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GRAIN MARKETING AND MARKET SYSTEM DEVELOPMENT IN HAITI

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REPORT SUMMARY

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SUMMARY STATEMENT

Expanded commercialization of grain in Haiti is anticipated in the near future because of potential increase in demand in urban areas; growing population, and potential for increased production.

Grain Storage currently is limited to farm storage under conditions that will permit a maximum storage period of 3 to 4 months. Grain is handled in small lots throughout the marketing system. Marketing women (madam saras) are the principal marketing intermediaries, traveling from place to place by public conveyance. Labor input in marketing is high, however, because of low wage rates, marketing costs are not high. Grain losses in the marketing channels are not large beacuse of individual attention given to small lots of grain and the virtual absense of long-term storage. Farm storage losses are unknown. Observed incidence of damaged grain in market places was not high.

Seasonal price fluctuations are large because of seasonal varitations in market supply. Price data indicate seasonal low prices for corn and rice in December or January with peak prices in May or June and a secondary peak for rice in October.

In this report we recommend: (1) improved facilities for storage in rural areas for interseasonal stabilization of market supply; (2) improvement in central market facilities to provide increase in sacked grain storage and improved sanitation; (3) studies of market organization and performance to enable understanding of the strengths of the present system and to locate key areas of potential improvement and (4) a training program in concepts and techniques of marketing and management for Haitians who will be involved in development of an improved grain marketing system.

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We acknowledge with gratitude the generous help of the many persons and agencies contacted for information on markets and marketing during our two weeks stay in Haiti.

Scott Behoteguy, Director, USAID/Haiti and other USAID/Haiti personnel were very helpful. We especially thank Leroy Rasmussen and Gus Menager for information, transportation and other services provided us through USAID while in Haiti.

PREFACE

Objectives of the review of grain marketing upon which this report is based are paraphased from the TDY request as follows:

1. To study the current programs in grain production with emphasis in handling, storage, transporation and marketing.

2. To review available reports on marketing of corn, rice, sorghum and other grains such as beans as appropriate.

3. To perform field trips for familiarization with local conditions as appropriate.

4. To prepare a descriptive report on the current status of grain marketing in Haiti with recommendations for improvement in on-farm grain storage facilities, centralized and decentralized storage, handling and processing facilities and other systems which are an integral part of basic grain problems in Haiti.

ITINERARY

Nov. 25 Traveled from Manhattan, Kansas to Port-au-Prince

Nov. 26 Discussed grain problems, TDY objectives and available information sources with Leroy Rasmussen and Gus Menager. Examined available studies.

Nov. 27 Examined economic development reports. Accompanied Mr. Menager to CARE and site of experimental ferrocement grain storage structure. Discussed project with Mr. Neil O'Toole.

Nov. 28 Drove to Les Cayes with Mr. Rasmussen and Mr. Menager. Observed retail market at Petit-Goave enroute. Visited briefly in the evening with George Conde, IDAI.

Nov. 29 Visited with Mr. Vermaat at United Nations Development Project headquarters in Les Cayes. Observed experiment farm at Levy. Visited with PR. Jean Vergonjeanne at La Borge and with Agronome Bellancourt at IDAI.

Nov. 30 Returned to Port-au-Prince. Observed farm storage conditions and milling operations enroute.

Dec. 1 Discussed UN FAO work in organizing producer "cooperative" at Saint Louis du sud with Mr. Dorzin, UNFAO at USAID Office.

Dec. 2 Sunday.

Dec. 3 Observed the retail market in Port-au-Prince Met with Mr. Jerry La Graw, Interamerican Institute for Agricultural Science. Discussed marketing procedures and operation in Haiti, at length with Mr. Menager.

Dec. 4 Visited the flour mill near Port-au-Prince. Met with Dr. William Fougere, Haitian American Community Help Organization.

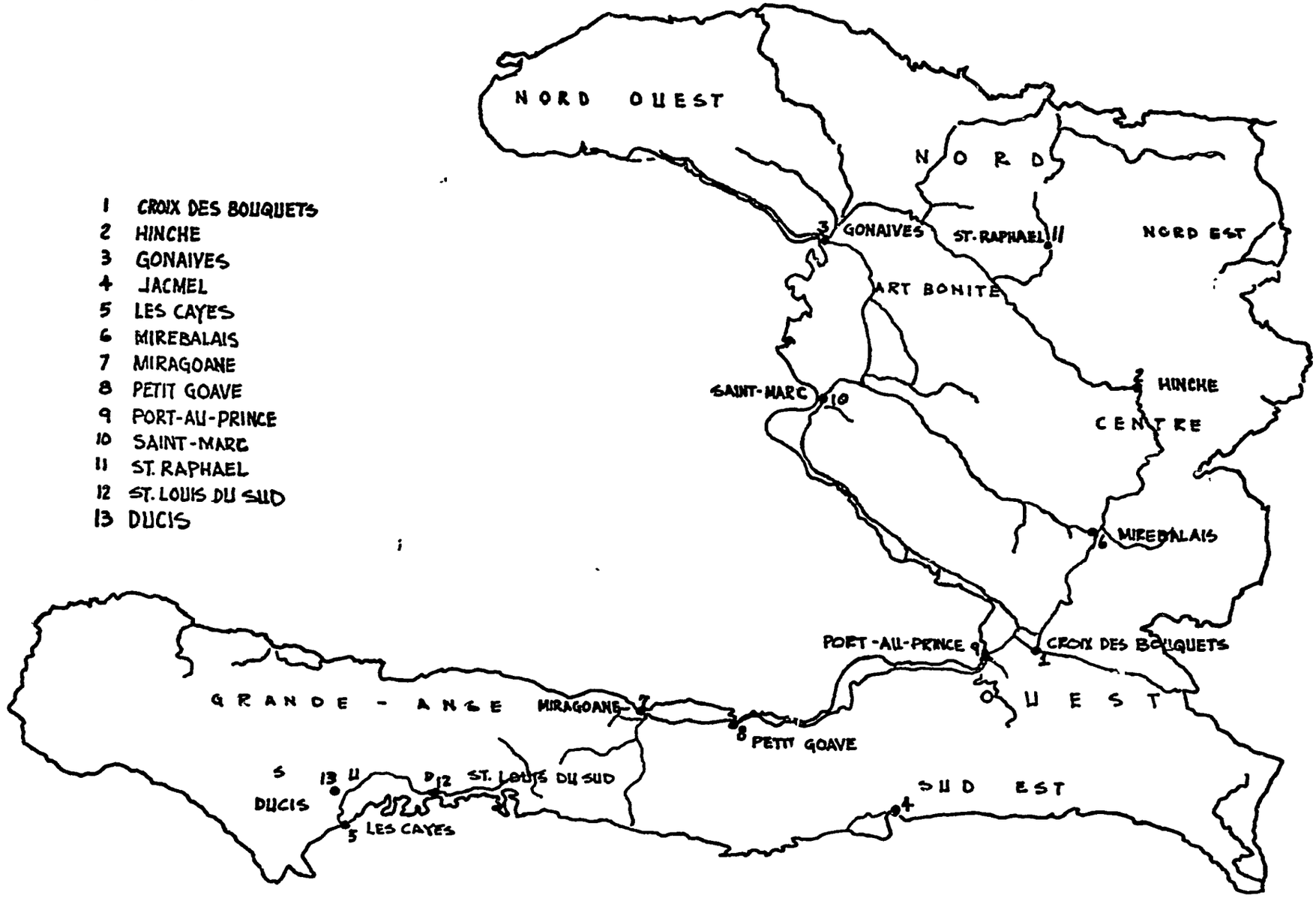
Dec. 5 Haitian Holiday, visited Fort Jacques area with Mr. Menager, worked on report.

Dec. 6 Second visit with Dr. William Fougere, worked on report.

Dec. 7 Completed preliminary report, discussed recommendations with Leroy Rasmussen.

Dec. 8 Left Port-au-Prince for return trip to U.S.

RÉPUBLIQUE D'HAÏTI



SUMMARY OBSERVATIONS AND RECOMMENDATIONS

1. Expanded production of food grains may be anticipated in the near future because potential for increased production exists in improved seed varieties, expanded and improved irrigation systems, increased use of agricultural chemicals and improved cultural practices.

2. Potential demand for increased production exists in a growing population; increased per capita income currently reflected largely in increased employment in Port-au-Prince; and sub-standard nutritional levels and accompanying need to increase per capita food intake. The key factor in expansion of market demand is increase in income.

3. Grain trading in the present marketing system is characterized by personal relationships and the absence of mechanization or officially standardized trading units. The complex system of market relationships apparently functions very effectively in relaying available supply to demand locations. Marketing functions are carried out largely by women. Stocks, purchases and sales involve small quantities. Storage depots are small or non-existent. Because of low cost of human services, marketing costs do not appear to be high and marketing losses relatively low. Price variations are large and market supplies variable. Price variations result in part from absence of storage stocks which could be used to counter short-run price variations and an inability of farmers to store marketable stocks for a long period. Mechanical milling facilities for milling rice and corn appear to be short in some areas.

4. Only very limited documentation of grain production or of market organization and performance is available. In the absence of economic studies, efforts to modify the marketing system should proceed slowly and experimentally.

The following points summarize our recommendations.

- In the short run, evaluate carefully the possible need to import basic food grains in May and June, 1974 to avoid severe price increases at that time.

- Initiate market studies that will lead to better understanding of grain market performance, marketing costs, price behavior and future marketing facility needs.

- Move forward with expansion of on-farm storage, improvement of rural storage and merchandizing centers, improvement of central market facilities in Port-au-Prince, and long-term consideration of a grain import/export facility at Port-au-Prince.

- Encourage the development of local marketing associations as a means of introducing storage and milling facilities locally and maintaining broad distribution of benefits of improved marketing and supply management.

