattern as in the Port-au-Prince market with two exceptions: (1) prices in years of production shortfall are higher in the Port-au-Prince market after all harvest seasons, and (2) price movements in normal years are higher in Port-au-Prince than in semi-rural market after the June-July period.

The price patterns for millet/sorghum, diagrammed in Figure 21, show substantial differences between Port-au-Prince and the semi-rural markets. Prices in the semi-rural markets not only show dramatically higher increases, but they also follow a substantially different pattern. If one compares the seasonal price movements for corn in Port-au-Prince and semi-rural markets with the seasonal price movements for millet/sorghum in both markets, the price patterns are similar. This reflects the fact that millet/sorghum seems to act as a substitute for corn in both market groups.

Price/Production Relationships

Since available production data are of low quality, the only calculations that can be made are crude estimations of the degree to which production shifts will affect prices of the commodities.

For rice, an analysis of production data and yearly average prices indicates that a decrease of 1 percent in production would lead to an increase of 1.5 percent in price. A decrease of 10 percent in production would lead to an increase of 9 percent in price. This is nearly a 1:1 ratio.

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[1]Superior rice had to be calculated based on regional markets due to the lack of sufficient data in semi-rural markets. No calculations could be made for all rice.

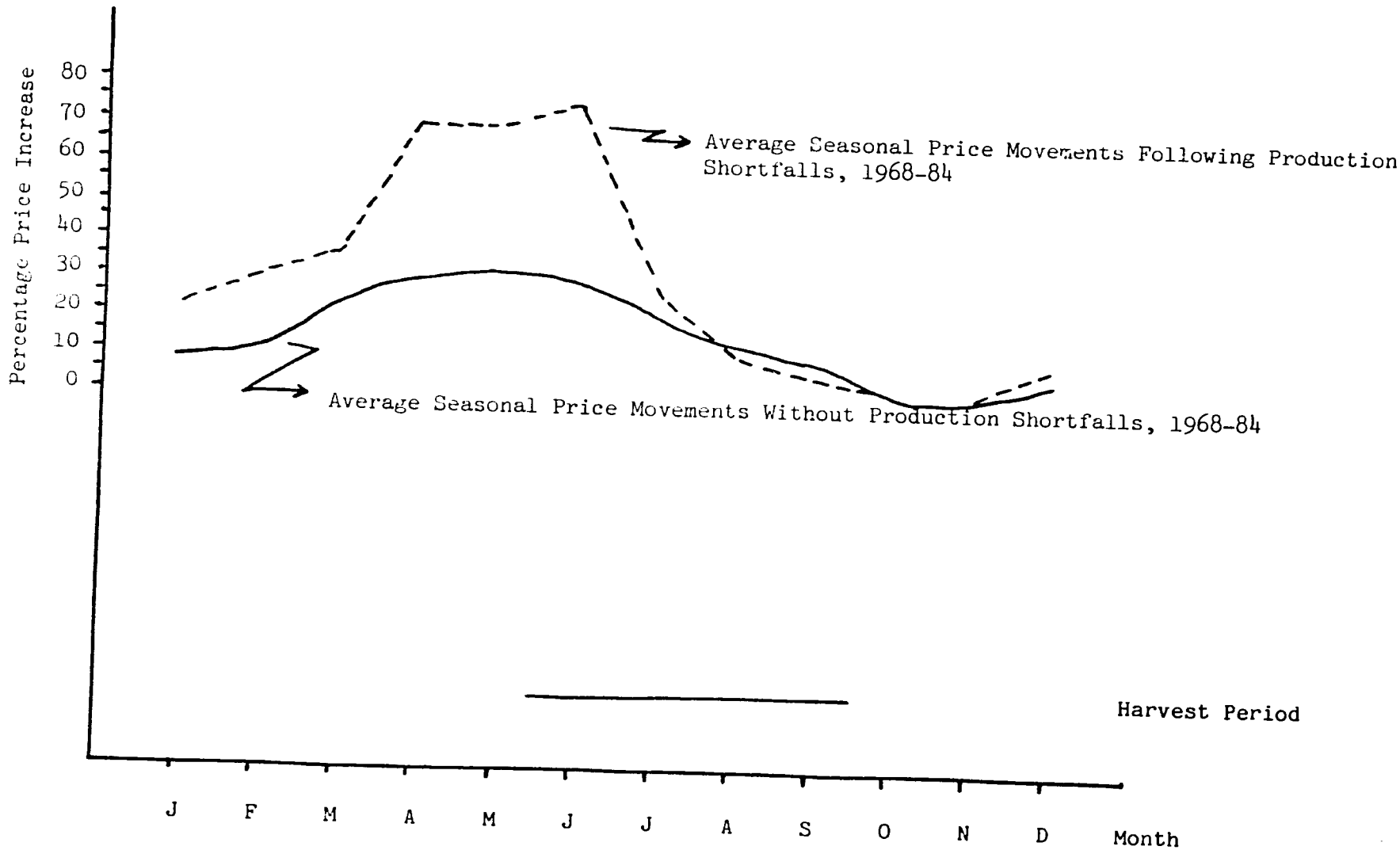

Figure 18. Corn, Seasonal Price Patterns, Semi-Rural Markets

Price Data Source: Borsdorf and Foster

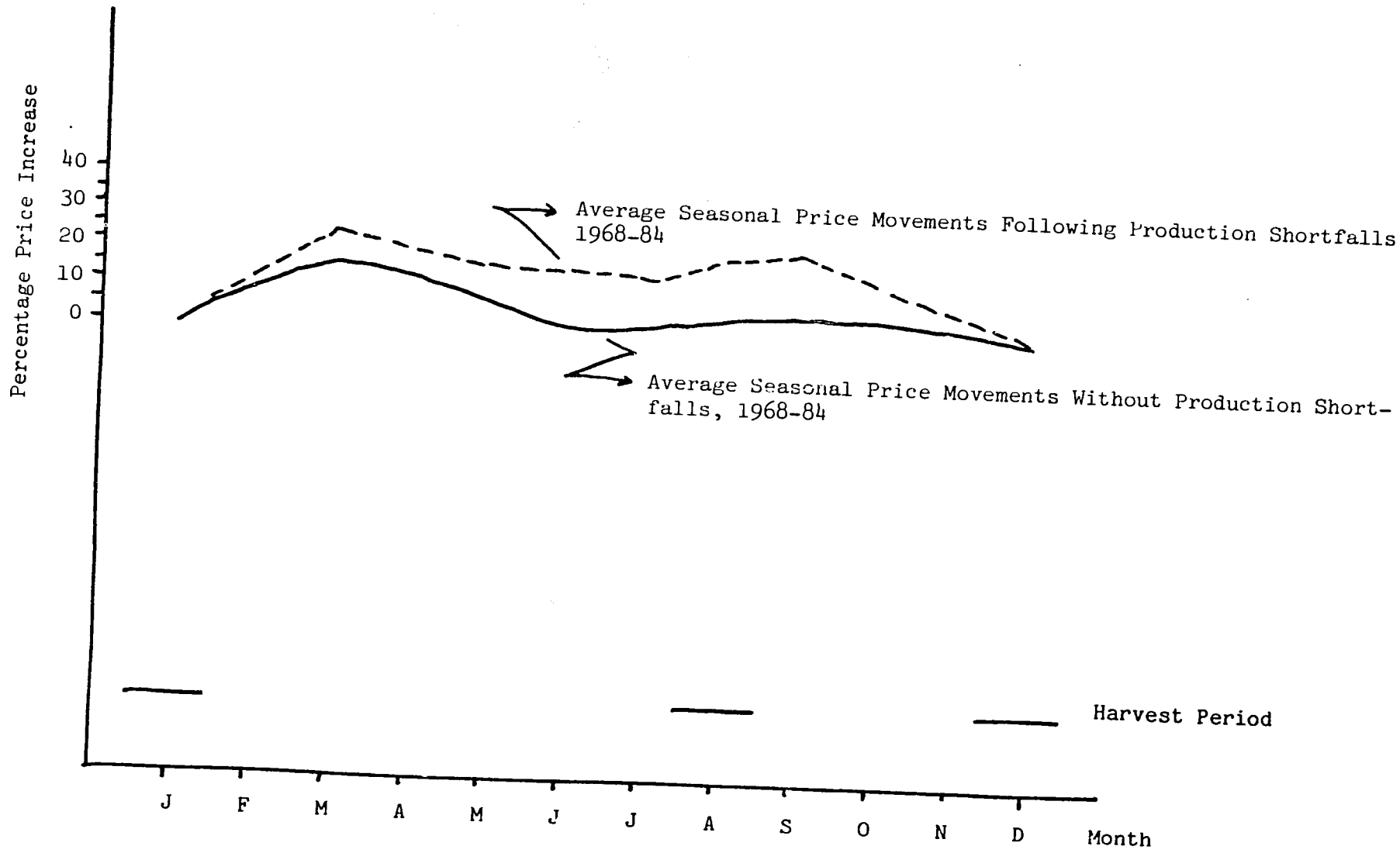

Figure 19. Superior Rice, Seasonal Price Patterns, Regional Markets
Price Data Source: Borsdorf and Foster

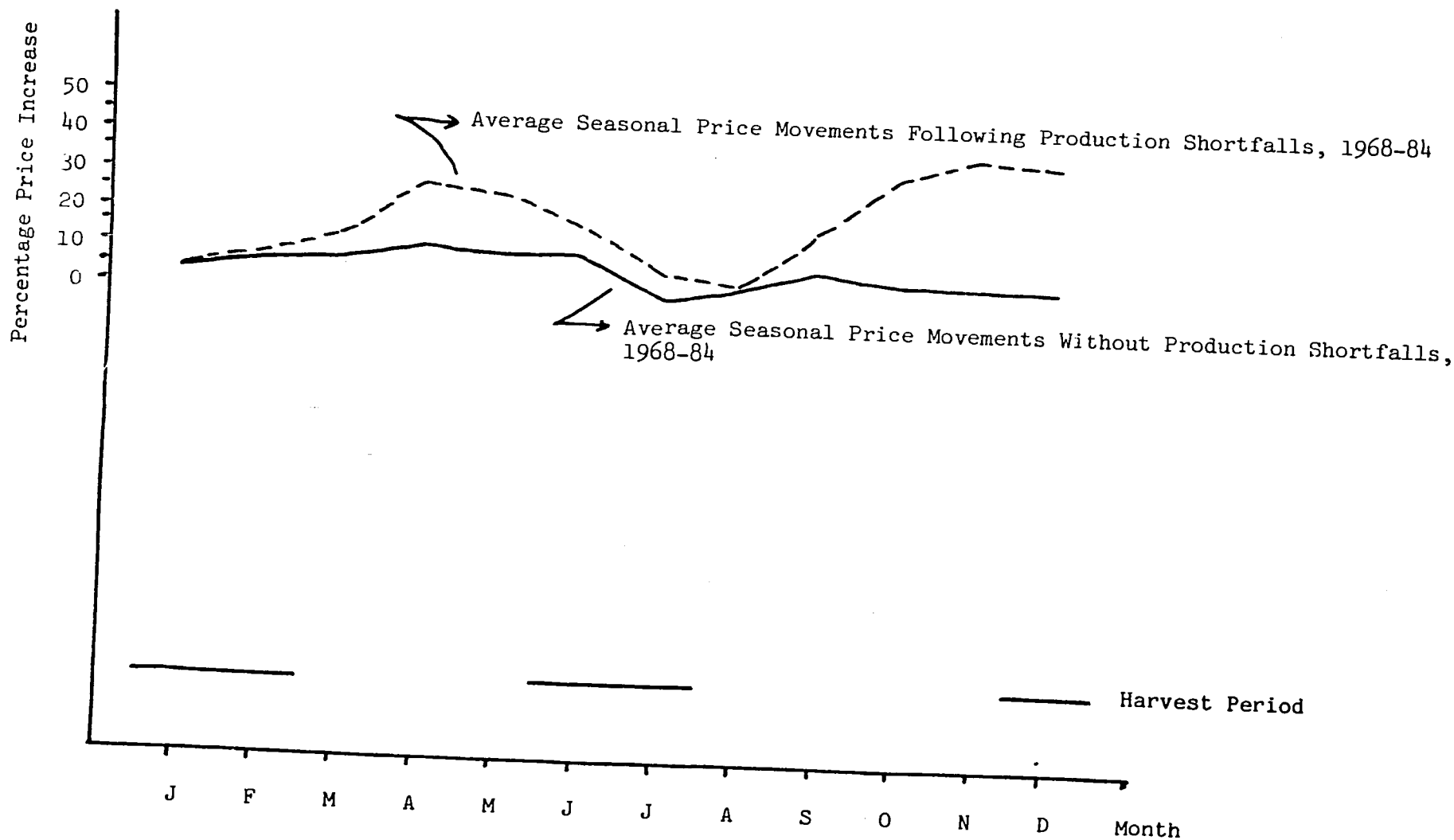

Figure 20. Red Beans, Seasonal Price Patterns, Semi-Rural Markets
Price Data Source: Borsdorf and Foster