- Undertake personnel training programs to develop expertise in business and financial management of warehousing/merchandizing firms; technical management of grain handling, storage and processing; and government policy and program guidance for improvement of the grain marketing system.

GRAIN MARKETING AND MARKET SYSTEM DEVELOPMENT IN HAITI

INTRODUCTION

Incomes in Haiti began rising in 1971. The major source of income improvement is industrial employment. If this trend continues more cereal grains and grain products will move through marketing channels because a larger percentage of Haitian people will be located in urban areas and improved incomes will result in larger consumption per capita. Population increase will also require greater movement of cereal grains through marketing channels.

Haitian population estimates are as follows:

1960	4,155,597
1965	4,660,233
1970	5,269,392
1975	6,015,583
1980	6,925,766

Annual cereal consumption per capita in 1970 is estimated as follows:

Wheat	13.2 lbs.
Corn	63.8 lbs.
Rice	19.8 lbs.
Millet	41.8 lbs.
TOTAL	138.6 lbs.

By 1980, with constant per capita intake, total consumption of cereals will increase by about 105,000 metric tons over 1970.

Needed expansion and improvement of the marketing system is not likely to occur automatically without policy or program guidance, especially if incomes and consequently marketing requirements expand rapidly.

Little documented evidence exists to describe marketing procedures in Haiti. One very excellent study (5) describes the means by which beans flow from producers in a relatively nearby producing area into Port-au-Prince. The study describes the movements of the marketing women (madam saras) in buying at local gathering points through delivery and resale in Port-au-Prince. The marketing process is very labor intensive, involves cash transactions except in a few distress situations, and the sale and purchase on inspection in small lots. Mechanization occurs only when beans are transported by truck from the local collection point to a central market for resale.

AN OVERVIEW OF GRAIN MARKETING IN HAITI

A. Market Organization:

The central figure in the marketing of corn, rice and millet in Haiti is the madam sara. These marketing women locate marketable stocks, buy grain, finance market grain inventory, arrange transportation, arrange temporary storage, bear intermarket price risk, and sell to other wholesalers or retailers in markets where the product is to be purchased by consumers. No information was discovered that would indicate the portion of total production of corn, rice or millet sold by farmers, or the portion of cash sales that went to the madam sara. Responses from people in positions to observe the marketing of grain indicate that virtually all grain that is moved beyond the local area of production is handled by the madam sara. In some cases the farmer's wife will take grain to Port-au-Prince or other somewhat distant market to be sold.

Description of the collection of stocks by the madam sara at the country point was not obtained, but it is assumed that grain is brought to collection points for sale on market days by producers or that stocks are located by employees of the madam sara as described in the study of bean marketing cited earlier (5).

Major central markets are reported to be at St. Raphael, Pont l'Estere, Pont Sonde, Hinche, Croix des Bouquets, and Ducis (see map, page vii). Retail/wholesale market operations were observed at numerous smaller markets from Port-au-Prince to Les Cayes, especially at Petit-Goave. We also observed the Port-au-Prince market. Corn, rice and

millet of various qualities and in various stages of milling and processing are displayed by numerous producers and market intermediaries for sale to consumers or to local area retailers.

Three features of the marketing system appear uncharacteristic of grain markets elsewhere. First, grain is handled in small lots throughout its entire marketing. Except for occasional accumulations by the central market wholesalers, the amount that a madam sara can take with her to a central market in bags on a truck is apparently the largest accumulation. This quantity is estimated not to exceed one-half ton. Second, there is no provision for storage of stocks once they enter the market channel except short-term sack storage rented by warehousemen at the central market. When warehousemen purchase stocks they are held for an unknown period of time but given the observed conditions under which grain is stored, it is unlikely that these stocks are stored more than a few weeks. The third uncommon feature is that the principal market functions are performed by women.

Marketing Costs: Economic studies of the marketing of food grains have not been done in Haiti, consequently our estimates of marketing cost are from fragmentary reports of costs of market functions and market services. Reported transportation cost by truck from Pont Sonde to Port-au-Prince is 80¢ per bag in dry season and $1.00 in the rainy season - a distance of about 115 miles. However, bags are said to contain from 100 to 400 lbs. If the bag contains 400 lbs., the rate is comparable to motor transport costs in the U.S. If bags normally contain nearer 100 lbs., transport rates are very high. Interest rates charged by lenders to madam saras are reported to be 2 percent per week. Margins earned by intermediaries, including the madam saras, beyond their cash expenses

appear to be very small. Because of rapid movement through the market system and the attention given to each small lot of grain, marketing losses of grain appear to be small. Market activities appear to be performed at relatively low cost except for transportation and the cost of borrowed working capital for intermediaries. Observation and comment of other observers indicate farmer to consumer price spreads in a range approaching 20 percent of farm price with considerable variation depending upon distance traveled and milling operations performed. The spread appears not to be excessive especially in a system involving high labor inputs.

Prices: Evidence from price data recorded by IDAI[1] at Les Cayes indicates that prices fluctuate very significantly from week to week in a given market. With highly competitive price negotiation and no centralized reserve of stocks or available storage with which to dampen out short-run price movements, sharp price fluctuations would be expected.

Large seasonal price fluctuations are reported resulting from a tendency to flood the market at harvest because of inability to store safely on farms for more than three or four months.

Weekly average prices for corn and rice from three markets (Port-au-Prince, Les Cayes and Saint-Marc) recorded by IHPCADE[2] and summarized into monthly averages by IICA[3] (Jerry La Graw) were examined for statistical evidence of seasonal variation for a 5-year period from January 1968 through December, 1972. Indexes of seasonal variation for rice, corn and beans for three Haitian markets calculated on the basis of a 13-month moving average are reported in Table 1.

1. Institut de Development Agricole et Induspriel
2. Institute Haitien d Promtion du Café et des Denrées d E'xportation
3. Instituto Interamericano de Ciencias Agricolas

TABLE 1. Index of Seasonal Variation in Reported Monthly Average Prices of Rice, Corn and Beans in Three Haitian Markets July, 1968 through June, 1972*

RICE

	J	F	M	A	M	J	J	A	S	O	N	D
Port-au-Prince	98.8	98.2	99.4	103.7	105.0	104.8	103.4	100.5	101.9	106.7	94.6	84.7
Les Cayes	94.2	93.8	97.4	100.0	103.6	109.3	105.1	103.2	101.4	98.0	95.4	94.5
Saint-Marc	91.4	95.9	98.1	112.1	112.9	105.8	104.8	99.2	104.7	96.2	90.2	88.7

CORN

	J	F	M	A	M	J	J	A	S	O	N	D
Port-au-Prince	85.8	90.5	96.6	101.8	105.3	112.1	115.1	108.9	103.5	101.6	92.1	86.2
Les Cayes	95.3	98.2	113.4	122.3	118.2	111.9	114.9	108.7	85.0	78.2	77.4	75.4
Saint-Marc	86.1	95.7	96.1	107.1	121.7	124.3	120.8	105.7	101.1	85.3	72.8	83.3

BEANS

	J	F	M	A	M	J	J	A	S	O	N	D
Port-au-Prince	98.4	95.9	96.6	108.1	106.3	112.4	101.8	95.5	100.0	101.6	92.3	90.9
Les Cayes	93.5	98.2	100.3	105.7	102.5	103.8	110.0	100.7	101.0	98.2	91.7	90.6
Saint-Marc	98.0	105.4	102.0	101.6	116.1	113.7	92.6	88.8	98.1	95.7	93.4	94.6

* For original price data, method of calculation of indexes and graphic display of indexes of seasonal variation and accopmanying indexes of irregularity see Appendix I of this report

Price data for rice indicate prices 15.3 percent below the annual average for Port-au-Prince in December increasing to 5 percent above annual average in May. In Les Cayes prices were 5.8 percent below annual average in January and 9.3 percent above in June. In Saint-Marc, rice prices averaged 11.3 percent below annual average in December and 12.9 percent above in May. Differences between the high and low index monthly price averages were 0.82 gourdes per marmit in Port-au-Prince, 0.73 gourdes per marmit in Les Cayes and 0.95 in Saint-Marc. Converting to dollars per ton,[1] differences between high and low months are $64.61 per ton in Port-au-Prince, $57.38 in Les Cayes and $74.67 in Saint-Marc.

For corn available data indicate prices in Port-au-Prince which are 13.8 percent below annual average in December and 15.1 percent above in July. In Les Cayes, prices averaged 24.6 percent below annual average in December and 22.3 percent above in April. In Saint-Marc prices were 27.2 percent below annual average in December and 24.3 percent above in June. Differences between the high and the low index monthly price averages were 0.33 gourdes per marmit in Port-au-Prince, 0.51 gourdes per marmit in Les Cayes and 0.44 in Saint-Marc. Converting to dollars per ton, differences between high and low months were $25.94 in Port-au-Prince, $40.08 in Les Cayes and $34.58 in Saint-Marc.

If the above earnings are available to a producer as a result of investments in storage, earnings from storage must be discounted over a period of time to arrive at present value. For example, present value of annual income over a 5-year period of $74.67 (rice at Saint-Marc) discounted at 10 percent is $283.06. Present value of $25.94 (corn at Port-au-Prince) received annually over a 5 year period with a discount rate of 10 percent is $98.33.

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1. Assumes an exchange rate of 5 gourdes per dollar and 5.6 pounds per marmit.

While the above data give an indication of the value of storage investment, these data must be used with some caution because (1) the above data represent average seasonal movement over only a relatively short historical period, (2) the data used for above calculations, although believed to be representative, have not been tested statistically, and (3) shorter term storage can be carried out without additional storage investment and hence storage investment would increase producer income through better price by only a portion of the total increase in price.

Evaluation of reduction in storage loss through storage facility investment is also necessary to appraise the benefits from investment, especially since a considerable portion of the typical farmer's production is retained for family food supply.

Price data examined suggest the following general price pattern for rice and corn in Haiti:

1. Rice prices tend to peak in May and June with slight reduction prior to a secondary peak in September or October.

2. Rice prices increased seasonally from December to June each year, 1968-1972, by 20 to 30 percent; 0.85 to 0.95 gourdes per marmit; or, $66.00 to $73.00 per metric ton.

3. Corn prices also peak in May and June with low prices occurring in December or January.

4. Corn prices increased seasonally from December to June in 1968-1972 by 30 to 50 percent by market; 0.30 to 0.50 gourdes per marmit; or, $26.00 to $40.00 per ton.

5. Rice prices are normally higher at Les Cayes than at Port-au-Prince, but Saint-Marc prices averaged 0.30 gourdes per marmit below Port-au-Prince prices.

6. Corn prices are higher at Les Cayes than Port-au-Prince and only slightly lower at Saint-Marc than at Port-au-Prince. Annual average price was lower at Saint-Marc in 3 of 5 years from 1968 through 1972.

Price data and field observations in Haiti both indicate a very sensitive, free market trading system in basic food grains. Sensitive price interactions with supply/demand changes and indicated as well as interactions (cross elasticities) among basic grains and beans. More complete knowledge of these interactions, as well as knowledge of functional costs in marketing, would aid in determining marketing activities amenable to change without major interruption of the existing system.

Organizational Improvement Efforts: Producer organizations to improve marketing were observed at La Borde near Les Cayes and at Saint Louis du Sud. At La Borde, farmer groups organized by the Catholic Church primarily for educational and social purposes were being assisted in marketing of corn and millet as well as in crop production. Two storage tanks had been constructed for bulk storage of grain to be held for seasonally higher prices. This was reported to have resulted in improved income for farmers in recent years since construction, although no corn was stored at this time because of very favorable prices at time of harvest.

At Saint Louis du Sud a rice "cooperative" has been formed under the sponsorship of the United Nations (FAO). Little has been done up to this time to improve marketing or to market jointly. Drying floors have been established, however. Principal achievement toward improved marketing appears to be the identification of local leadership and initiative with plans for raising capital for purchase and operation of equipment for marketing, including a rice mill and a truck. Whether

this association will continue cooperative principles of business organization in capital accumulation, distribution of earnings, and operation and management of the association is not clear. An educational effort to explain organizational differences between farmer cooperatives and other corporations may be useful at this point.

In both of these cases organizational efforts have developed slowly from successful educational programs in production that have gained farmer confidence with initiative then shifting, especially in the Saint Louis du Sud case, to the producers themselves.

B. Marketing Facilities:

On-farm Storage: Cereal grains in Haiti are harvested completely by hand. When rice has matured, heads are cut from plants and threshed on concrete floors or mats on the ground by beating with sticks or by individuals walking back and forth across the grain. Rice is then dried by sun on mats or concrete floors for several days depending on weather conditions. Sometimes rough rice is parboiled and dried by sun after threshing. After drying, rice is either stored at the farms or sold in milled or unmilled form.

Sorghum heads, after cutting, are dried gradually in storage by natural air. Just prior to consuming or marketing, sorghum heads are threshed on concrete floors or mats on the ground by beating with sticks or by walking back and forth over the grain.

Husk covered ears of corn are commonly dried in storage by natural air and shelled by hand just before consuming or marketing. Corn is sold in either milled or unmilled form by producers.

Sometimes corn and sorghum grains are dried by exposure to sun on concrete slabs or on the ground, after shelling or threshing. At any

rate, grains produced in Haiti are not presently dried by artificial drying methods. We were told by several Haitians that, except during rainy seasons, grains can be semidried to a moisture level for safe storage of about three months.

Grains that are not sold at the harvesting period are stored at the farms in various ways. Common ways of storing are:

1. Portable storage bags made of plaited palm leaves with special neck closure, baskets or 55-gallon oil drums (with cover) placed in living huts;

2. Thatched huts built on tall stilts;

3. Bundles of husk-protected ears suspended by wires or ropes from the branches of trees; and

4. Thatched roof granaries with walls made of clay mixed with plant materials and supported by timber frames.

In our observations, no farm storage methods other than indigenous storage methods could be found. The use of fumigants to control insects in on-farm storage is not generally practiced. The quality of grains stored at the farm was not checked during our stay in Haiti. We observed various degrees of grain quality in the markets, but no excessive evidence of insect or rodent damage. No reliable data on moisture content of grains are available in Haiti either at harvest, after conditioning and drying or during marketing. A moisture tester was used at the flour mill near Port-au-Prince and one Steinlite moisture tester unit was available at Damien.

o official grades and standards are used in grain marketing. The unit of measure used in trading is the "marmit" (volumeunit), which contains about 5.6 lbs. of grain. Being a volume unit the weight of grain in a marmit varies, depending largely on moisture content of

grain, condition (amount of broken, fine, and foreign matters) of grain, and how the grain is filled in a can. Selling and purchasing of grain are based on marmit basis and visual observation of grain quality. Price of grain is negotiated between buyer and seller. It should be pointed out that under the above conditions it is extremely difficult to assess quantitatively the state of grain quality at the farms and within various marketing chanles.

Because of adverse climatic conditions experienced in Haiti for a safe storage, the losses of grain would be expected to be high in the absence of considerable care in maintaining grain quality.

Some estimates place grain insect, bird and rodent losses at a low figure because of small quantities handled by each producer and hence more intensive care. Other estimates place losses at a relatively high figure. The different figures of grain loss data in Haiti are reported and indicated by various sources (10% to 40%). It is apparent that no grain loss survey was conducted yet to find out the actual loss at various stages between the field and the farm, and during farm storage under different storage methods at various districts in Haiti. However, major losses known are due to rodents, birds, insects, and molds activities resulting from improper storage facilities and management.

In order to improve farm storage so as to reduce the grain loss and to increase the income of rural sectors, USAID/Haiti is presently contemplating to commit the funds to construct 1100 units of ferrocement grain storage bins capable of storing from two to four tons of grain, for the next three years (100 units in FY 74,500 units each in FY 75 and FY 76). We have inspected the pilot model of ferrocement silo (2 tons) constructed by Mr. Neil O'Toole, CARE, located in Port-au-Prince.

Mr. O'Toole explained the problems encountered during the construction and the cost of constructing it. He also indicated that the instruction and design specifications in ferrocement silo construction given in the reports, prepared by Applied Scientific Research Corporation of Thailand and Asian Institute of Technology, Bangkok, are not sufficient to construct a silo, especially to make the lid on the top airtight. With help of his friends who is an architect, who was able to construct silo and modified the section and the lid for eliminating air leakage.

The silo is stable and rigid and appears to be waterproof and bird and rodent proof. The reports released by ASRC and AIT in Bangkok on the storage tests showed the paddy rice at about 11% to 12% moisture content stored in a bin for more than a year was in sound condition. Only less than 1% damage by insects and less than 1% loss in germination during the test period were observed. However, they cautioned that the grain should be dried to at least 13% moisture content before storage, or internal migration may lead to moisture accumulation near the top of the bin and consequent danger of mold growth. One must remember that the keys to safe storage in ferrocement silos are low initial moisture content of grain (at least 13%) and uniform moisture distribution in grain lots to be stored. Our observations on grain handling and marketing in Haiti indicated that grains are handled without knowing moisture content and with a wide distribution of moisture content in grain lots. Therefore, a careful study of the storage performance of sun dried grain in ferrocement silos should be made before embarking on a large scale construction program.

The cost of constructing a pilot model silo (2-tons unit) was about $200.00 in Haiti according to Mr. O'Toole. This figure may be lowered after

mass construction starts, providing material costs and other costs remain unchanged.

The capacity of contemplated ferrocement silos (2 tons) appears to be too large for bulk storage use by an individual farmer. Land holdings average less than one hectare per farm. Furthermore, a given land is commonly utilized for more than one crop (corn, sorghum and beans). Because of diverse yearly crop production by a farmer it is not likely that 2 tons of a single kind of grain will be available for bulk storage. Utilization of ferrocement for bag storage of more than one kind of grain may make possible fuller utilization of a 2-ton storage unit.

Off-farm Storage: Information on capacity and condition of existing off-farm storage and existing mechanical dryer facilities is not well documented. Very little off-farm bulk storage was reported. However, we were able to obtain the capacities of bulk storage facilities at five locations, owned by IDAI (see map, page vii).

Les Cayes	-	7 "BSB" corrugated metal bins each at 35 tons
Miragoane	-	3 "BSB" corrugated metal bins each at 35 tons
Jacmel	-	3 "BSB" corrugated metal bins each at 35 tons
Gonaives	-	3 "BSB" corrugated metal bins each at 35 tons
Mirebalais	-	1 "BSB" corrugated metal bins each at 35 tons

Each bin is equipped with an aeration system but aeration fans are not connnected to ducts, locally constructed batch dryers (flat-bed type) are available at Les Cayes and at Gonaives (capacities not known).

We have observed the storage facility and dryer at Les Cayes. We were informed that the storage bins and a dryer at Les Cayes and at other locations have been utilized very little for storing and conditioning grains. The main reasons for not being utilized were lack of trained

operating people for grain storage and conditioning, and only small amounts of incoming grains at moisture contents requiring mechanical drying.

We also visited the farm federation operated by a Catholic Mission at La Borde. There are two metal bins about 15 ton each which are effectively utilized for storing corn and sorghum produced by small farmers. We were informed that no problem of keeping grains in the metal bins was experienced.

Small amounts of storage for sacked grain are maintained by wholesalers at major central markets. Such space was reported to be used mostly for over night storage by madam saras.