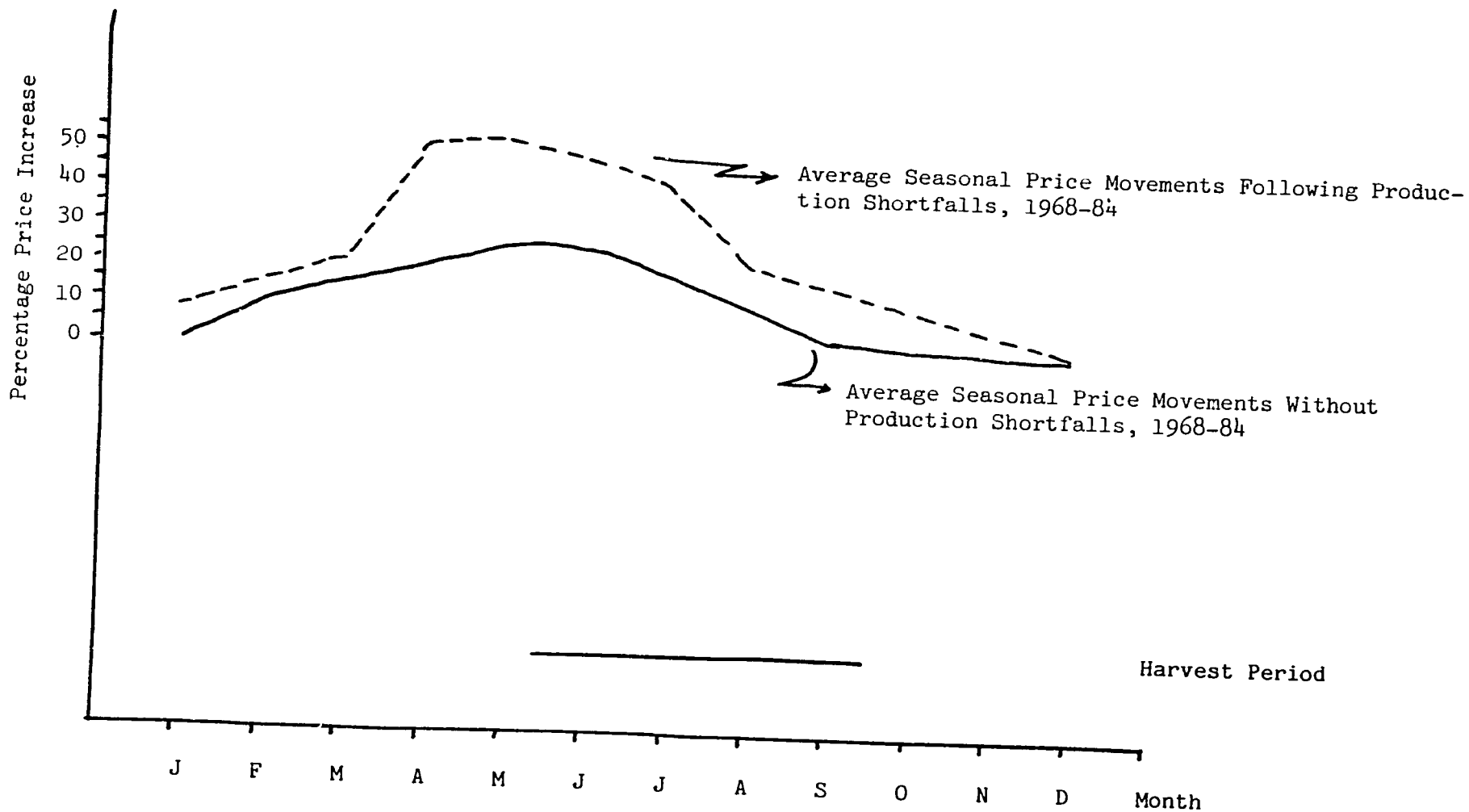

Figure 21. Millet/Sorghum, Seasonal Price Patterns, Semi-Rural Markets

Price Data Source: Borsdorf and Foster

For corn, analysis of production data and yearly average prices indicates that a decrease of 1 percent in production would lead to an increase of 2 percent in price, a decrease of 10 percent in production would lead to an increase of 7.5 percent in price, and a decrease of 15 percent in production would lead to an increase of 11 percent in price. This commodity also shows nearly a 1:1 ratio.

For millet/sorghum, an analysis of production data and yearly average prices failed to show a relationship between production and price. There are two possible explanations for this lack of correspondence: either the available data sets are bad, or millet/sorghum is so close a substitute for corn that the calculation of a relationship between millet/sorghum production and price is impaired.

For red beans, an analysis of production data and yearly average prices indicates that a decrease of 10 percent in production would lead to an increase of 13 percent in price. A decrease of 20 percent in production would to an increase of 19 percent in price. Again, this is nearly a 1:1 ratio.

Marketing Margins and Costs

Marketing margins can be divided into two major categories. The first category is spatial marketing margins, or the margins between purchase price and sales price which result from the purchase of a commodity from the producer or marketplace and the resale of that commodity in another marketplace within a limited time period (less than one month). The second category is temporal marketing margins, or the margins between purchase price and sales price due to holding a purchased commodity for an extended period of time in expectation of selling the commodity at a higher price as seasonal prices increase.

Exact spatial marketing margins in Haiti are unknown. Based on evidence presented in references given in Appendix E, it could be stated that the average marketing margin between the price paid to the producer and the retail price is approximately 25 percent of the retail price of the commodity. An analysis of average monthly prices in all semi-rural markets[1] in relation to the Port-au-Prince proxy time series reveals that the expected spatial price difference as a percentage of average Port-au-Prince sales prices should be 12 percent for corn, 17 percent for superior rice, 12 percent for red beans, and 13 percent for millet/sorghum. If the 25 percent average marketing margin stated above is accepted as a sound approximation of the total margin, then the calculated spatial margins between markets should be reliable estimates since this would leave a difference of 8 to 13 percent between the farmgate and wholesale prices.

Temporal marketing margins, as shown in Table 2, are calculated from the seasonal price patterns established in the previous subsection for years of normal production. These calculated temporal margins express the expected gain a marketer could achieve by purchasing a commodity at its low price and holding it for resale until the price reaches its highest percentage of increase over the purchase price.

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[1]Superior rice is calculated based on regional markets. No calculations could be made for all rice.

Table 2

Calculated Temporal Marketing Margins
(Percent of Purchase Price)

Commodity	Port-au-Prince Proxy Time Series	Average of All Semi-Rural Markets
Corn	25	31
All Rice		
First Season	8	-
Second Season	13	-
Superior Rice		
First Season	10	16
Second Season	8	4
Red Beans		
First Season	9	6
Second Season	13	8
Millet/Sorghum	9	26

Source: Figures 13-21
Table 25, Appendix B
Borsdorf and Foster

To determine whether marketing margins can be considered normal or excessive, they must be compared to marketing costs. There are five broad categories of marketing costs: (1) carrying cost, or the return on the money invested in a commodity for the purpose of resale, (2) holding cost, or the cost of storage and quality maintenance of the product purchased for resale, (3) risk cost, or the cost of accepting risk of ownership of a commodity due to the potential for physical (quantity) or quality loss, (4) transport cost, or the cost of moving a product from one market area to another, and (5) overhead cost, or the average return a marketer should receive over and above all other costs in order to compensate him for the effort expended in marketing a commodity. The overhead cost should be considered as a return to labor and management.

While very little research on marketing costs has been done in Haiti, a review of available references in Appendix E assisted in the development of a set of crude minimum marketing costs. These minimum marketing costs are as follows:

Carrying cost - 4 percent of purchase price of the commodity per month

Holding cost - 0.2 percent of purchase price of the commodity per month

Risk cost - 1 percent of purchase price of the commodity per month

Transport cost - 6 percent of the purchase price of the commodity

Overhead cost - 11 percent of the purchase price of the commodity

A comparison of marketing margins and costs is presented so as to provide a description of the marketing system in which the GOH may decide to participate. The reader must remember that the results presented herein are crude calculations, often developed with only the most tenuous of data to be used as a base. This approach has been taken in order to express all considerations which should be weighed by the GOH prior to undertaking any grain price stabilization activities.

A comparison of spatial marketing margins and costs is presented in Table 3. Marketing margins are large enough to cover marketing costs and allow for net margins.

A comparison of temporal marketing margins and costs is shown in Table 4. Historically, the average expected margins have not been high enough to cover all marketing costs. As a result, marketers have recovered only their out-of-pocket expenses such as storage costs. The returns have not been sufficient to fully reimburse them for the money, labor, and management invested in the marketing effort, nor for the risk assumed.

The net margins generated by the immediate resale of commodities, as shown in Table 3, are used to support the negative margins which result from holding the product for later sale, as shown in Table 4. There is no available evidence to suggest that any amount of excess profit is being generated by marketers. Given the high level of costs incurred with carrying cost and transport expenses, it appears that margins are only large enough to cover costs. This is not to say there are no "windfall" profits in the system. Such windfall profits could be generated in years of production shortfall when prices can be forced upwards in the marketplace due to supply shortages. Windfall profits may also occur in a single marketplace due to supply/demand imbalances on any given market day. The first case is a result of production failure and poor management of food product imports. The second is due to a tight supply/demand situation in Haiti which may cause diversion of commodities from one market to another based on the expectations of marketers. Because of a lack of information, these expectations may not be correct, and may lead to losses in one marketplace with concurrent windfall profits in another marketplace.

There is one other element in marketing margins to be considered. This involves the processing margins for products which undergo a change in form, such as polished rice and milled corn. In the case of rice, an analysis of the prices for paddy and polished rice reveals that a portion of the milling costs may be covered by the marketing margins shown in Tables 3 and 4. Using a 65 percent milling yield for paddy, and based on the data provided by ODVA, the return to milling varies widely. Local market prices in the ODVA area indicate that the return to milling (processing margin) ranges from -10 to +10 percent of the sales price of polished rice, depending on the year and the season. These processing costs are not included in the costs shown in Table 3. When the processing margins are 0 or negative, then this cost is covered

Table 3

Comparison of Spatial Marketing Margins and Costs
(Percent of Purchase Price)

Commodity	Calculated Marketing Margin[1]	Calculated Marketing Margin[2]
Corn	22	16
Superior Rice	27	16
Red Beans	22	16
Millet/Sorghum	23	16

[1]Spatial marketing margin plus 10 pecent for wholesale/producer price difference to match with crude estimates in references.

[2]Carrying cost, risk cost, transport cost, and overhead cost for a 10-day period.

Table 4

Comparison of Temporal Marketing Margins and Costs
(Percent of Purchase Price)

	Port-au-Prince Proxy Time Series			Average of All Semi-Rural Markets		
Commodity	Margin	Months to Achieve Margin	Cost[1]	Margin	Months to Achieve Margin	Cost[1]
Corn	25	5	37	31	6	40
All Rice						
First Season	8	3	25	-	-	-
Second Season	13	3	25	-	-	-
Superior Rice						
First Season	10	3	25	16	2	20
Second Season	8	2	20	4	2	20
Red Beans						
First Season	9	3	25	6	3	25
Second Season	13	3	25	8	2	20
Millet/Sorghum	9	7	45	26	5	35

[1]Carrying cost, holding cost, risk cost, and overhead cost for months indicated.

by the net margin as determined from Table 3. When further related to temporal margins, Table 4, no excess profits can be determined.