Corn and Rice Milling: Corn is marketed as whole kernel and ground. Three classifications of ground corn, corn meal (over 1/16" screen), corn flour and corn bran or hull are sold in markets. For home use at farms, corn is ground by hand and sifted to different classification mentioned above. Corn meal and corn flour are consumed for foods, and corn bran or hull is used for feeds. Excess corn is marketed and usually milled by hammer mills located along side of highways linking various markets. By hammer mills, whole kernels are converted into about 90% corn meal, 6.2% corn flour, 2.8% corn bran and 1% lost in dust. Corn milling charge is reported to be 2¢ per marmit. Since the information on the number of existing corn mills in various districts in Haiti, the capacity of each mill and the condition of each mill is not available, it is extremely difficult to evaluate the need for future corn mills.

We could find only two hammer mills (Danish made) on the way to Les Cayes from Port-au-Prince. Based on this, it appears that only very limited mechanical corn milling capacity presently exists in Haiti.

Information on rice milling is solely based on personal communication with Mr. Gustave Menager and Mr. Dorzin, FAO, because our time in Haiti did not permit us to visit rice producing areas. For home use on farms, rice is milled by hand after sun drying. Head rice and broken kernels are consumed for human foods, and rice bran is used for feeds. Practically all rice marketed in Haiti is milled by only rice hullers (no polishers). It was reported that a small portion of rice marketed is parboiled before milling and there exists enough milling facilities for the current rice production (German Billbrook Rice Huller, Japanese Yamar Rice Hullers). Rice milling charge at custom mills is reported to be about 3¢ per marmit. Again no data are available on the number of existing rice mills at various locations in Haiti, the capacity of each mill, condition of each mill, or head rice yield. These data would be very useful to evaluate the need for addiational milling facilities to accomodate future rice production.

Retail and Wholesale: Retail grain marketing operations are commonly performed at the neighborhood side walk, streets, central market places in urban areas and local market places. Wholesale operations involve lots of 1000 pounds or less with storage as required in sacks in central market warehouses. Trading facilities varied from sheltered stalls on an elevated concrete platform in an area with good surface drainage observed at Petit Goave to sale in poorly drained unsurfaced streets in Port-au-Prince. Trading facilities at local markets near production areas were usually thatched-roof shelters supported by wooden poles.

The central market at Port-au-Prince is not only the largest wholesale center, but also the largest retail center in the city. The physical congestions of vehicles, conditions of streets, and especially the poor

sanitary conditions in warehouses and streets result in inefficient and ineffective grain merchandising operations. Grain losses by insect and rodent activities are reported to occur because of improper handling and poor sanitations in and around warehouses. For insect control, a fumigant, "Lindagrain" imported from France, is occasionally applied at wholesale warehouses. Often a poor quality grain is blended with good quality grain before selling.

Transportation: Transportation is one of the most troublesome bottlenecks in Haiti's marketing system. The largest transportation problem is the need to rehabilitate and up-grade the existing road system. The deterioration and lack of the road system have restricted Haiti's economic and social developments. Recognizing this the government of Haiti is taking action to correct this problem with aids from AID/Haiti and other international lending agencies. Work is underway to rehabilitate and to upgrade the road from Port-au-Prince to a northern sector of Haiti as well as to improve road maintenance procedures. Also the plan was made to construct a new road from Port-au-Prince to Les Cayes. Only after such projects are completed, will Haiti be in a position to improve and modernize marketing facilities. Little water-way transport and railroad system for grain marketing exist in Haiti.

RECOMMENDATIONS

A. Short-run Market Supply:

Corn and rice have been in short supply in Haiti in the past year reportedly because c

1. Production difficulties in rice related to irrigation breakdown in the Artibonite, and

2. Increase in demand growing out of improved income largely in Port-au-Prince.

In the south, the 1973 corn crop recently harvested is reported to be below normal. The market portion is reported already sold because of favorable prices. A sharp drop in rice prices from October to December in Port-au-Prince suggests that early harvest of rice may also have been marketed immediately.

If demand for grain remains strong, this raises questions about supplies of corn and rice to meet market demand in April and May, 1974 and again in September and October of 1974. Time has not permitted any kind of thorough exploration of market supply probabilities for 1974, but if supply is to be short, again requiring importation of rice and corn, import should be planned by the Government of Haiti in the near future.

B. Market Studies:

Recorded information relevant to formulation of policies in grain marketing is virtually non-existent in Haiti. Market organization, cost of performing various marketing functions, grain movement channels, and price behavior are important aspects of a marketing system. Each may be

importantly (possibly adversely) affected by outside facility investments, regulation, or other policy modifications imposed on the system. "Marketing channels that are costly and frought with uncertainty have often played cruel tricks on development planners." (12)

At the present time, recorded information needed to estimate additional storage, drying and processing facilities to meet the future need is practically non-existent in Haiti. The most important factors determining the amount of new storage and processing facilities needed to handle expected increase in grain production are: (1) monthly supply and demand projections of various crops for each district; (2) the quantity of each crop entering commercial marketing channels; (3) the amount of crop shipped from one district to another or stored from one time period to another; (4) the seasonal production patterns and; (5) the number, capacity, condition and location of existing facilities. Therefore, study on additional storage, drying and processing facilities to meet the grain production increase after 1976 is needed.

We strongly recommend that studies be undertaken that will lead to better understanding of market performance, marketing costs, price behavior and future facility needs. This chouid be done before policy measures or capital investments are made for the purpose of modifying current organization on any major scale.

Interamerican Institute for Agricultural Sciences has made a commendable start toward documenting marketing techniques and interpersonal commercial relationships within the system. This work needs to be expanded with greater emphasis on analysis of the economic attributes of the system and the consequence of legal environment and taxes as well as documentation of sociological attributes.

A second area of information is the development and recording of supply, consumption, and price information on a continuing basis so that

analysis and understanding of system performance can be achieved.

Because training in methods of performing marketing studies has not been incorporated in the educational system in Haiti, outside help will be required. This could be accomplished with study teams for short term projects or possible through sponsored research by U.S. graduate students. To develop Haitian ability to perform marketing studies it would seem desirable that outside analysts work with Haitian nationals in planning and carrying out marketing studies.

The Interamerican Institute of Agricultural Sciences through Jerry La Graw has expressed interest in the possibility of a program of marketing involving cooperation between that Agency, USAID, and a U. S. University or Universities. This possibility warrants further exploration.

C. Marketing Facilities:

The following recommendations are made to improve Haitian grain marketing facilities, based on existing evidence and on our observations on the current Haitian grain marketing system.

On-farm Storage: We are in agreement with the program of USAID/Haiti to improve on-farm storage in order to (1) reduce grain loss, (2) increase length of the storage period, (3) reduce seasonal price fluctuation and (4) stabilize market flow of essential food grains.

Investment is normally justified by estimated flow of returns or benefits over the life of the investment or other relevant period. Estimates of the cost of ferrocement storage units of 2-ton capacity is approximately $100. per ton. Annual benefits required over various benefit periods to equal $100. of current value at 8 percent and at 10 percent discount rates are indicated in Table 2.

Useful life of a well constructed ferrocement storage unit would likely exceed 10 years, however, investment planning periods for Haitian farmers

may not exceed 10 years. If annual benefits exceed those indicated for a 10-year benefit period, returns will equal benefits in less than a 10 year period. Analysis of seasonal variation in price indicate that ability to take full advantage of seasonal variations of historical periods would have provided returns to individual producers sufficient to pay for storage units in a shorter period of time.

TABLE 2. Annual Benefits Required Over 1 to 10 Years Benefit Periods for Current Investment Value of $100 at Discount Rates of 8 and 10 Percent

DISCOUNT RATE	BENEFIT PERIODS (YEARS) 1	2	3	4	5	6	8	10
(Percent)	--DOLLARS PERCENT--							
8	108.00	56.08	38.80	30.19	25.05	21.63	17.40	14.90
10	110.00	58.39	40.21	31.55	26.38	22.96	18.74	16.27

It is our judgment that annual benefits would justify investment in on-farm storage, although estimated benefits from reduction in grain storage loss on which there is not documented evidence is a part of this evaluation. Facilities requiring a lower level of investment would require lower annual benefits to be profitable.

Before embarking on a large scale, ferrocement silo construction program, a careful investigation should be made on the storage performance of grain samples received under the present handling and drying practices, by using a ferrocement silo for at least five months storage. The tests should be conducted with both grains harvested in rainy season and dry season. If possible, such tests should also be conducted at different locations where climatic conditions are appreciably different. Before

the test, the initial moisture contents should be measured by the oven method or well calibrated grain moisture tester and the qualities of grain samples determined. During the test, moisture contents, temperatures and qualities (insect and mold activities and if possible germination test) of grain samples at various locations in a ferrocement silo should be periodically recorded.

Also consider cylindrical or rectangular shape of farm storage bins constructed by ferrocement construction techniques. Small farm storage of 1.5 to 3 cubic meter (1 to 2 ton) size may be constructed with less reinforcing and less wall thickness than a conical shape ferrocement silo already constructed. Detailed technical information for constructing such a unit may be obtained from Dr. R. Bradly Williamson, College of Engineering, University of California, Berkeley, California or the New Zealand Portland Cement Association, Wellington, New Zealand.

The use of a simple sheet metal bin constructed by using light weight metal (20 gauge - galvanized) shown in Figure 1 should be considered. The bin can just as well be round if that shape is more convenient that a square or a rectangular bin. If the bin is located outside of another structure such as the house, it is desirable to paint the inside and outside of the bin with a non-toxic waterproofing paint and to place the bin on a pallet or concrete block pad.

Such bins can easily be constructed in Haiti after sheet metal is obtained from a foreigh country. The current unit cost of constructing such a bin in Haiti is not known, however, the cost of sheet metal needed for constructing a 2-ton unit in the U.S. is about $45. It should be pointed out that constructing a 2-ton unit of ferrocement silo in Haiti would also require materials not locally available such as sealant, paint,

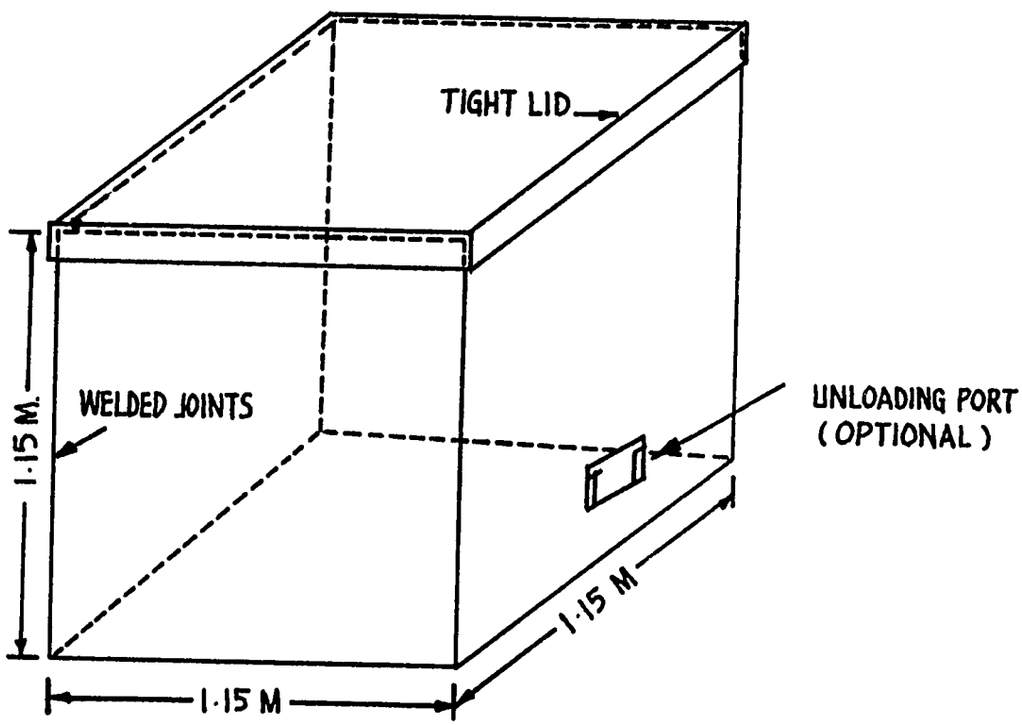

FIGURE 1 ONE TON UNIT, SHEET METAL FARM STORAGE BIN

chicken wire, steel rod and pipe, which constitutes about 40% of the total construction cost (about $80). It appears that the unit construction cost of the sheet metal bin in Haiti would be appreciably cheaper than that of the ferrocement silo.

Another storage method that can be used for farm storage is the use of a plastic liner or bag (polyethene film material) fitted to the inside of a bin constructed by locally available materials such as clay or mud, clay mixed with fragmented plant materials, cement incorported with mud, etc. and covered with an overhanging thatch roof. Bins of this type should be raised about 0.5 meter above ground level on unbaked clay or concrete blocks or timber. The floor should be constructed to prevent rats and other animals from getting into the bin, e.g. by fitting rodent proof barriers of sheet metal placing at right angle to the surface of poles.

The plastic films should form a large bag to fit the inside bin dimensions. It should be sealed at the top after filling the bin with grain. If the plastic bin lining cannot be constructed without joints, then the film should overlap about 30 cm along each joint. Thus, the airtightness can be attained with the use of a plastic liner in the bin. Even with a steel bin shown in Figure 1, the easiest solution to make storage airtight may be the use of a plastic liner rather than attempting to seal the lid and unloading port. In addition, the application of a coat of waterproof paint on the inside and outside of the bin walls should be enouraged.

In any case, it is recommended that the farm storage bin should be located in the shade and the coolest most uniform temperature place available. Storage in sheet metal bins and ferrocement silos may be

improved by having a large thatched roof with plenty of overhang built over the bins to keep the surface of the bins as cool as possible.

It should be emphasized that the grain cannot be safely stored in any type of storage facility for a long period without proper care and management practices. The grain moisture content should be relatively low (below 14%), and uniform moisture distribution between grain lots is very much desirable before storing.

Considerable attention is necessary during sun drying. The grain should be turned frequently in order to insure uniform moisture content (even drying) and should be covered and carried indoors in the evening or before a rain. It is at this stage that the grain may become infested and also crack or break due to excessive and careless handling. Breakage of grains is minimized by the use of trays, mats or plastic sheets. More effective drying can be accomplished by creating air movement through the exposed thin layers of grain, spreading the grain on porous mats (bamboo or other plant materials) or on wire bottom trays which are supported off of the ground.

Compared with trays and mats, plastic sheets provide a combination of facilities including ease of spreading and collecting; protectiong from the rain and moisture from the ground; easily lifted into the house at night or before the rain; and protection from insects. Thus, the use of plastic sheets for grain drying should be also encouraged.

During grain storage, the grain should be inspected periodically for the sign of deterioration. If the insect activity is detected, the grain should be cleaned by screens or preferably by applying fumigants. Encourage farmers to use fumigants (i.e. phostoxin) to control insect activity in stored grains. Proper instruction for applying fumigants should be provided to farmers. If heating of grain (hot spots) or

increasing grain moisture is detected, then the grain should be taken out of the bins and spread on mats or plastic sheets for redrying and cooling.

Cleanliness around the storage area and also the use of clean baskets and containers for handling grains should be emphasized. Baskets and containers should often be disinfected after handling and storing grain. Cleanliness or good housekeeping is one of the most important factors for safe grain storage.

Off-farm Storage and Merchandizing Stations: More warehouses appear to be needed near production areas to serve farmers and market intermediaries. Current conditions and marketing techniques favor use of sack storage. Indigenous material supply suggests concrete warehouses. A concrete warehouse should be equipped with a small corn mill or rice mill or both, depending on the area and a concrete drying floor. Small batch dryers or in-sack dryers would be desirable. Also moisture testers, triers, probes, thermometers, scales, sieves and small platform scales should be included. One or two hand trucks for movement of bagged grain may be included. Pallets should be provided so that grain may be stored off the warehouse floor. Warehouses hould also have provisions for grain fumigation.

Although sacked grain storage appears more compatible with the present overall system of grain handling in rural areas, plans should be made to use the existing bulk storage facilities at Les Cayes, Miragoane, Jacmel, Gonaives and Mirebalais. These facilities could be used for sacked grain storage on a owner/identified basis if this is preferable to bulk storage operated by a grain merchant or, alternatively, operated cooperatively by participating producers.

Warehouses located in rural areas would not only constitute opportunities for grain storage, but could become merchandising stations of benefit to producers and to the madam saras. Present major markets are

also likely sites for warehouse improvement, i.e. Pont l'Estere, St. Raphael, Pont Sonde, Hinche, Ducis and Croix des Bauquets.

The Central Market in Port-au-Prince: In the central market the Municipality should exercise adequate control to force a general clean-up. Grain wholesalers should be encouraged to use measures to control rodents and insects. The Municipality should repair the streets in the market. A study on new warehouse facilities to accomodate wholesale operations may be needed.

Port Facilities at Port-au-Prince: Importation of cereal grains has steadily increased in Haiti during the last five years due to a short domestic supply of cereal grains, resulting from production difficulties and the increase in consumer demand. A major portion of imported grains is wheat, which is handled by the port grain handling facility for National Flour Mill, located north of Damien. At the present time, this is the only port grain handling facility available in Haiti. However, this facility is exclusively used for handling wheat supplies needed for the National Flour Mill, and is now operating at its maximum capacity.

It appears that Haiti may need a port grain handling and storage facility for imported grains to offset a short domestic supply, and to stablize domestic grain prices. A port facility also could handle grain surplus for export should surplus arise. It is recommended that only a pre-feasibility study of the economic potential for a port grain handling and storage facility at Port-au-Prince or for expanding the port facility north of Damien (National Flour Mill) to handle other grains, rather than a full economic-engineering study be done at this time.

D. Producer Associations:

The environment of broadly distributed land holding and apparently

strong economic motivation on the part of farmers along with willingness to adopt new methods would seem to provide a good environment for development of marketing associations at the local level. Objectives of such associations would be to improve farmer income through better marketing and providing better channels for acquiring fertilizer and other production supplies.

Given current conditions, it is our judgement that producer associations should be developed slowly (such as at Saint Louis du Sud), developing farmer leadership and guiding farmer initiative with capital inputs, for purchase of facilities, coming from farmer members and association earnings as much as possible.

Local associations are expected to improve marketing by providing improved local storage for more timely marketing of grain and by providing facilities for milling of rice and corn where needed. Producer associations would provide for broad distribution of benefits of grain supply management among producers.

Producers associations may be organized on a non-cooperative, corporate basis if such organization satisfies the objectives of the association. However, cooperative principles of business organization have been used successfully for business organization in other areas and would appear to be likely to satisfy producer objectives in Haiti.

Efforts to establish cooperatives should be accompanied by training programs for producer-participants and for association managers.

E. Training Programs:

The grain marketing system in Haiti encompasses highly skilled individual traders. However, business and financial management of warehousing/merchandising firms; technical management of grain handling, storage and processing facilities; and establishment of government

policies and programs for optimum marketing system development each requires a high level of skills that apparently do not exist in Haiti. Training in each of the above areas is essential to the success of any program to improve Haiti's grain marketing system in the next few years.