SECTION IV

Present Grain Storage Facility Status

DARNDR Facilities

Historically the GOH has not been involved in ownership or operation of grain storage facilities. However, in the 1970s the GOH began constructing metal grain storage bins and other associated equipment. The Service National de Commercialisation Agricole (SENACA) indicated that a total of 10 modules of 5 silos each were to be located at Bon Repos, St Marc, Gonaïves, Mirebalais, and Petit Goâve. Adequate documentation was not available to determine the plans and programs for these facilities. The study team visited the Bon Repos facility near Port-au-Prince, but it was not possible to see the facilities at any other locations.

The as-built layout of a module at Bon Repos and the detail of the Bon Repos facility status are given in Appendix C. This unfinished facility consists of five modules, each containing one combination drying-storage bin, four storage bins, a scalper (cleaner) and other associated equipment. All equipment was imported from the U.S. and installed by a local contractor on site. The estimated storage capacity of this facility is 5,000 MT of dry grain sorghum.

On-Farm Facilities

Farm sizes are so small and fragmented that it is impossible to gather quantitative data on facilities being used for grain storage. No study has yet been conducted in this regard. However, a general description can be given of the various on-farm storage methods being used.

In the production of corn, corn in the husk is semi-dried in the field for 30 to 45 days after maturity. The large producers harvest the grain at about 16 percent moisture content and sun dry the grain to about 15 percent moisture on a concrete drying surface for about a day. The small farmers harvest the semi-dry unhusked ear corn and hang the bundled ears from tree trunks for final drying and storage. The storage structure used is locally known as "gouane." Gouanes are used exclusively for corn, and are built at very low cost with tools and materials available on the farm. Gouanes do not provide adequate protection against insects, molds and rodents. Desrouilleres (1981) evaluated the grain losses in traditional storage including gouanes used in Salagnac and Madian areas. Three loss evaluation criteria were used: (1) number of kernels affected by insects and fungi, (2) affected weight in a sample of 1,000 kernels, and (3) percent weight loss. The study indicated that losses on the basis of all three criteria increased with the storage duration. Weight losses were found to vary from 0.2 to 14.9 percent for a storage time of 32 days to 200 days, with 9.8 percent maximum loss for a 163-day storage. However, it is unclear whether weight losses due to drying are included in this figure.

In the production of sorghum, the semi-dry sorghum heads are harvested by hand and stored in the house in wooden boxes or in the attic area above a kitchen fire. Sorghum is shelled in the same manner as corn and spread on the concrete drying floor in front of the house or on mats to further dry the grain before storage in wooden boxes, sacks, or other containers.

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Rice production is concentrated mainly in the valleys, with Artibonite being the largest area of production. Sorenson and Chung (1973) reported that rice heads were harvested from the paddy stalk, transported from the field by manual labor, and then threshed on concrete floors or mats by beating with sticks or by repeatedly trampling under the feet. Rice was then sun-dried on mats or concrete floors. An alternative method was to leave the rice in the field to dry. Dried heads were then harvested and stored in the living quarters on a raised platform without any walls and roof. The rice was threshed when marketed.

In the last few years, new rice varieties have been introduced and accepted by many farmers in the producing areas. These varieties, such as long-grain rice from Texas, are easier to dry than the traditional short-grain varieties. New harvesting and threshing methods have also been adopted. These methods involve harvesting the entire paddy stalk at a higher level of moisture than before. The fields are generally flat, and they are dry during harvest season. All of these elements make it possible to change the threshing method. Under the new method, threshing is done in the field on a large canvas sheet by holding a handful of stalks at the bottom and beating the heads against a stone, lumber, a rubber tire, or any other convenient hard object. The threshed rice is then transported to the farmer's house, in front of which is a multipurpose concrete drying floor. Sun drying of rice is done on this drying floor or on mats. A typical farmer harvests about 2 MT of rough rice in a 2-season harvest year. After drying, the grain is usually stored in a large flat woven basket without any lid.

In bean production, the entire bean plants are harvested, dried, and stored in the attic above the kitchen area where the final drying is accomplished. Beans are threshed before consumption and marketing. Beans may be redried after threshing by spreading on a drying floor or a mat.

Because of the extreme limitations of data, the volume of the grain stored on-farm can not be quantified. However, it is evident from various references that a lack of sufficient on-farm storage capacity is partly responsible for lower crop prices during the harvest.

Market Facilities

An accurate description of these facilities can not be given because of the lack of data and fragmented nature of operations.

Storage facilities mainly consist of warehouses or general-purpose rooms in the markets. The warehouses are generally owned by the traders. In Haiti, the government has not yet become involved in grain storage and marketing operations.

In relation to market facilities, one ongoing project in Haiti that attempts to combine the need for producer storage with the need to encourage producer participation in the market system is a project funded by the Deutsche Welt-hungerhilfe (DWHH).

The storage component of this project initially involved the construction of a 8 x 10 x 3 m pilot warehouse and an adjacent grain drying floor in Fond des Nègres. The project was then extended to include the construction of 18

similar warehouses - 10 in the northeast, 3 in the central region (Artibonite), and 5 in Fond des Nègres. Construction was begun in the northeast region in December, 1982, and in the other two regions construction was begun in May 1983. By March 1985, 6 warehouses in the northeast and 2 in Fond des Nègres were completed. The concrete warehouses were built by local engineers and construction crews, including the area farmers. The estimated storage capacity of the project is 1,800 MT.

The warehouses were built on the expectation of generating profit by buying the grain from the area farmers during harvest when prices are low, and selling when prices are higher. Any profit is to be equally divided between the warehouse and the farmer whose grain is sold. Each operational warehouse is run by a manager selected by the area farmers. The project also provides chemicals and technical assistance to the warehouses, and is considering installation of rice mills in the project area.

SECTION V

Consideration of Possible GOH Actions

A large number of possibilities exist as to the type of actions which the GOH could undertake in the general area of grain price stabilization. When considering these possibilities, the reader should keep in mind that no decisive criteria exist which allow any determinations to be made concerning allegations that (1) farm prices are too low, even at harvest time, (2) low prices are the major constraint in increasing agricultural production, and (3) the lack of marketing infrastructure is the major constraint in the expansion of output of a given commodity and the improvement of producer income.

Grain Price Stabilization Activities

There are three basic approaches to grain price stabilization activities which the GOH can take under consideration. Price stabilization can be accomplished through the regulation of imports; the purchase, storage, and resale of domestically-produced commodities; or the development of the market system. The specific objectives that the GOH wishes to achieve through grain price stabilization actions are unknown. As pointed out in Section I, definite objectives need to be established before any actions are taken. It should again be emphasized that price stabilization can be implemented for different purposes and some of these purposes serve conflicting interests.

The GOH can consider using the regulation of imports as a form of price stabilization. Governmental import restrictions currently exist for cereal grains such as corn and rice, and price controls are in effect for flour. These governmental actions help maintain cereal prices at high levels by limiting the supply. These import restrictions could be reformulated to allow for the importation of predetermined quantities of basic cereals at established points in time. The price policy involving flour could also be reformulated to coincide with regulated import controls.

The basic objective of using this approach to price stabilization is to dampen seasonal price rises, especially during years of production shortfalls. This approach would call for import regulation such that imported commodities would arrive in limited quantities at the time seasonal prices begin their upward movement. Prior to the new harvest season, imports would be curtailed so as not to drive harvest prices lower than normally expected for current conditions. However, it should be realized that such an objective is consumer-oriented and does nothing for the producer. The impact of such an approach may even cause a decline in producer prices, especially during the harvest season, since marketers may not be willing to purchase and store grain without the assurance of a price increase sufficient to cover marketing costs. The study team considers this approach to be valid only if a measurement of the potential impact of import regulations on market prices, producer prices, and the market system is carried out prior to taking any action. If the GOH wishes to give detailed consideration to such an approach, far more data and analysis will be required than can be presented in this report. This further emphasizes the fundamental need for data collection and analysis as described on pages 54 and 55.

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Another approach to grain price stabilization activities is for the GOH to purchase, store, and resell domestically-produced commodities. The analysis of commodity prices in Section III sets the stage for determination of possible impacts of such an activity on the market system and market prices. The prices for commodities in Haitian markets are highly correlated. This means that the consequence of a reduction in supply due to GOH purchases in one market area would be felt in many other market areas. Therefore, this type of price stabilization activity would have to be implemented on a countrywide basis, with the basic purchasing points being rural markets. In this way, purchases would be spread evenly over the markets and a serious impact in one market could be avoided, thus protecting all markets.

Average seasonal price patterns as shown in Section III are not considered extreme except in years of production shortfall, however this is a production problem, not a marketing problem. The seasonal price patterns and the price/production relationships suggest that if the GOH intervened in the market, the seasonal price curves for normal production years would shift upward and the shape of the curves would change to resemble those for years of production shortfalls. This would mean that seasonal prices would rise more rapidly than expected in normal production years. Taking as an example the case of corn, the GOH has the capacity to store approximately 10,000 MT[1] (if all bulk storage facilities were in the condition to do so). If this amount were taken out of the market in a normal year, it would be expected that the seasonal price curve would shift as shown in Figure 22. Not only is the curve higher, but it is also shifted to the left, which indicates that the rate of percentage increase will rise more rapidly. GOH purchases in the market system would act in the same way as a production shortfall because available supply to the free market system is being reduced. The private-sector marketing system would have less commodity to handle, consequently prices to producers and consumers would be higher.

Analysis of commodity prices does not reveal any evidence that marketers receive windfall profits, except in the case of production shortfalls and supply/demand imbalances in individual markets. There is the possibility that GOH intervention would create the opportunity for windfall profits for marketers since prices in the marketplace would begin to act like prices in production shortfall years. Also, additional supply/demand imbalances could be created in specific markets by the decrease in market supply due to GOH purchases. These reactions could further heighten the expected seasonal price pattern shown in Figure 22.

The seasonal price patterns in Section III indicate that prices decline throughout the harvest season, reaching their lows shortly after the end of the harvest season. GOH purchases, if begun during the harvest season, should assist in maintaining prices above the normal seasonal lows, thereby increasing the average annual market price. This increase would be in proportion to the amount taken out of the market by the GOH, as described in the price/production relationships in Section III.

At this point, the question may arise as to why the GOH could not simply purchase the commodities at a price above the low harvest price which would act as a farm support price, then release the commodities later in the

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[1]Approximately 5 percent of production.