Traditional business management skills need modification and amplification to deal with the unique characteristics of grain markets and with joint activities of farmer associations organized under cooperative principles. Principles can be learned in a formal educational setting. Application of principles is not as well adapted to formal training. Since experienced management for producer associations is not available in Haiti, a relatively high degree of in-service development coupled with formal training will be required. Management development can be speeded up through use of short courses and other extension training activity directed to this objective.

Successful operation of grain marketing or processing facilities also requires technical knowledge of specific engineering, entomology and cereal chemistry applications. The main purpose of training in these areas is to assure that adequately trained people are available at grain marketing facilities.

A training program to aid in business and technical management can be obtained at kansas State University. The Food and Feed Grain Institute at Kansas State University offers annually, a Grain Storage and Marketing Short Course under contract AID/csd-1588, at Manhattan, Kansas, for eight weeks during the months of June, July and August. Three or four engineers or agricultural technologists carefully selected by GOH should be sent to the U. S. for such training. After training in the U. S., participants may be expected to organize and conduct a training course for semi-skilled persons working at grain storage and processing facilities.

Efforts should also be made to include study of marketing systems and marketing principles by Haitian nationals, possibly at Damien. Advanced training for GOH officials expected to be responsible for policy and program decisions related to grain marketing should also be instituted. A knowledge of the "system" nature of grain marketing, i.e. interrelatedness of various elements of the system is an essential basis for guidance of development toward an advanced marketing system for grain.

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APPENDIX

Appendix I. Market Prices for Rice, Beans, Corn, Millet, Bananas and Carbon [1/]

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1/ Data Developed by IPHACADE and IICA with estimated by the authors.

APPENDIX I-A MARKET PRICES (GOURDES PER MARMITE) FOR RICE, BEANS, CORN, MILLET, BANANAS AND CARBON AT PORT-AU-PRINCE

RICE

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.50	3.50	3.50	3.50	4.28	4.50	4.31	4.00	4.18	4.25	3.50	3.56	3.88
1969	3.68	3.50	3.50	3.50	3.50	3.50*	3.50	3.41	3.42	3.75	3.68	3.25	3.52
1970	3.25	3.50	3.50	3.75	4.06	4.37	4.12	4.00	4.37	5.12	4.62	4.00	4.06
1971	5.50	5.50	5.70	6.15	5.90	5.50	5.80	5.90	5.80	5.62	4.87	4.10	5.53
1972	5.25	5.12	5.25	5.50	5.50	5.37	4.30	4.25	4.75	4.56*	4.36*	4.25*	4.90
1973													
Average	4.24	4.22	4.29	4.48	4.65	4.65	4.41	4.31	4.50	4.72	4.23	3.83	4.38

*Estimated

BEANS

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.00	3.18	3.30	3.33	3.79	5.50	4.31	3.66	3.43	3.25	2.94	3.00	3.56
1969	3.25	3.33	3.25	3.75	3.75	3.75*	3.00	2.94	3.50	3.75	3.12	3.37	3.40
1970	3.62	3.31	3.25	3.37	3.68	4.81	3.43	3.25	3.25	3.20	3.00	3.00	3.43
1971	3.15	3.00	3.20	4.50	4.05	3.65	3.60	3.65	4.05	4.50	4.37	3.90	3.80
1972	4.00	4.00	4.25	4.06	4.00	4.25	3.56	4.05	5.25	5.25*	5.15*	5.00*	4.40
1973													
Average	3.40	3.36	3.45	3.80	3.85	4.39	3.58	3.51	3.90	3.99	3.72	3.64	3.72

*Estimated

APPENDIX I-A Port-au-Prince Con't.

CORN

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	1.00	.92	.90	.90	1.52	1.85	1.72	1.50	1.30	1.05	.89	.88	1.20
1969	.96	1.06	1.10	.90	.90	.90*	.90	.87	.79	.80	.90	.81	.90
1970	.73	.87	.90	.95	1.10	1.17	1.05	1.00	1.10	1.25	.95	.90	1.00
1971	.90	.90	.95	1.15	1.15	1.25	1.15	1.20	1.15	1.15	1.12	1.06	1.09
1972	1.00	.90	1.02	1.25	1.25	1.42	1.25	1.30	1.52	1.52*	1.45*	1.40*	1.27
1973													
Average	.92	.93	.97	1.03	1.18	1.32	1.21	1.17	1.17	1.35	1.06	1.01	1.09

*Estimated

MILLET

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	1.40	1.25	1.25	1.26	.60	2.00	1.82	1.78	1.72	1.60	1.50	1.50	1.47
1969	1.60	1.60	1.60	1.40	1.40	--	1.40	1.40	1.22	--	--	--	1.45
1970	--	--	--	--	--	--	--	--	--	1.50	1.40	1.40	1.43
1971	1.40	1.40	1.45	1.60	1.55	1.50	1.50	1.65	1.60	1.60	1.55	1.56	1.53
1972	1.40	1.25	1.30	1.50	1.50	1.55	1.50	1.50	1.70	--	--	--	1.47
1973													
Average	1.45	1.38	1.40	1.44	1.26	1.68	1.55	1.58	1.56	1.56	1.48	1.48	

*Estimated

APPENDIX I-A Port-au-Prince Con't.

BANANA

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	4.25	4.50	4.20	4.00	4.25	5.50	4.50	4.60	4.50	7.00	7.00	7.00	5.11
1969	7.00	--	7.00	8.00	7.66	--	7.00	6.25	--	5.00	5.00	5.75	6.52
1970	6.00	6.00	6.00	6.75	7.00	7.00	6.00	6.00	7.00	6.00	6.00	6.00	6.31
1971	6.00	6.00	6.25	7.00	8.00	7.50	6.60	6.00	6.40	6.00	7.00	6.20	6.58
1972	7.00	6.75	6.10	6.10	6.10	6.10	6.25	7.10	7.89	--	--	--	6.60
1973													
Average	6.05	5.81	5.91	6.37	6.60	6.53	6.07	6.00	6.45	6.00	6.25	6.24	

*Estimated

CARBON

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	8.25	8.00	7.00	6.33	6.66	7.00	7.00	7.00	7.00	8.00	8.00	9.00	7.44
1969	9.00	8.00	8.20	8.33	8.00	--	8.00	8.00	8.00	9.00	9.00	10.00	8.50
1970	11.50	11.50	11.00	11.00	10.50	9.75	9.00	9.25	9.00	9.25	10.00	10.25	10.17
1971	9.60	9.00	9.00	9.75	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.80	9.18
1972	11.75	11.10	10.60	10.10	10.10	10.10	10.10	10.10	10.00	--	--	--	10.44
1973													
Average	10.02	9.52	9.16	9.10	8.85	8.96	8.62	8.67	8.60	8.81	9.00	9.76	

APPENDIX I-B MARKET PRICES (GOURDES PER MARMITE) FOR RICE, BEANS, CORN, MILLET, BANANAS AND CARBON AT ST. MARC

RICE

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.42	3.46	3.70	3.90	4.00	3.85*	3.70*	3.50	3.75*	3.50	3.41	3.53	3.64
1969	3.50	3.50	3.52	4.50	4.50	4.30*	4.10*	3.90*	3.70*	3.51	3.65	3.45	3.85
1970	3.55	3.85	3.60	3.95	4.06	4.02	4.10	4.17	4.63	3.9[illegible]	3.46	3.55	3.90
1971	3.96	3.98	4.50	5.45	5.50	4.25	4.50	3.98	4.50	4.57	4.00	3.70	4.41
1972	3.75	4.20	4.50	4.50	4.50	4.87	5.00	5.00	5.00	5.00*	4.75*	4.50*	4.63
1973													
Average	3.64	3.80	3.96	4.46	4.51	4.26	4.28	4.11	4.32	3.87	3.63	3.56	4.03

*Estimated

CORN

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	.90	.95	.99	.95	.90	.97*	.97*	.75	.75*	.80	.75	.78	.87
1969	.80	1.00	1.19	1.16	1.56	1.56*	1.40*	1.20*	1.10*	.74	.85	1.05	1.04
1970	1.10	1.15	1.05	1.15	1.20	1.28	1.50	1.30	1.23	1.21	.66	.89	1.14
1971	.95	1.05	.90	1.35	1.45	1.50	1.26	1.30	1.26	.92	.90	.94	1.16
1972	.95	1.00	1.08	1.05	1.11	1.20	1.25	1.13	1.26	1.20*	1.15*	1.10*	1.13
1973													
Average	.94	1.03	1.04	1.13	1.24	1.30	1.28	1.14	1.12	.97	.86	.97	1.08

*Estimated

APPENDIX I-B St. Marc Con't.

MILLET

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	.98	1.30	1.01	--	--	--	--	--	--	1.35	1.50	1.62	1.29
1969	1.90	2.06	2.00	1.15	2.06	--	--	--	--	.75	.79	1.00	1.46
1970	.89	1.15	1.00	.89	1.10	1.19	1.28	1.20	1.30	1.26	.90	.88	1.09
1971	.93	1.10	1.20	1.27	1.30	1.25	1.55	1.50	1.32	1.41	1.30	1.31	1.29
1972	.70	.70	.71	.72	.90	.91	.96	.93	1.00	--	--	--	.84
1973													
Average	1.08	1.26	1.18	1.00	1.34	1.12	1.26	1.21	1.21	1.19	1.12	1.20	

BEANS

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.60	3.56	3.35	3.60	3.60	4.20*	3.30*	2.92	3.10*	3.15	3.00	3.00	3.37
1969	3.00	3.56	3.23	3.50	4.00	4.00*	3.25*	3.00	3.60*	3.85	3.78	3.65	3.54
1970	3.80	3.90	3.80	3.28	4.54	4.95	3.25	3.55	3.65	2.71	3.05	3.24	3.64
1971	3.15	3.30	3.65	4.05	4.40	4.25	3.35	3.23	3.75	4.15	3.87	4.00	3.76
1972	4.12	4.36	4.16	4.00	4.10	3.56	2.93	3.38	4.56	4.70*	4.55*	4.40*	4.07
1973													
Average	3.53	3.74	3.64	3.69	4.13	4.19	3.22	3.22	3.73	3.71	3.65	3.66	3.68

*Estimated

APPENDIX I-B St. Marc Con't.