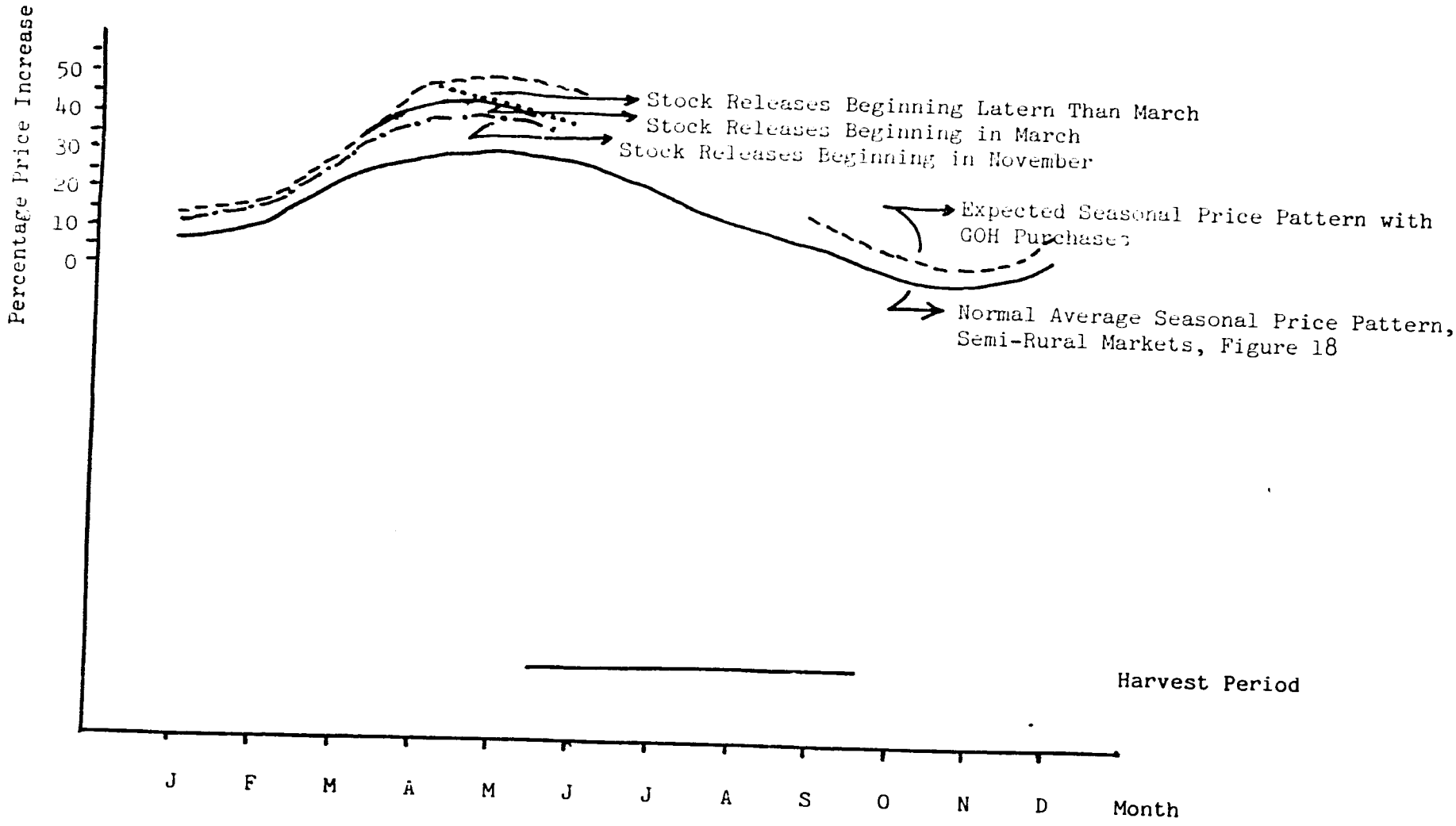

Figure 22. Example of Seasonal Price Pattern Shift

season to moderate seasonal price increases. If this is the objective of price stabilization actions, four basic factors concerning moderation of seasonal price increases must be considered: (1) global supply/demand balance, (2) timing of stocks released, (3) quantity of stocks released, and (4) location of stocks released.

In the case of Haiti, the global supply/demand balance is essentially one of insufficient supply. If quantities are removed from the market system by an agency not currently involved in the marketing process, this will create a further imbalance due to the fact that existing marketers will be unsure of how the actions of the intervening agency will affect them. Therefore they will react as if there were a production shortfall.

Timing of stock release is critical to the success of any price moderation action. If stocks are released at the time when seasonal prices begin to move upwards, such as in November, one would not expect the season price to be moderated since marketers will have already purchased commodities at a price level nearly equal to the GOH purchase price and they will have to sell these commodities at prices which will generate a sufficient margin to cover their operating expenses. The need to cover operating expenses also applies to GOH purchases since the release price would have to be high enough to recuperate the original purchase price plus any marketing costs. The only way to reduce the release price is if the GOH is willing to subsidize these marketing costs. If stocks are released beginning in March when prices take a strong upward turn, the expected effect of a new seasonal high price may be dampened, and the curve would begin to follow the normal pattern as shown in Figure 22, although at a higher peak than when stocks are released beginning in November. Stocks released after March, when seasonal prices have reached their peak, would have a tendency to turn the market downward towards the level prevailing during the new harvest period. However, since the market system would not have a sound understanding of when stocks would be released, these actions may not be able to prevent seasonal prices from going even higher before leveling out.

Stock release quantities will have to be carefully calculated in order to avoid destabilizing individual markets. Because the release of large quantities of stock would drive prices sharply downward and could force some marketers out of the system, stock releases should occur in measured amounts. However, when selling into a fragmented system composed of small marketers, such as exists in Haiti, the GOH will incur much higher marketing costs since it is more expensive to sell in small lots than in large quantities.

The last factor to be considered in this type of stabilization action is the location for the release of stocks. If stocks are held at Bon Repos and the other stated storage facility locations, then release from these locations would have some adverse price effects on different markets. Seasonal prices in rural markets would continue their upward movement as shown in Figure 22. However, seasonal price movements in markets located near storage areas would be decreased much more than shown in Figure 22 because of the volume being released into the market, even though it may be done in small lots over time. This would damage producers and consumers in rural areas by leaving prices high, and would destabilize the market system serving the market areas into which stocks were released. Any expectation of stock release could cause destabilization in these markets even before stocks are physically released.

Such intervention in the marketing system implies that the GOH agency responsible for price stabilization must have the manpower, talent, and facilities to perform such a function. This is not the case at the present time. In addition, given the current calculated marketing margins in the private sector, it may be necessary for the GOH to subsidize the operating costs of such intervention because the marketing costs incurred by the GOH can be assumed to be much higher than those incurred by the private sector.

It does not appear that grain price stabilization activities involving the intervention of the GOH in procurement, storage, and resale of cereals is warranted at this time. Seasonal price movements are not of the extreme to require such intervention, nor are marketing margins excessive, in either spatial or temporal terms. Further, the lack of knowledge concerning the operation of the current market system precludes the development of any activities which might rationally fit into the system. In addition, the lack of understanding of production cost factors prevents the GOH from being able to determine appropriate prices for commodities. These deficiencies emphasize the need for data analysis as detailed later in this section.

The third basic approach to grain price stabilization is for the GOH to encourage the development of the market system. If the objective of stabilizing prices is to increase the producer price at harvest and to dampen seasonal price increases, then several different actions can be considered.

In order to help farmers obtain higher prices for their products, an appropriate storage system applicable to either individual farms or to village-level storage should be developed. Given current conditions as set forth in Section IV, this provides the opportunity to cure existing deficiencies in the system. With the creation of a storage system which will allow producers to preserve the quality of their harvested crops, higher prices can be acheived for the commodities as seasonal prices increase. In addition to higher quality, the quantity of grain available is also greater, thus seasonal price increases should be dampened as the supply of grain over time is increased. The development of such a storage system will require the accompanying introduction of market credit for farmers to allow them to carry their own inventories. This activity gives the producer the opportunity to obtain a higher price for his products and to become more firmly entrenched in the marketing system.

Another area which should be addressed is postharvest losses both at the farm level and within the marketing system. The degree of postharvest losses occurring in these systems should be assessed by measuring the type, location and amount of loss, and based on these findings loss control procedures should be developed and introduced into both the on-farm or village-level storage system and the marketing system. This specific set of actions will lead to a greater quantity of grain for farmers and marketers to sell, thus tending to dampen seasonal price increases. It will also allow producers and marketers to command a fair price for a quality product since the quality of the product has not deteriorated during storage.

Finally, development of the marketing system can be encouraged through the collection and dissemination of market information to as many participants as possible within the system. The specific needs of the marketing system as concerns the different types of information need will have to be defined and procedures will have to be developed to serve these needs.

The management of these activities should be assigned to DARNDR. The present capabilities of this agency are such that extensive organizational improvement will not be necessary, but additional resources will be required in order to allow it to successfully carry out the above activities.

Utilization of DARNDR Storage Facilities

Due to the inability of the GOH to effectively intervene in the market system by means of price stabilization actions involving the purchase, storage, and resale of commodities, any consideration that the existing bulk storage facilities can be used to support price stabilization activities is inadvisable. If utilization of the unfinished DARNDR storage facilities is desired, the following options are the only alternatives which can be considered viable at the present time.

1. Sell the storage facilities in their current unfinished condition to interested parties in the private sector or the public sector. This option would not require any investment on the part of DARNDR other than the cost of administering the sale.
2. Complete the construction of the facilities and sell them to interested parties in the private sector. This option requires the investment of resources in the storage facilities, which constitutes a considerable risk for DARNDR. The foreign exchange cost will be very high, and DARNDR will probably realize only a minimal rate of return on its investment.
3. Complete the construction of the facilities and lease them to interested parties in the private sector. Again, this option will require considerable investment on the part of DARNDR, which may see only a slight return.

It is not recommended that the bulk storage bins be used for the storage of bagged products. Technical considerations prevent this option from being considered as a viable alternative.

The study team recommends that option 1 be the course of action taken by DARNDR. In this case, no further detail is necessary. However, if option 2 or option 3 is selected, further specific actions will need to be undertaken. Appendix D should be consulted for details.

Data Collection and Analysis

The direction towards establishment of a sound data collection mechanism is the correct position for the GOH. This effort should be expanded to include collection of marketing and postharvest loss data as described in Section III.

Further, the analysis of collected data should not be ignored. Plans should be developed and a program implemented, coincidental with the implementation of data collection procedures, by which DARNDR can improve its ability to analyze data and present the results of this analysis to decision-makers. The suggestions herein are intended as guidelines for the general analytic areas which should be encompassed by such development programs.

The first area is the collection, analysis, and dissemination of current information on supply, demand, and price. Government planners and implementing agencies alike must have this kind of information on a regular and timely basis if they are to perform effectively. The same information is needed to support the functions involved in marketing policy analysis. Further, the private sector needs this type of information in order to make decisions on its day-to-day business as well as its investments. The collection, analysis, and dissemination of the information is clearly the responsibility of a public agency. Private industry can not effectively perform such a function.

It is suggested that first priority be given to this area, and that a plan be designed to ensure accurate and timely reports. Among the types of reports needed, the following priority is suggested: (1) current crop estimates of acreage, yield, and production of grains by department, (2) average monthly wholesale market prices for grains by market, (3) current weekly wholesale market prices for grains by market, (4) Average monthly retail market prices for grains by market, (5) average monthly market prices received by farmers for grains by department, (6) monthly stocks of grain by position (farm, first handlers, wholesalers, processors) by department, (7) current situation reports of demand conditions and price outlook for grains by market, and (8) current situation and outlook on marketable surplus and flows of basic grains by department.

The second area is the analysis of cropping patterns, production costs, supply responses, and demand projections. This involves the analysis, evaluation, and projection by department of (1) farm production costs for grains, (2) shifts in cropping patterns, (3) shifts in demand patterns, and (4) production response to alternative levels of prices. Such work is essential to the support of planning by public implementing agencies as well as by private industry. This information is a prerequisite to such activities as (1) determining the proper number, type, size, and location of storage and marketing facilities, (2) establishing appropriate price support levels, (3) properly designing procurement and sales programs, and (4) designing programs for public and private marketing industry development.

The third area is the analysis of marketing patterns and systems. No organized marketing analysis is now conducted in DARNDR or elsewhere in the government. This information is essential to support the development of sound marketing policies and efficient marketing programs, both at the ministry level and within other implementing agencies. This should include analysis of (1) market organization, structure, conduct, and performance, (2) marketing functions, channels, costs and margins, (3) the impacts of physical and institutional infrastructure affecting the development and performance of Haitian marketing systems, and (4) the impacts of existing and alternative marketing and processing technologies.

The nation as a whole would benefit from the development of the capacity within the public sector to diagnose total food and fiber marketing system problems and to prescribe appropriate system-wide solutions.

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APPENDIX A

Statement of Work

1. Background

USAID is pleased to report that GOH's new Minister of Agriculture has shown some laudable initiative in refocusing national attention on food storage problems. He has asked USAID to participate in this review, specifically to provide some technical recommendations as to what can be done with the USAID-funded (1971-1976) grain silos, at Bon Repos near Port-au-Prince, as well as smaller, equally unused, silos in Cayes and Mirebalais, in the context of a nationwide price stabilization plan.

2. Proposed USAID response to GOH inquiry

USAID would like the Kansas State University Food and Feed Grain Institute to send some short-term technical assistance, funded through the ST/AGR/APS Improvement of Postharvest Grain Systems project No. 0786, to formulate some alternative approaches for the Ministry. Specifically, we would like a food supply agricultural economist working with a Ministry counterpart to:

A. Review food price trends, beginning with Rod Kite and Shirley Pryor's 1983 "Haiti: Food Policy Options" study, and assess the impact of crop losses on the uncertainties that they impose on producer behavior.