BANANA

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	5.50	4.08	5.18	5.25	4.00	--	--	6.00	--	4.75	4.50	4.31	4.84
1969	4.50	4.57	4.56	4.30	4.50	--	--	--	--	6.50	6.65	7.05	5.33
1970	7.20	5.75	5.15	5.00	5.45	5.30	4.91	5.05	5.12	5.17	5.62	5.32	5.42
1971	5.25	5.40	5.55	5.85	4.85	4.50	3.75	4.00	4.00	4.12	4.12	4.10	4.62
1972	4.50	4.50	4.50	4.75	4.50	4.50	4.62	4.70	4.62	--	--	--	4.58
1973													
Average	5.39	4.86	4.99	5.03	4.66	4.77	4.43	4.94	4.58	5.13	5.22	5.20	

CARBON

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	5.65	6.08	4.68	4.12	4.25	--	--	5.12	--	4.50	4.25	4.12	4.75
1969	4.50	4.10	4.50	5.00	4.50	--	--	--	--	4.50	5.37	6.05	4.82
1970	6.15	5.13	5.10	4.46	4.75	4.87	5.25	5.55	5.13	4.88	5.00	5.12	5.12
1971	5.20	5.40	6.20	6.40	5.50	4.75	5.10	5.00	5.00	5.00	5.00	5.00	5.30
1972	5.25	6.00	5.60	5.00	5.00	5.00	5.25	5.50	5.62	--	--	--	5.36
1973													
Average	5.35	5.34	5.22	5.00	4.80	4.87	5.20	5.29	5.25	4.72	4.90	5.07	

APPENDIX I-C MARKET PRICES (GOURDES PER MARMITE) FOR RICE, BEANS, CORN, MILLET, BANANAS AND CARBON AT LES CAYES

RICE

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	4.50	4.85	5.00	5.00	4.78	5.00	4.75	4.75	4.75	4.37	4.00	4.00	4.65
1969	4.00	4.00	4.62	4.98	5.00	4.78*	4.56*	4.33	4.15*	4.00	4.00	4.00	4.21
1970	4.00	4.00	4.00	4.25	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.69
1971	5.00	5.00	5.12	5.00	5.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.59
1972	6.00	6.00	6.00	6.00	6.00	6.75	6.00	6.00	6.00	6.00	5.95	5.70	
1973													
Average	4.70	4.77	4.95	5.05	5.16	5.51	5.44	5.22	5.44	5.07	4.99	4.94	5.10

*Estimated

BEANS

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.00	4.00	3.70	3.75	4.07	4.30	4.26	3.43	3.67	3.45	2.60	3.00	3.60
1969	3.22	3.50	3.16	3.56	3.40	3.40*	3.10*	2.80	2.80*	3.00	3.00	3.00	3.16
1970	3.06	3.37	3.50	3.50	3.00	3.18	3.75	3.68	3.47	3.25	3.45	2.93	3.35
1971	3.05	3.05	3.42	3.61	3.73	3.81	3.80	3.80	3.78	3.68	3.35	3.35	3.54
1972	3.32	3.24	3.46	3.65	3.86	3.86	3.70	3.47	4.65	4.65*	4.50*	4.30*	3.89
1973													
Average	3.13	3.43	3.45	3.61	3.61	3.71	3.72	3.44	3.67	3.61	3.38	3.32	3.51

*Estimated

APPENDIX I-C Les Cayes Con't.

CORN

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	1.13	1.36	1.43	1.53	1.89	2.20	1.61	1.68	1.42	1.20	1.07	1.00	1.46
1969	1.25	1.40	1.38	1.30	1.27	1.17*	.90*	.70	.80*	.90	1.03	.92	1.09
1970	1.00	1.00	1.33	1.28	1.26	1.35	1.45	1.35	.85	.75	.62	.66	1.08
1971	.80	.80	1.06	1.43	1.50	1.50	1.50	1.52	1.08	.95	1.00	1.00	1.18
1972	1.38	1.32	1.30	1.40	1.20	.92	.77	1.18	1.15	1.10*	1.10*	1.10*	1.16
1973													
Average	1.11	1.18	1.30	1.39	1.42	1.43	1.25	1.29	1.08	.98	.96	.92	1.19

*Estimated

MILLET

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968			1.43	1.43	1.75	2.15	1.86	--	--	--	--	--	
1969	1.45	1.45	1.25	--	--	--	--	--	--	--	--	--	
1970	--	--	--	--	--	--	--	--	--	--	--	--	
1971	.90	.90	1.05	1.32	1.40	1.40	1.40	1.46	--	--	--	--	
1972	--	--	1.25	--	--	1.50	1.18	1.15	--	--	--	--	
1973													
Average													

APPENDIX I-C Les Cayes Con't.

BANANAS

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	3.00	3.66	3.33	3.50	3.87	4.00	4.00	4.16	4.00	4.00	4.00	4.00	3.79
1969	4.00	4.00	5.00	5.00	5.00	--	--	5.50	--	4.00	4.00	4.00	4.50
1970	4.00	4.00	4.12	4.12	4.25	4.25	4.75	4.75	4.25	4.00	4.00	4.00	4.21
1971	4.00	4.00	4.12	4.00	4.00	4.00	4.12	4.00	3.83	4.00	4.00	4.00	4.00
1972	4.00	4.00	4.00	4.00	4.25	5.00	5.00	4.50	4.00	--	--	--	4.31
1973													
Average	3.80	3.93	4.11	4.12	4.27	4.31	4.47	4.58	4.02	4.00	4.00	4.00	

CARBON

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1968	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	4.00	4.00	4.00	--	--	5.00	--	5.00	5.00	5.00	4.44
1970	5.50	6.87	6.20	6.00	6.00	6.50	5.75	7.00	7.00	7.00	6.37	6.00	6.85
1971	6.50	6.00	6.00	6.00	6.00	5.66	6.00	6.00	6.00	6.00	6.00	6.00	6.01
1972	7.00	7.00	8.00	8.00	8.50	9.50	7.00	6.00	6.00	--	--	--	7.44
1973													
Average	5.40	5.57	5.64	5.60	5.70	6.42	5.69	5.60	5.75	5.50	5.34	5.25	

APPENDIX II. Procedures for Calculating Index of Seasonal Variation and Index of Irregularity

Index of Seasonal Variation:

1. From a monthly price series, calculate the average price for the first 13 months and enter the average price for the mid-month. Continue calculating the mid-month averages by dropping the first month and adding the succeeding month until the price series is exhausted.

2. Divide the monthly moving average into the original data for the same month and move the decimal point two places to the right to record precentage figures.

3. Add percentage figures for each month and divide by the number of observations for that month. You now have a monthly index of seasonal variation for the period covered by the data.

(Note: If the sum of the 12 monthly index figures is not equal to 1200, correct the index by dividing each of the 12 index figures by the average of the 12).

Index of Irregularity:

1. Compute the difference between the precentage figure calculated in step 2 above and the index of seasonal variation for the same month. This may be a plus or minus figure, but the sign is ignored. Do the same for each percentage figure calculated in step 2 above.

2. Compute the average of the above differences for each of the 12 months. You now have an index of irregularity.

3. For each month, add the index of irregularity to the index of seasonal variation to obtain an upper limit and subtract it in the same manner to obtain the lower limit. The band created by the upper and lower limits will contain approximately 68 percent of the variation which would normally be expected to occur in the data series.

APPENDIX III. Index of Seasonal Variation and Index of Irregularity for Rice, Beans and Corn.