B. Recommend desirable program and policy changes, if any, that might regularize prices such that investments in food production would increase.

C. Review and advise on

1. A phased series of household production/consumption surveys to determine how price shifts in one staple commodity affect supply responses for another.

2. Collection of quantitative data on postharvest crop losses that can be used to identify points at which conservation can feasibly be improved. In this connection, reference should be made to the literature on USAID's Vertebrate Pest Management Project with Denver Wildlife.

3. Measurement of the degree to which small farmers could improve their situation if staple food prices were more stable.

At the same time, USAID would like a food storage technologist working with a Ministry counterpart to:

D. Assess the farm-level and national level food storage infrastructure now available in Haiti and make recommendations as to how it might be more effectively utilized.

E. Advise USAID and Ministry of Agriculture on additional technical options that could be sought to reduce postharvest food losses at all levels.

F. Advise USAID and Ministry on potential use of unused silo facilities in the appropriate sort of price stabilization initiative.

After the arrival of the study team, verbal discussions were held with representatives of USAID/Port-au-Prince and GOH for the purpose of clarifying the

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issue to be addressed under the Scope of Work. As a result of these dicussions, the Scope of Work was redefined to encompass three main areas: possible price stabilization actions (including analysis of past price data), a review and evaluation of proposed data collection processes, and the economic and physical utilization of bulk storage facilities.

APPENDIX B

Data Tables

Table 1

Consumer Price Index[1]

Year	1970 = 100	1976 = 100
1960	76.0	
1961	78.9	
1962	78.4	
1963	81.8	
1964	89.4	
1965	91.4	
1966	98.9	
1967	96.1	
1968	97.3	
1969	98.7	
1970	100.0	
1971	109.5	
1972	113.1	
1973	138.8	
1974	159.5	
1975	186.3	
1976	199.4	100.0
1977	214.2	107.4
1978	208.0	104.3
1979	228.1	114.4
1980	269.2	135.0
1981	291.3	146.1
1982	315.7	158.1
1983	336.3	168.4

[1]CPI for Port-au-Prince weights: food 68.5%, clothing 19.53%, housing 11.91%.

Source: Zuvekas
Département du Plan
World Bank

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Table 2

Rice Imports

Year	Tonnage Imported (MT)
1962	65.9
1963	31.0
1964	54.6
1965	30.0
1966	13.8
1967	16.8
1968	0.2
1969	9.0
1970	3.8
1971	47.9
1972	197.2
1973	2,515.4
1974	18.6
1975	1,106.0
1976	17,765.2
1977	741.6
1978	198.7
1979	115.8
1980	160.4
1981	898.3
1982	577.2
1983	7,500.0

Source: Delatour

Table 3

Corn Imports
(MT)

Year	Corn[1]	Corn[2]	All Corn Products[3]	All Corn Products[4]
1962			4,300	
1963			2,700	
1964			2,200	
1965			2,400	
1966			4,400	
1967			6,000	
1968			7,000	
1969			2,000	
1970				11
1971		826		12
1972	8	5,465	2,000	8
1973	58	673	3,000	53
1974	19	6,645	1,000	19
1975	3,971	3,581	5,000	3,971
1976	94	20,000	1,000	94
1977	433		16,000	19,650
1978	123			5,200
1979	196			15,000
1980	1,191			5,000
1981	464			10,000
1982	298			5,000
1983				

[1]Source: Kite and Pryor
[2]Source: Roe
[3]Source: USDA, Foreign Agricultural Circulars
[4]Source: FAO, Trade Yearbook

Table 4

Rice Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962	54	1,111	60
1963	55	1,164	64
1964	60	1,133	68
1965	65	1,108	72
1966	70	1,086	76
1967	70	1,100	77
1968	72	1,069	77
1969	75	1,107	83
1970	75	1,067	80
1971	75	1,080	81
1972	76	1,079	82
1973	76	1,079	82
1974	45	2,222	100
1975	48	2,292	110
1976	48	2,308	112
1977	40	2,260	90
1978	52	2,200	114
1979	54	2,261	122
1980	50	2,200	110
1981	50	1,900	95
1982	50	2,100	105
1983	50	1,900	95

Source: FAO, Production Yearbook

Table 5

Rice Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962	54	1,110	60
1963	55	1,160	64
1964	60	1,130	68
1965	65	1,110	72
1966	70	1,090	76
1967	70	1,100	77
1968	72	1,070	77
1969	75	1,110	83
1970	75	1,070	80
1971	75	1,070	80
1972	76	930	71
1973	76	1,050	80
1974	76	1,080	82
1975	76	1,080	82
1976	76	850	65
1977	76	1,110	85
1978	51	1,780	91
1979	51	1,870	95
1980	50	1,820	91
1981	50	1,900	95
1982	50	2,100	105
1983	50	1,900	95

Source: USDA

Table 6

Corn Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962	300	763	229
1963	300	767	230
1964	300	773	232
1965	300	780	234
1966	305	766	234
1967	320	769	246
1968	300	733	220
1969	305	793	242
1970	310	774	240
1971	320	788	252
1972	330	779	257
1973	330	788	260
1974	238	1,050	250
1975	238	1,050	250
1976	239	1,048	250
1977	210	800	168
1978	260	962	250
1979	234	784	183
1980	245	714	175
1981	200	925	185
1982	185	919	170
1983	200	900	180

Source: FAO, Production Yearbook

Table 7

Corn Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962	300	760	229
1963	300	770	230
1964	300	770	232
1965	300	780	234
1966	305	770	234
1967	320	770	246
1968	300	730	220
1969	305	790	242
1970	310	770	240
1971	320	790	252
1972	330	780	257
1973	320	780	250
1974	320	780	250
1975	320	780	250
1976	320	560	180
1977	320	780	250
1978	248	1,050	260
1979	250	980	245
1980	245	960	235
1981	250	1,180	295
1982	250	1,000	250
1983	250	1,000	250

Source: USDA

Table 8

Sorghum/Millet Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962	260	706	184
1963	260	708	184
1964	260	712	185
1965	270	693	187
1966	270	694	187
1967	270	696	188
1968	270	700	189
1969	280	746	209
1970	280	750	210
1971	280	754	211
1972	280	768	215
1973	280	771	216
1974	220	995	219
1975	220	1,000	220
1976	223	1,009	225
1977	152	730	111
1978	200	775	100
1979	157	787	123
1980	160	688	110
1981	163	675	110
1982	155	710	110
1983	155	742	115

Source: FAO, Production Yearbook

Table 9

Sorghum/Millet Production

Year	Area Harvested (1000 ha)	Yield (Kg/ha)	Production (1000 MT)
1962			
1963			
1964			
1965			
1966			
1967			
1968			
1969			
1970			
1971			
1972	216	670	144
1973	216	670	144
1974	216	670	144
1975	216	670	144
1976	216	670	144
1977	200	930	185
1978	210	900	189
1979	210	860	181
1980			
1981			
1982			
1983			

Source: USDA

Table 10

Agricultural Production
(1000 MT)

Year	Corn	Millet/ Sorghum	Rice	Beans
1977	168.3	110.8	90.3	46.5
1978	161.4	99.5	113.5	45.6
1979	183.3	123.3	122.1	51.9
1980	186.2	125.2	124.1	52.6
1981	179.2	120.8	119.7	50.8
1982	175.7	117.8	115.8	50.3
1983	170.9	106.6	113.4	46.7

Source: DARNDR estimates

Table 11

Planted Area by Department
(Hectares)

Department	Corn		Rice		Beans		Millet	
	1978	1979	1978	1979	1978	1979	1978	1979
West	62,791	32,312	2,224	2,296	48,231	38,825	57,780	31,978
North	18,058	19,387	3,853	4,275	15,485	19,448	1,995	1,341
Northeast	17,461	16,947	3,013	2,784	11,688	12,806	8,374	8,717
Northwest	13,848	14,617	713	535	16,993	17,027	6,931	6,753
South	29,974	36,094	4,521	4,963	23,678	25,775	21,193	31,948
Southeast	19,568	20,706	1,497	862	14,836	17,218	9,356	9,924
Grande-Anse	30,231	33,865	1,736	2,483	18,805	22,748	6,595	6,103
Central	24,879	27,515	2,621	3,355	14,854	17,553	25,047	28,812
Artibonite	31,563	32,306	31,436	32,450	24,843	25,832	30,585	31,122
Haiti	248,373	233,749	51,614	54,003	189,413	197,232	165,856	156,698

Source: DARNDR estimates

Table 12

Agricultural Production, 1978

	Corn	Paddy Rice	Beans	Sorghum
Transversal				
Area (ha)	74,438	29,680	21,554	66,687
Yield (MT/ha)	0.82	4.00	0.60	0.84
Production (MT)	61,039	118,720	12,932	56,017
South				
Area (ha)	69,953	5,920	23,536	38,051
Yield (MT/ha)	0.66	1.50	0.47	0.62
Production (MT)	45,272	8,880	11,190	23,524
West				
Area (ha)	53,018	4,680	28,460	41,902
Yield (MT/ha)	0.99	1.40	0.59	0.96
Production (MT)	52,488	6,552	16,791	40,226
North				
Area (ha)	36,334	42,800	16,128	10,055
Yield (MT/ha)	0.67	1.80	0.72	0.33
Production (MT)	24,344	77,040	11,612	3,318
Country				
Area (ha)	233,743	83,080	89,678	156,195
Yield (MT/ha)	0.78	2.54	0.59	0.79
Production (MT)	183,143	211,192	52,524	123,085

Source: Ministry of Plan

Table 13

Market Price Correlations for Corn[1]
Port-au-Prince and Other Urban Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Cap-Haïtien	1968-74	0.67
Cayes	1968-74	0.69
Gonaïves	1968-74	0.72
Hinche	1970-74	0.69
Jacmel	1968-74	0.57
Jacmel	1969-74	0.32[2]
Jérémie	1968.74	0.48
Port-de-Paix	1969-74	0.57
St Marc	1968-74	0.79
IHSI Data		
Cap-Haïtien	1968-76	0.77
Cayes	1968-76	0.79
Gonaïves	1968-76	0.70
Jacmel	1968-76	0.58
Jérémie	1968-76	0.71
Port-de-Paix	1968-76	0.64
St Marc	1968-76	0.86
DARNDR Data		
Cap-Haïtien	1978-81	0.81
Cayes	1978-81	0.93
Gonaïves	1978-81	0.77
Hinche	1978-81	0.97
Jacmel	1978-81	0.85
Jérémie	1978-81	0.69
Port-de-Paix	1978-81	0.49
St Marc	1978-81	0.89

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 14

Market Price Correlations for Superior Rice[1]
Port-au-Prince and Other Urban Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Cap Haïtien	1968-74	0.75
Cayes	1968-74	0.79
Gonaïves	1968-74	0.77
Jacmel	1968-74	0.56
Jacmel	1969-74	0.68
Jérémie	1968-74	0.56
Port-de-Paix	1969-74	0.45
St Marc	1968-74	0.63
IHSI Data		
Cap Haïtien	1968-76	0.62
Cayes	1968-76	0.68
Gonaïves	1968-76	0.84
Jacmel	1968-76	0.77
Jérémie	1968-76	0.79
Port-de-Paix	1968-76	0.83
St Marc	1968-76	0.80
DARNDR Data		
Cap Haïtien	1978-81	0.85
Cayes	1978-81	0.85
Gonaïves	1978-81	0.79
Jacmel	1978-81	0.78
Port-de-Paix	1978-81	0.74
St Marc	1978-81	0.93

[1]Price data source: Borsdorf and Foster.

Table 15

Market Price Correlations for Red Beans[1]
Port-au-Prince and Other Urban Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Cap Haïtien	1968-74	0.80
Cayes	1968-74	0.80
Gonaïves	1968-74	0.82
Hinche	1970-74	0.65
Jacmel	1968-74	0.59
Jacmel	1969-74	0.57
Jérémie	1968-74	0.77
Port-de-Paix	1969-74	0.63
St Marc	1968-74	0.83
IHSI Data		
Cap Haïtien	1968-76	0.86
Cayes	1968-76	0.82
Gonaïves	1968-76	0.72
Jacmel	1968-76	0.66
Jérémie	1968-76	0.81
Port-de-Paix	1968-76	0.68
St Marc	1968-76	0.80
DARNDR Data		
Cap Haïtien	1977-81	0.80
Cayes	1978-81	0.60
Gonaïves	1977-81	0.77
Hinche	1978-81	0.65
Jacmel	1977-81	0.56
Jérémie	1977-81	0.49
Port-de-Paix	1977-81	0.04[2]
St Marc	1977-81	0.86

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 16

Market Price Correlations for Millet/Sorghum[1]
Port-au-Prince and Other Urban Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Cap Haïtien	1968-74	0.65
Cayes	1968-74	0.46
Gonaïves	1968-74	0.45
Hinche	1970-74	0.62
Jacmel	1968-74	0.70
Jacmel	1969-74	0.68
Jérémie	1968-74	0.20[2]
St Marc	1968-74	0.41
IHSI Data		
Cap Haïtien	1968-76	0.64
Cayes	1968-76	0.79
Gonaïves	1968-76	0.80
Jacmel	1968-76	0.52
Jérémie	1968-76	0.52
Port-de-Paix	1968-76	0.73
St Marc	1968-76	0.54

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 17

Market Price Correlations for Corn[1]
Port-au-Prince and Regional Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Chantal	1968-74	0.53
Ducis	1968-74	0.58
Croix des Bouquets	1968-74	0.81
Fond des Nègres	1969-74	0.76
Miragoâne	1969-73	0.51
Pont de l'Estère	1968-70	0.41
Pont Sondé	1972-74	0.69
IHSI Data		
Croix des Bouquets	1968-76	0.86
DARNDR Data		
Chansolme	1978-81	0.63
Chantal	1978-79	0.17[2]
Croix des Bouquets	1978-81	0.79
Fond des Nègres	1978-81	0.82
Léon	1978-81	0.74
Limbé	1978-81	0.49
Pont de l'Estère	1978-81	0.87
Pont Sondé	1978-81	0.80
Thiotte	1978-81	0.85

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 18

Market Price Correlations for Superior Rice[1]
Port-au-Prince and Regional Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Croix des Bouquets	1968-74	0.89
Miragoâne	1969-73	0.22[2]
Pont de l'Estère	1968-70	0.81
Pont Sondé	1972-74	0.17[2]
IHSI Data		
Croix des Bouquets	1968-76	0.89
DARNDR Data		
Pont de l'Estère	1978-81	0.80
Pont Sondé	1978-81	0.41

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 19

Market Price Correlations for Red Beans[1]
Port-au-Prince and Regional Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Chantal	1968-74	0.66
Ducis	1968-74	0.70
Croix des Bouquets	1968-74	0.88
Fond des Nègres	1969-74	0.75
Miragoâne	1969-73	0.62
Pont de l'Estère	1968-70	0.72
Pont Sondé	1972-74	0.29[2]
IHSI Data		
Croix des Bouquets	1968-76	0.89
DARNDR Data		
Chansolme	1978-81	0.53
Chantal	1978-79	0.18[2]
Croix des Bouquets	1978-81	0.69
Fond des Nègres	1978-81	0.32[2]
Léon	1978-81	0.59
Limbé	1978-81	0.78
Pont de l'Estère	1978-81	0.71
Pont Sondé	1978-81	0.60
Thiotte	1978-81	0.72

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 20

Market Price Correlations for Millet/Sorghum[1]
Port-au-Prince and Regional Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Chantal	1968-74	0.68
Ducis	1968-74	0.60
Croix des Bouquets	1968-74	0.62
Fond des Nègres	1969-74	0.65
Miragoâne	1969-73	0.78
Pont de l'Estère	1968-70	0.75
Pont Sondé	1972-74	0.64
IHSI Data		
Croix des Bouquets	1968-76	0.64

[1]Price data source: Borsdorf and Foster.

Table 21

Market Price Correlations for Corn[1]
Port-au-Prince and Semi-rural Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Camp Perrin	1968-74	0.61
Cerca Carvajal	1973-74	0.33[2]
Croix Fer	1972-74	0.59
Désarmes	1972-74	0.80
IHSI Data		
Petit Goâve	1968-76	0.80
DARNDR Data		
Camp Coq	1978-81	0.63
Cerca Carvajal	1978-81	0.79
Croix Fer	1978-81	0.84
Darbonne	1978-81	0.73
Désarmes	1978-81	0.77
Forêt des Pins	1978-79	0.86
Gaillard	1978-81	0.16[2]
Marfranc	1978-81	0.61

[1]Price data source: Borsdorf and Foster.
[2]Not significant at 5% level.

Table 22

Market Price Correlations for Red Beans[1]
Port-au-Prince and Semi-rural Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Camp Perrin	1968-74	0.80
Désarmes	1972-74	0.62
IHSI Data		
Petit Goâve	1968-76	0.89
DARNDR Data		
Camp Coq	1978-81	0.64
Cerca Carvajal	1978-81	0.58
Croix Fer	1978-81	0.45
Darbonne	1978-81	0.64
Désarmes	1978-81	0.52
Forêt des Pins	1978-79	0.55
Marfranc	1978-81	0.59

[1]Price data source: Borsdorf and Foster.

Table 23

Market Price Correlations for Millet/Sorghum[1]
Port-au-Prince and Semi-rural Markets

Market	Time Series	Correlation (R^2)
La Gra Data		
Camp Perrin	1968-74	0.53
Cerca Carvajal	1973-74	0.45
Croix Fer	1972-74	0.54
Désarmes	1972-74	0.85
IHSI Data		
Petit Goâve	1968-76	0.74

[1]Price data source: Borsdorf and Foster.

Table 24

Market Price Correlations between Corn and Millet/Sorghum[1]
Port-au-Prince

Data Series		Correlation (R^2)
La Gra	1968-74	0.88
IHSI	1968-76	0.88
DARNDR	1978-81	0.58

[1]Price data source: Borsdorf and Foster.

Table 25

Proxy Price Series
Average Monthly Prices
Port-au-Prince

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1968					
Jan	1.00	1.40	3.00	4.20	3.50
Feb	0.92	1.25	3.18	3.50	3.50
Mar	0.90	1.25	3.30	3.65	3.50
Apr	0.90	1.26	3.33	4.55	3.50
May	1.52	0.60	3.79	5.25	4.28
Jun	1.85	2.00	5.50	4.40	4.50
Jul	1.72	1.82	4.31	4.20	4.31
Aug	1.50	1.78	3.66	4.20	4.00
Sep	1.30	1.72	3.43	4.65	4.18
Oct	1.05	1.60	3.25	4.90	4.25
Nov	0.89	1.50	2.94	5.50	3.50
Dec	0.88	1.50	3.00	5.00	3.56
1969					
Jan	0.96	1.60	3.25	4.30	3.68
Feb	1.06	1.60	3.33	4.09	3.50
Mar	1.10	1.60	3.25	4.09	3.50
Apr	0.90	1.40	3.75	4.09	3.50
May	0.90	1.40	3.75	4.09	3.50
Jun	0.90	1.40	3.38	4.09	3.50
Jul	0.90	1.40	3.00	4.50	3.50
Aug	0.87	1.40	2.94	4.25	3.41
Sep	0.79	1.22	3.50	4.10	3.42
Oct	0.80	1.35	3.75	3.55	3.75
Nov	0.90	1.25	3.12	3.90	3.68
Dec	0.81	1.60	3.37	4.25	3.25
1970					
Jan	0.73	1.55	3.62	4.00	3.25
Feb	0.87	1.50	3.31	4.31	3.50
Mar	0.90	1.45	3.25	4.31	3.50
Apr	0.95	1.30	3.37	5.00	3.75
May	1.10	1.40	3.68	5.00	4.06
Jun	1.17	1.50	4.81	5.00	4.37
Jul	1.05	1.50	3.43	5.07	4.12
Aug	1.00	1.50	3.25	4.93	4.00
Sep	1.10	1.50	3.25	5.00	4.37
Oct	1.25	1.50	3.20	6.31	5.12
Nov	0.95	1.40	3.00	5.69	4.62
Dec	0.90	1.40	3.00	4.93	4.00

Table 25 (cont.)

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1971					
Jan	0.90	1.40	3.15	4.29	5.50
Feb	0.90	1.40	3.00	5.00	5.50
Mar	0.95	1.45	3.20	4.48	5.70
Apr	1.15	1.60	4.50	5.47	6.15
May	1.15	1.55	4.05	5.25	5.90
Jun	1.25	1.50	3.65	4.89	5.50
Jul	1.15	1.50	3.60	4.87	5.80
Aug	1.20	1.65	3.65	4.97	5.90
Sep	1.15	1.60	4.05	5.98	5.80
Oct	1.15	1.60	4.50	5.00	5.62
Nov	1.12	1.55	4.37	4.05	4.87
Dec	1.06	1.56	3.90	4.75	4.10
1972					
Jan	1.00	1.40	4.00	5.77	5.25
Feb	0.90	1.25	4.00	5.63	5.12
Mar	1.02	1.30	4.25	5.77	5.25
Apr	1.25	1.50	4.06	5.25	5.50
May	1.25	1.50	4.00	5.51	5.50
Jun	1.42	1.55	4.25	5.50	5.37
Jul	1.25	1.50	3.56	5.35	4.30
Aug	1.30	1.50	4.05	5.50	4.25
Sep	1.52	1.70	5.25	5.50	4.75
Oct	1.60	1.70	5.50	6.04	5.50
Nov	1.50	1.70	4.41	6.04	5.50
Dec	1.70	1.80	4.12	6.73	6.12
1973					
Jan	2.00	1.95	5.12	5.60	7.00
Feb	2.25	2.06	5.31	5.70	6.62
Mar	2.53	2.35	5.56	5.90	7.31
Apr	2.87	2.62	5.50	6.30	9.56
May	2.73	2.56	4.68	6.59	9.25
Jun	3.12	2.72	6.50	7.51	9.25
Jul	3.25	2.75	6.75	7.29	9.00
Aug	3.25	2.75	5.81	7.29	9.00
Sep	3.00	2.58	6.25	7.03	8.68
Oct	2.40	2.25	5.87	6.42	8.37
Nov	2.16	2.32	4.94	6.50	6.81
Dec	2.17	2.32	4.81	6.50	6.25

Table 25 (cont.)

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1974					
Jan	2.37	2.48	5.75	6.09	6.50
Feb	2.45	2.53	6.31	6.45	6.88
Mar	2.64	2.60	6.69	6.91	7.38
Apr	2.75	2.70	6.81	7.00	7.50
May	2.64	2.50	7.00	7.12	7.50
Jun	2.58	2.50	6.63	7.33	7.63
Jul	2.50	2.45	5.70	7.50	7.63
Aug	2.58	2.50	5.40	7.31	8.00
Sep	2.18	2.43	5.40	7.55	7.88
Oct	2.40	2.50	6.45	7.70	8.40
Nov	2.29	2.43	6.50	7.41	8.50
Dec	2.48	2.50	6.13	7.87	8.25
1975					
Jan	2.25	2.96	5.36	7.88	7.00
Feb	2.60	2.73	5.50	7.88	8.00
Mar	3.00	3.15	7.50	9.15	8.00
Apr	3.76	3.50	8.33	10.27	11.75
May	4.56	4.56	10.59	12.28	12.87
Jun	5.20	3.39	11.00	10.34	12.62
Jul	4.41	4.90	7.65	9.56	11.67
Aug	4.41	4.53	6.46	11.12	13.57
Sep	3.80	4.84	6.32	11.96	14.60
Oct	2.88	4.24	6.17	11.12	13.57
Nov	2.38	4.51	6.50	10.50	12.81
Dec	2.46	4.20	7.40	11.54	11.81
1976					
Jan	2.92	3.85	8.45	11.60	9.75
Feb	2.58	4.36	9.66	12.15	11.50
Mar	2.81	4.15	9.75	11.70	11.62
Apr	2.80	4.10	9.50	11.20	10.00
May	2.80	3.00	9.03	10.50	10.50
Jun	2.87	2.95	6.85	8.80	10.25
Jul	2.20	2.75	6.20	7.60	8.07
Aug	2.31	2.56	5.65	10.90	7.62
Sep	2.33	2.75	5.80	10.65	8.10
Oct	2.50	3.15	6.30	8.70	9.00
Nov	2.65	3.85	7.20	9.75	9.75
Dec	3.30	4.15	6.10	9.60	9.75

Table 25 (cont.)

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1977					
Jan	3.23	3.70	8.70	11.45	11.88
Feb	3.05	3.60	8.55	11.35	11.78
Mar	3.20	3.95	8.95	11.05	11.47
Apr	3.94	4.80	11.36	11.25	11.69
May	4.01	4.95	14.40	11.50	11.94
Jun	3.94	4.75	9.90	8.00	8.30
Jul	3.94	4.75	6.05	10.05	10.43
Aug	3.94	4.75	5.95	10.00	10.38
Sep	3.23	4.15	6.50	10.00	10.38
Oct	3.16	3.56	6.55	10.00	10.38
Nov	2.75	3.30	6.30	9.05	9.39
Dec	2.75	3.15	5.95	8.10	8.41
1978					
Jan	2.49	3.70	7.15	8.50	9.18
Feb	2.49	2.90	8.35	8.60	9.16
Mar	2.57	3.05	8.05	8.75	9.38
Apr	2.49	3.15	8.05	9.20	9.54
May	2.53	2.90	8.40	9.10	8.98
Jun	2.53	3.50	7.60	8.25	8.78
Jul	2.31	3.45	7.45	9.85	10.33
Aug	2.01	3.05	7.55	10.05	10.42
Sep	2.02	3.20	7.95	11.45	11.33
Oct	2.15	3.25	7.60	10.00	11.30
Nov	1.90	3.50	8.55	9.65	9.55
Dec	1.95	3.60	7.75	10.00	9.75
1979					
Jan	2.05	3.35	7.40	9.95	9.72
Feb	2.45	3.40	8.55	10.00	10.20
Mar	2.65	3.60	9.80	11.10	11.60
Apr	3.15	3.95	11.55	12.65	13.25
May	3.30	4.55	10.15	12.25	12.80
Jun	4.40	4.85	9.30	12.00	11.60
Jul	3.05	5.20	8.00	12.45	12.70
Aug	2.75	5.20	8.20	12.85	12.80
Sep	2.80	5.40	8.75	13.40	13.00
Oct	2.50	4.46	10.84	11.46	11.35
Nov	2.60	4.68	11.56	12.52	12.40
Dec	2.40	3.77	10.75	13.33	13.20

Table 25 (cont.)

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1980					
Jan	3.45	5.50	12.60	13.80	14.50
Feb	3.75	5.50	12.45	13.90	14.25
Mar	3.70	5.25	12.25	15.56	15.10
Apr	4.00	5.50	12.50	14.25	14.40
May	4.10	5.40	12.50	12.36	12.30
Jun	4.60	5.55	13.50	12.85	12.05
Jul	4.41	5.50	12.15	13.25	13.25
Aug	4.55	5.85	12.15	13.00	12.98
Sep	4.35	5.85	12.15	14.10	12.84
Oct	3.55	6.10	12.65	14.40	12.70
Nov	4.15	6.15	12.05	14.20	13.25
Dec	4.50	6.25	12.50	14.60	14.15
1981					
Jan	4.80	6.19	12.05	17.21	16.80
Feb	5.50	6.23	12.27	17.97	18.25
Mar	6.00	6.68	12.57	21.64	22.15
Apr	6.10	5.15	9.05	17.40	20.95
May	5.70	5.15	8.50	17.10	16.75
Jun	5.00	5.20	8.00	14.20	16.50
Jul	4.60	5.60	8.70	14.50	17.50
Aug	3.35	5.40	8.45	14.55	17.25
Sep	3.00	5.35	8.95	14.35	16.25
Oct	4.03	5.00	9.25	12.45	16.00
Nov	3.23	4.75	10.60	13.05	16.70
Dec	3.30	4.80	10.15	12.75	16.55
1982					
Jan	3.82	3.96	9.26	11.81	13.82
Feb	3.99	3.78	9.09	11.75	13.75
Mar	3.90	3.48	8.91	12.44	14.55
Apr	3.86	3.12	9.14	12.81	14.99
May	3.90	3.30	9.66	13.00	15.21
Jun	4.11	3.54	10.18	12.75	14.92
Jul	4.11	3.66	9.03	12.25	14.33
Aug	4.11	3.66	8.91	12.38	14.48
Sep	4.24	3.30	8.80	12.31	14.96
Oct	4.07	4.08	8.86	12.25	15.44
Nov	3.94	3.48	8.74	12.38	15.92
Dec	3.74	3.48	8.91	12.63	16.40

Table 25 (cont.)

Gourdes per Marmite

Year/ Month	Whole Corn	Millet	Red Beans	All Rice	Superior Rice
1983					
Jan	4.86	3.48	9.09	12.81	16.63
Feb	5.08	3.54	9.14	12.94	16.27
Mar	5.08	3.66	10.18	13.50	17.42
Apr	5.41	3.90	11.50	14.31	19.00
May	5.83	3.90	11.96	14.88	18.63
Jun	5.75	3.84	10.70	15.06	16.50
Jul	5.87	4.98	9.55	14.25	16.53
Aug	5.11	3.72	10.18	14.88	17.27
Sep	5.18	4.68	10.64	15.31	17.59
Oct	5.79	5.40	11.50	15.63	15.82
Nov	5.67	4.20	11.85	15.31	15.92
Dec	5.33	4.14	11.21	15.19	15.19
1984					
Jan	5.33	4.14	12.08	14.94	16.04
Feb	5.20	4.26	12.19	14.94	16.99
Mar	5.37	4.32	12.13	15.00	17.12
Apr	5.54	4.50	11.79	14.44	15.64
May	5.58	4.80	11.85	14.69	16.29
Jun	5.45	5.10	11.85	14.75	16.36
Jul	5.03	5.10	11.33	14.75	16.36
Aug	5.03	5.34	11.33	14.75	16.36
Sep	5.45	5.34	12.19	14.88	16.50
Oct	5.50	5.34	12.13	15.31	16.98
Nov	5.25	5.40	12.09	15.13	16.78
Dec	5.25	5.34	12.13	15.19	16.85

Source: Borsdorf and Foster

APPENDIX C

Description of DARNDR Bulk Storage Facility at Bon Repos

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Located 11 km from Port-au-Prince, Bon Repos is the site of a bulk grain storage facility constructed by the GOH in an attempt to become involved in grain marketing activities. Equipment for the plant was ordered from the US in 1977. Haytian Tractor and Equipment Company, S.A. of Port-au-Prince was hired as a procurement agent for the silo equipment, and construction was contracted to a local firm. However, construction was halted in 1978 before completion of the operation and the grain drying and storage facility has remained unfinished to this day. The study team was unable to locate the documentation which described how this facility would fit into the grain marketing system in Haiti, nor could any explanation be found as to the reason for the discontinuation of construction on the facility.

The facility calls for five semi-circular modules, each consisting of four storage bins and one combination drying-storage bin. The schematic layout of the silo modules is shown in Figure 1. All bins have flat bottoms and are of the following dimensions: 28 ft diameter, 16 ft eave height, 30° roof pitch, and perforated floor 14 in above bin bottom. Even though GOH documents show the capacity of each bin to be 240 MT, a more realistic storage capacity based on U.S.Grade 1 corn is 200 MT (see nominal grain storage capacity calculation, page 99). The estimated total storage capacity of the Bon Repos facility is 5,000 MT for shelled corn or sorghum, or 4,100 MT for rough rice.

Each bin is equipped with an unloading auger and a sweep auger. In addition to the main unloading sump at the center of the bin floor, there are three other unloading sumps which allow grain to be taken out uniformly from radial locations. Each bin is also equipped with a suction-type aeration system consisting of a 12-in diameter axial flow fan driven by a 3/4 HP motor.

The drying equipment consists of a Sukup Heatway fuel oil burner (No. 1 or No. 2 fuel oil or kerosene). The heat output of the burner could be varied from an estimated 410,000 Btu/hr to 1,040,000 Btu/hr by varying the size of the two nozzles on each burner. The drying air is supplied by a Sukup Speedway centrifugal fan. The drying unit is provided with a heat exchanger to prevent flue gases from passing through the grain. The burner has a sail switch which turns it off if the fan stops.

To dry grain uniformly, each drying bin is equipped with a 4-auger Sukup Stirway II stirring system. To spread the fine materials and grain uniformly in the drying bin so as to facilitate uniform drying, each drying bin is also equipped with a Sukup Spreadway grain spreader.

Each module is equipped with a rotating cylindrical grain scalper (cleaner) and a portable transport auger mounted on wheels so as to transfer the grain from the ground level into the top of a bin. The dry grain can be transferred to any of the storage bins by using either the transport auger or the vertical auger installed beside the drying bin wall and a roof auger.

An evaluation of the existing status of the plant is detailed as follows:

Site

The land has not been leveled and graded, and it lacks proper drainage. The grain receiving and cleaning area has not been paved.

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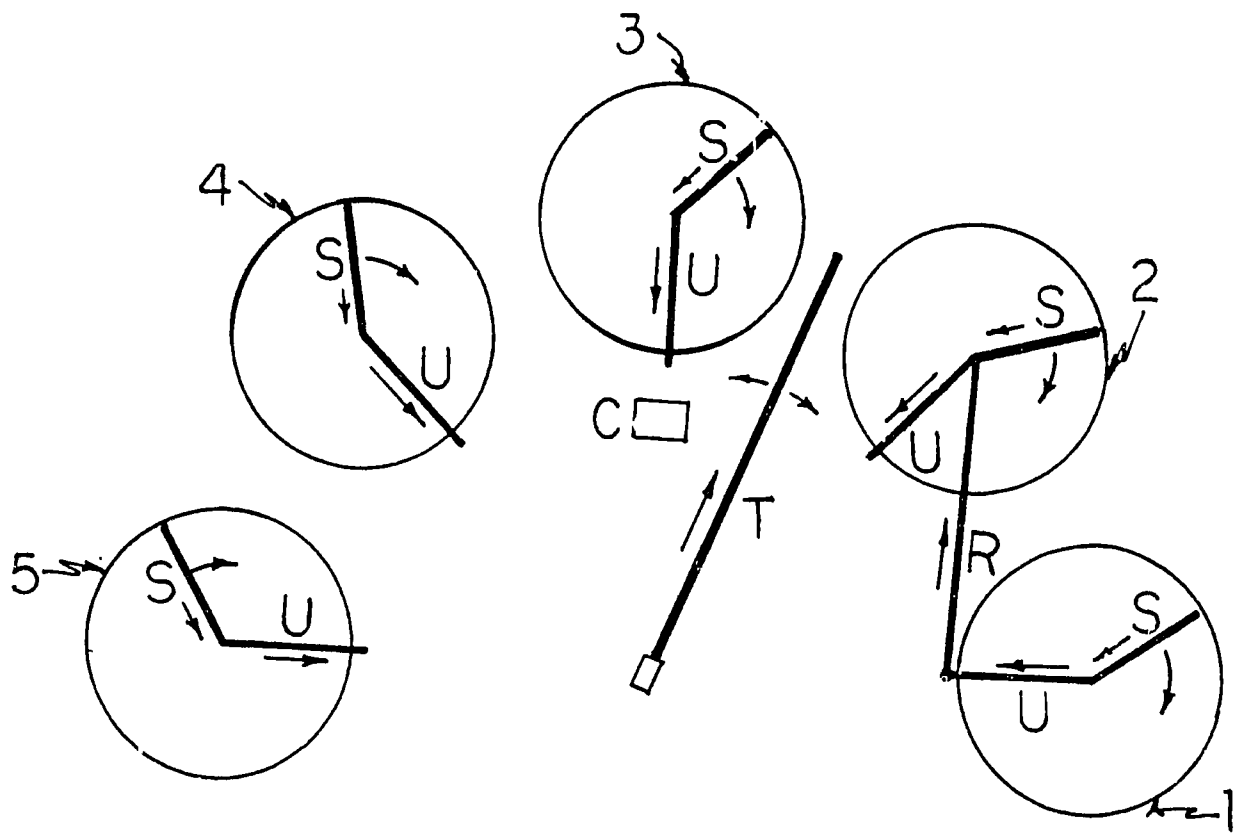

1- COMBINATION DRYING-STORAGE BIN

2, 3, 4, 5 - STORAGE BINS

C- CLEANER R- ROOF AUGER

S-SWEEP AUGER T- TRANSPORT AUGER

U-UNLOADING AUGER

FIG. 1 LAYOUT OF BON REPOS SILO MODULE AND MAJOR EQUIPMENT

Bin Foundation

The foundation plinth level is low (only about 6 in above the ground level). In general, the foundation appears to be adequate. However, the real strength of the foundation will not be tested until the bin has been loaded with grain.

Bins

The anchoring of the bins by using a hold-down flat plate seems erratic. The use of a flat plate to press the bin down onto the foundation is not a good method of anchoring. Some anchor bolts protruded above the nuts more than others. This means that either bolts of different lengths were used, or all anchor bolts were not uniformly embedded in the concrete. The sealing between the bottom tier and the foundation seems adequate. The bin walls and the roof appear to be reasonably well-erected. However, the bolts on the side wall sheets seemed to be over-tightened, with resulting damage to the neoprene washers in many places. Mastic seals were properly used in joints. There were no obvious water leakage problems in the few bins inspected, however the inspection was done on a dry day. The galvanization of wall and roofing material in general has not weathered. The material is bright and shiny. On a few bin walls there are some rusty areas.

The perforated floor seemed somewhat lacking in strength. It was not possible to determine whether proper and sufficient number of steel floor supports were used or not. In general, the floor seems adequate. The sweep augers and the unloading sumps and augers have been installed, however the mechanism to open and close the sump gates does not work.

The walk-in door and the door steps were installed at the proper height, but some doors were inconveniently and arbitrarily located. The doors close well. The oblong manhole covers on the bin roofs are badly corroded. The mechanism to open and close the manhole covers from the ground works satisfactorily. The roof safety ring appears to be properly installed. The bird stops at the junction of the roof sheet rib and the bin wall are in the proper places. The ladders are not located at convenient places.

Augers

The unloading auger and tube assembly in a few bins was located underneath the walk-in door which is an inconvenient and unaesthetic location. The motor drive on the vertical auger for the drying bin is located below the ground level. This undesirable location could have been avoided by using a higher floor level for the foundation. Proper transport augers have been used. The screw flightings are rusty, however.

Scalper Cleaners

The cleaners are in reasonably good condition.

Motors and Drives

All motors and drives, especially the outdoor ones, are badly corroded. A few motor mounts do not have motors on them.

Bearings and Shafts

All bearings and shafts are heavily corroded, especially the outdoor ones belonging to augers, cleaners, fans, and burners.

Power Cables

The existing location of the power cable in front of the working area may be inconvenient and hazardous, especially for the trucking operation. The installation of the main power cables and power lines to each motor and control unit is incomplete.

Power Transformers

Three pole-mounted transformers have been installed for single (115 V, 60 Hz) and three-phase (208/230 V, 60 Hz) power, but their condition is unknown.

Motor Controllers

Many motor controllers have not been installed.

Fuel Oil Tank and Piping

The fuel oil tank and the necessary pipings have not been installed.

Other Observations

It is not known what provisions were originally planned for weighing the grain since there is no truck scale. Therefore, it may be assumed that both incoming and outgoing grain was supposed to be in bags. However, the plan does not seem to include provisions for a bagging operation, and platform scales were not found. A bagging operation in the plant will be slow and difficult.

Security of the grain being stored in the bin is of utmost importance. Consideration against grain pilferage seems somewhat lacking.

There is a lack of adequate truck access to each module.

There were many unassembled parts of bins and equipment such as side wall and roof sheets, perforated floors, sumps, auger parts, motors and controls, pulleys, belts, bolts and nuts at the Bon Repos plant. These can not be erection spares because manufacturing companies provide erection spares only on small items such as bolts, nuts, washers, seals, and caulking agents. The type and quantity of the unassembled parts remaining at this plant suggest that additional bins were to be erected either in this location or elsewhere.

Nominal Grain Storage Capacity Calculation[1]

Bin diameter, $D = 28$ ft
Eave height from the bin bottom, $H_1 = 16$ ft
Perforated floor level from the bin bottom, $X_1 = 14$ in
Roof pitch, $\theta = 30^o$
Angle of repose, α, varies from grain to grain and with moisture. Let $\alpha = 35^o$
Opening size on the bin top, $k = 2$ ft

$$L_1 = (D/2 - k/2) \cdot \tan\theta$$
$$= (14 - 1)(\tan 30) = 7.51 \text{ ft}$$
$$H_3 = H_1 + L_1 = 16 + 7.51 = 23.51 \text{ ft}$$

Since the roof pitch is somewhat lower than the angle of repose, the bin can not be filled to the eave height (point E). The maximum grain level is point A.

$$L_2 = D/2 \cdot \tan\alpha = 14 \cdot \tan 35^o = 9.80 \text{ ft}$$
$$H_2 = H_3 - L_2 = 23.51 - 9.80 = 13.71 \text{ ft}$$
$$H = H_2 - X$$
$$= 13.71 - 1.17$$
$$= 12.54 \text{ ft}$$

Considering the conical portion of the stored product, the effective cylinder height, h, of the storage $= H + 1/3 \cdot L_2$

$$h = 12.54 + (1/3)(9.80)$$
$$h = 15.81 \text{ ft}$$

The volume of the stored product

$$= (\pi/4)(D^2).(h)$$
$$= (\pi/4)(28)^2(15.81)$$
$$= 9735 \text{ ft}^3 = 7788 \text{ bu}$$

On the basis of U.S. Grade 1 yellow dent corn (56 lb/bu), the storage capacity of the bin $= \frac{7{,}788 \times 56}{2{,}204} = 198$ MT

Considering some grain compaction, the nominal storage capacity of a bin may be taken as 200 MT of corn. The test weight for sorghum is about the same as corn, thus the storage capacity estimate for sorghum is 200 MT. For rough rice, the capacity will be reduced by a factor equivalent to the ratio of the test weight of rough rice to the test weight of corn. This will give a storage capacity for rough rice of about 164 MT.

The total storage capacity of the facility is 5,000 MT of yellow dent shelled corn or sorghum, or 4,100 MT of rough rice.

[1]See Figure 2 for dimensions and notations.

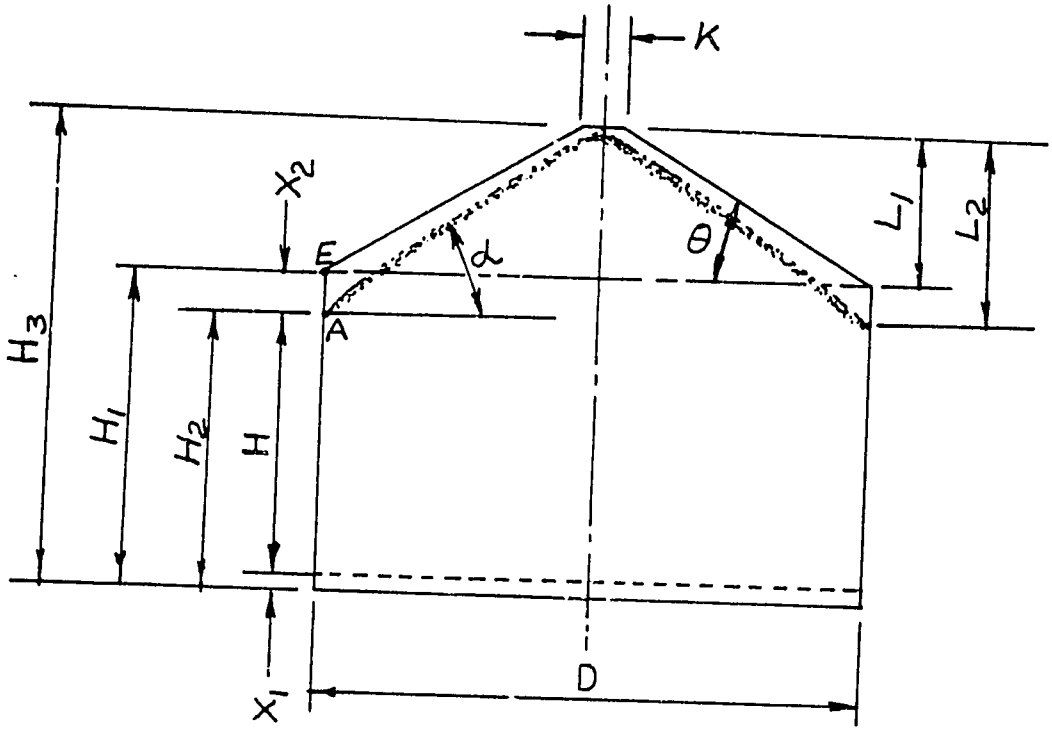

FIG.2 BIN DIMENSIONS AND NOTATIONS

APPENDIX D

Rehabilitation of DARNDR Bulk Storage Facility at Bon Repos

Because of the discontinuation of construction on the grain storage and drying facility at Bon Repos before the project was completed, the facility has never been used. However, due to the fact that it has stood unused and partially completed from 1978 to the present, deterioration of the structures and equipment has occurred. If the GOH desires to bring this facility up to operational status, considerable rehabilitation of the facility will be necessary. The following specific actions should be undertaken in order to accomplish this task.

A complete inventory should be taken of all equipment and parts to find out what is available on-site and in good condition, and what will have to be imported from the U.S. It may be possible to repair some of the corroded equipment, while other items will need to be replaced. Mechanical and electrical parts and equipment should be cleaned and relubricated after repair or replacement. Any usable parts and equipment that have been salvaged should be painted if they show signs of weathering.

The power lines should be re-routed to the back side of the silo modules. Underground lines are not advisable, therefore overhead lines should be used. Both single and three-phase power should be obtained by the use of appropriate step-down transformers. All power lines must be properly supported.

All motors, magnetic motor controllers, circuit breakers, and switches must be supplied with an appropriate power source. Security lights should be installed at the site. Electricity to operate construction tools and equipment during the rehabilitation work must also be made available prior to the beginning of such work. The wire size and specifications, voltage drop considerations, all supports, all electrical equipment, and safety devices must conform to the U.S. National Electric Code (NEC) 1984, published by the National Fire Protection Association. All outdoor equipment as defined by the NEC 1984 must be approved for outdoor use. All specifications must also comply with any local electrical codes. The contractor must prepare necessary wiring drawings.

The installation of a truck scale is not advised, since transportation, storage, and handling are not geared to a bulk system. Incoming grain will be mostly in bags, and outgoing grain will need to be rebagged, therefore operation and maintenance of a truck scale will be difficult. The use of platform scales and the sewing of bags by hand are the procedures recommended for this facility.

Once the facilities are operational, 200 MT of wet grain should be available at a rate of 50 MT per day, in order to test the capacities of the dryer, storage bins, and augers.

Qualifications of the Contractor

The contractor should be a company or person(s) from the U.S. with ten years of experience in electrical and mechanical erection and operation of the type of grain drying and storage equipment used at this facility. The contractor should have a good financial standing. The qualifications of the contractor should be evaluated by a qualified consulting engineer. Getting a capable U.S. company interested in a small foreign project like this will involve a substantial amount of money. However, the success of the project depends on obtaining a capable U.S. company as contractor.

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Consulting Engineer

The consulting engineer will provide periodic short-term technical assistance to ensure the appropriateness, compliance of contractual obligations, and progress of the contractor's work. The consulting engineer must have broad experience in the design, construction, and supervision of similar grain storage projects. It is estimated that two TDY trips to Haiti will be required. The first trip, of a one-week duration, should coincide with the contractor's commencement of work on the construction site. The second trip, to last three weeks, should start immediately prior to the end of the construction and continue through the end of the test run.

Cost of Rehabilitation

The exact cost of rehabilitation can not be estimated without a complete itemized survey of all storage units and equipment. However, a preliminary estimate for rehabilitation is $500,000 to $700,000.

APPENDIX E

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