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III-C-1	Port-au-Prince	54
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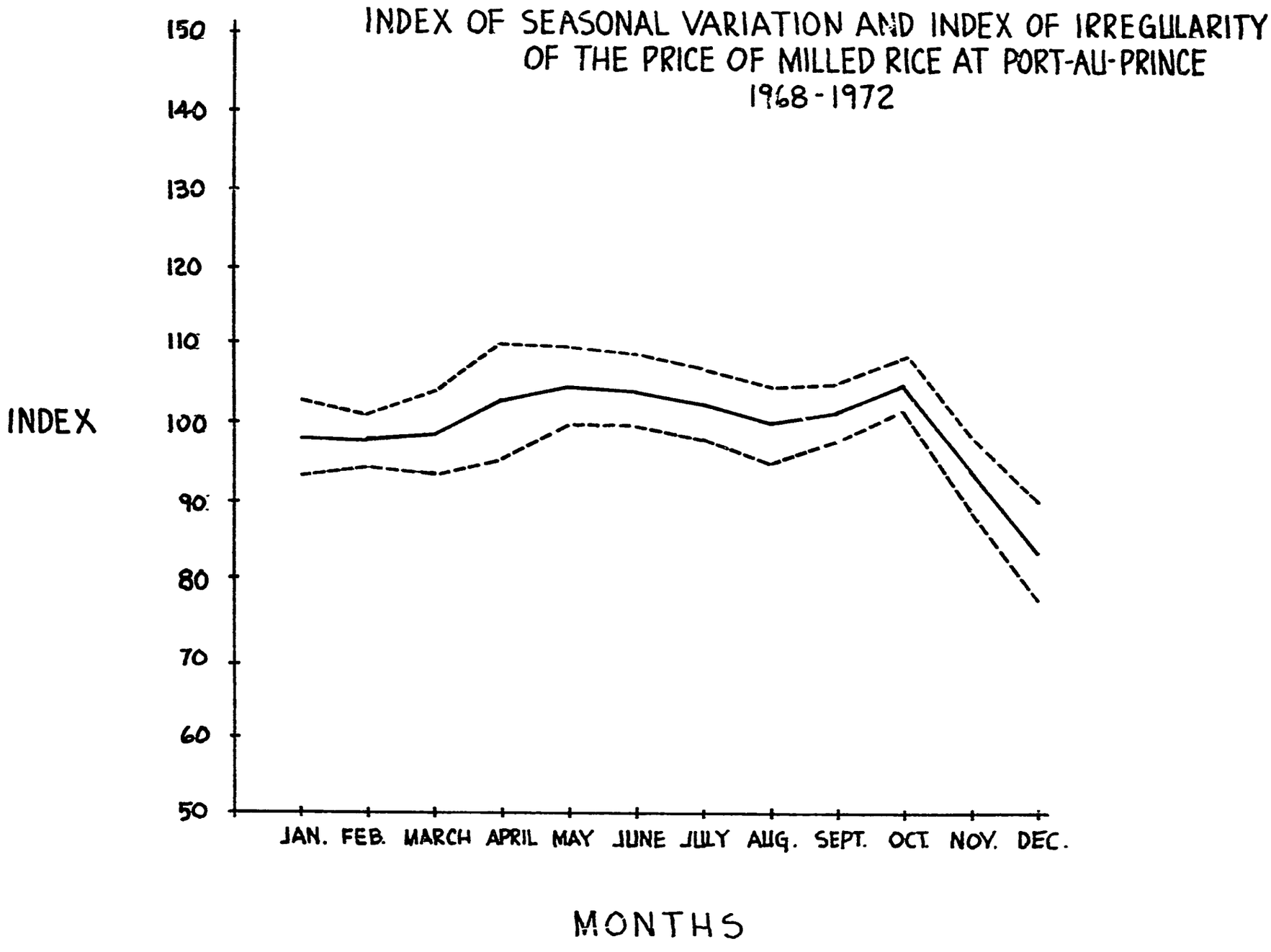
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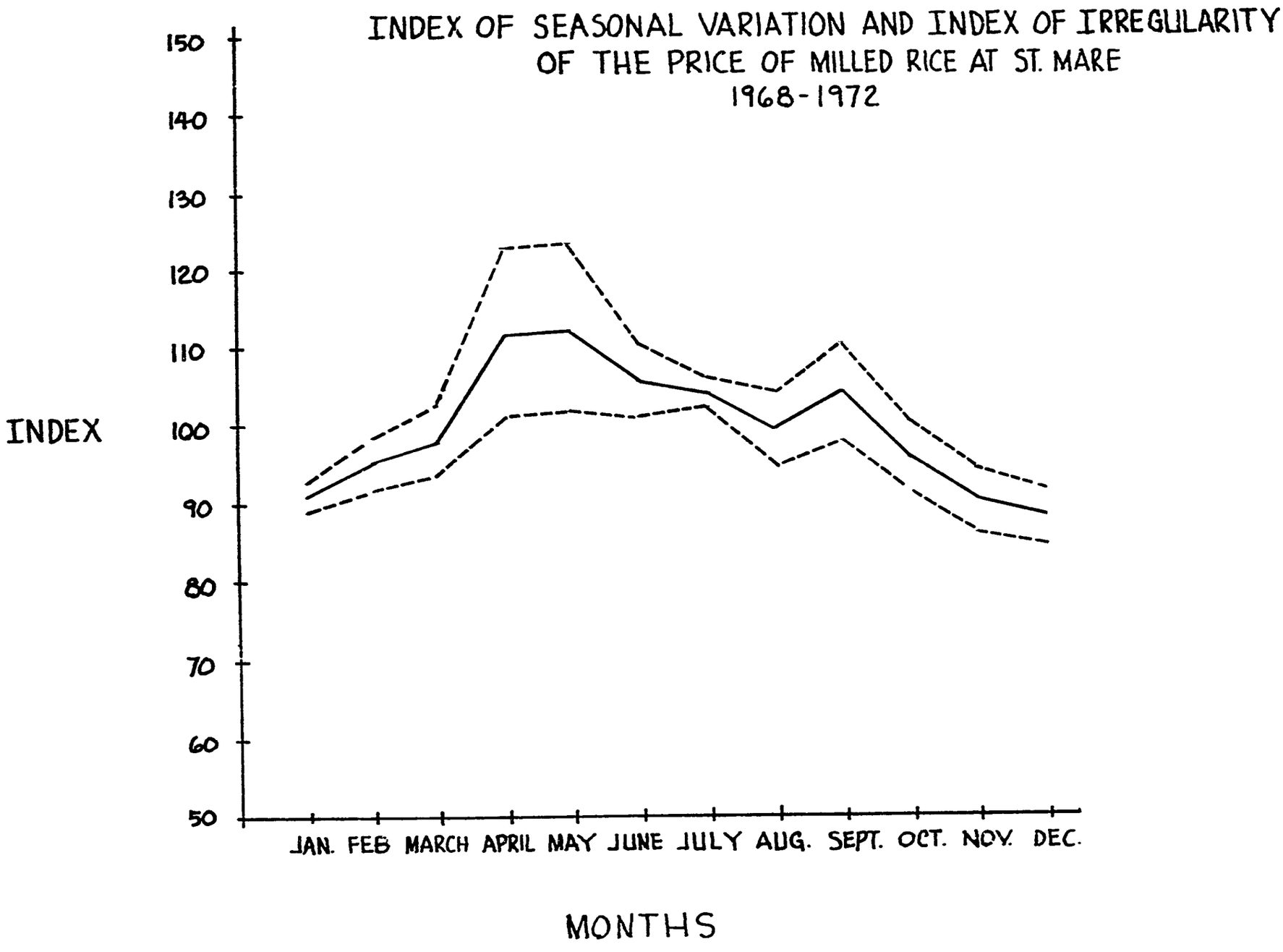
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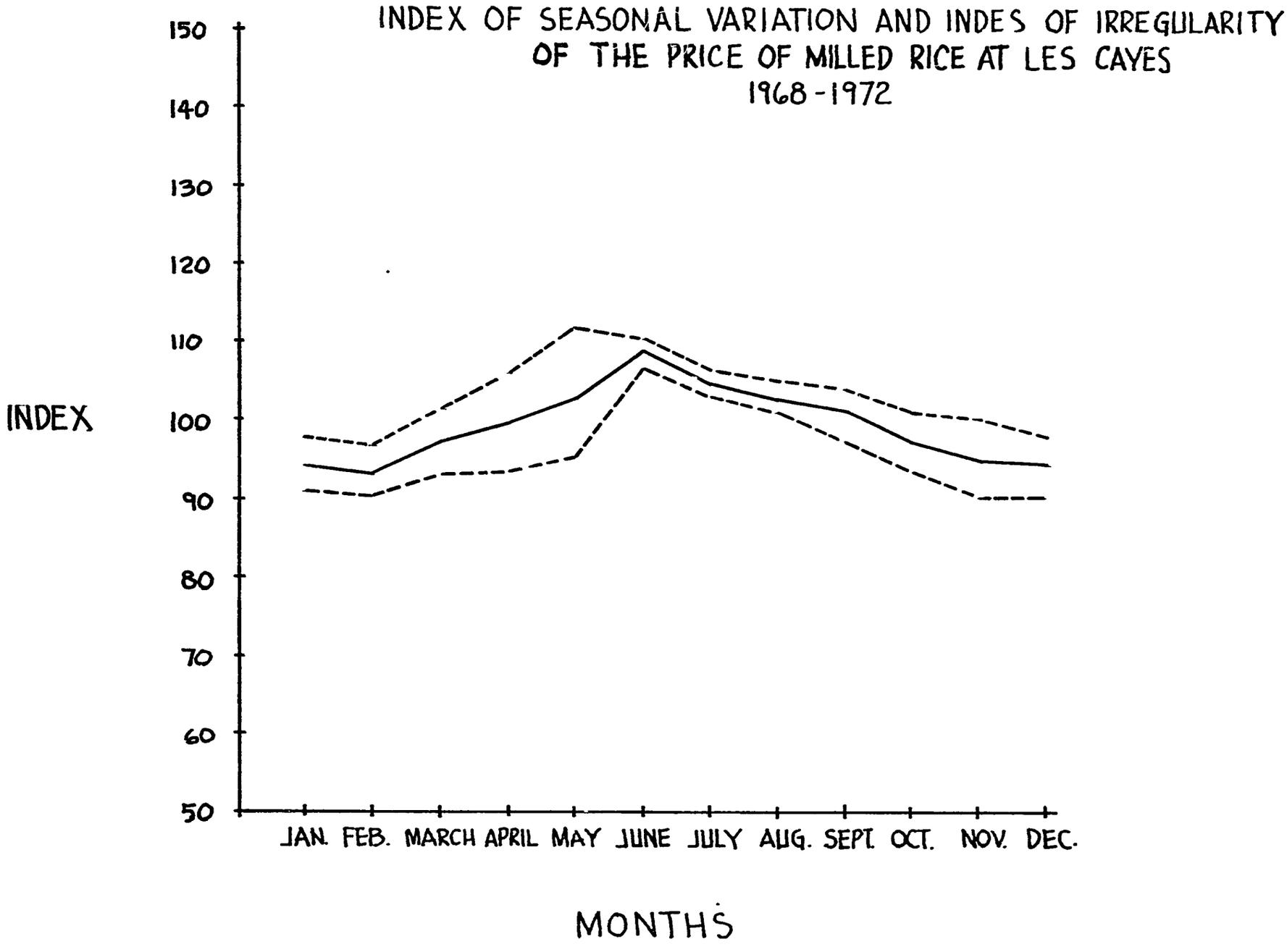
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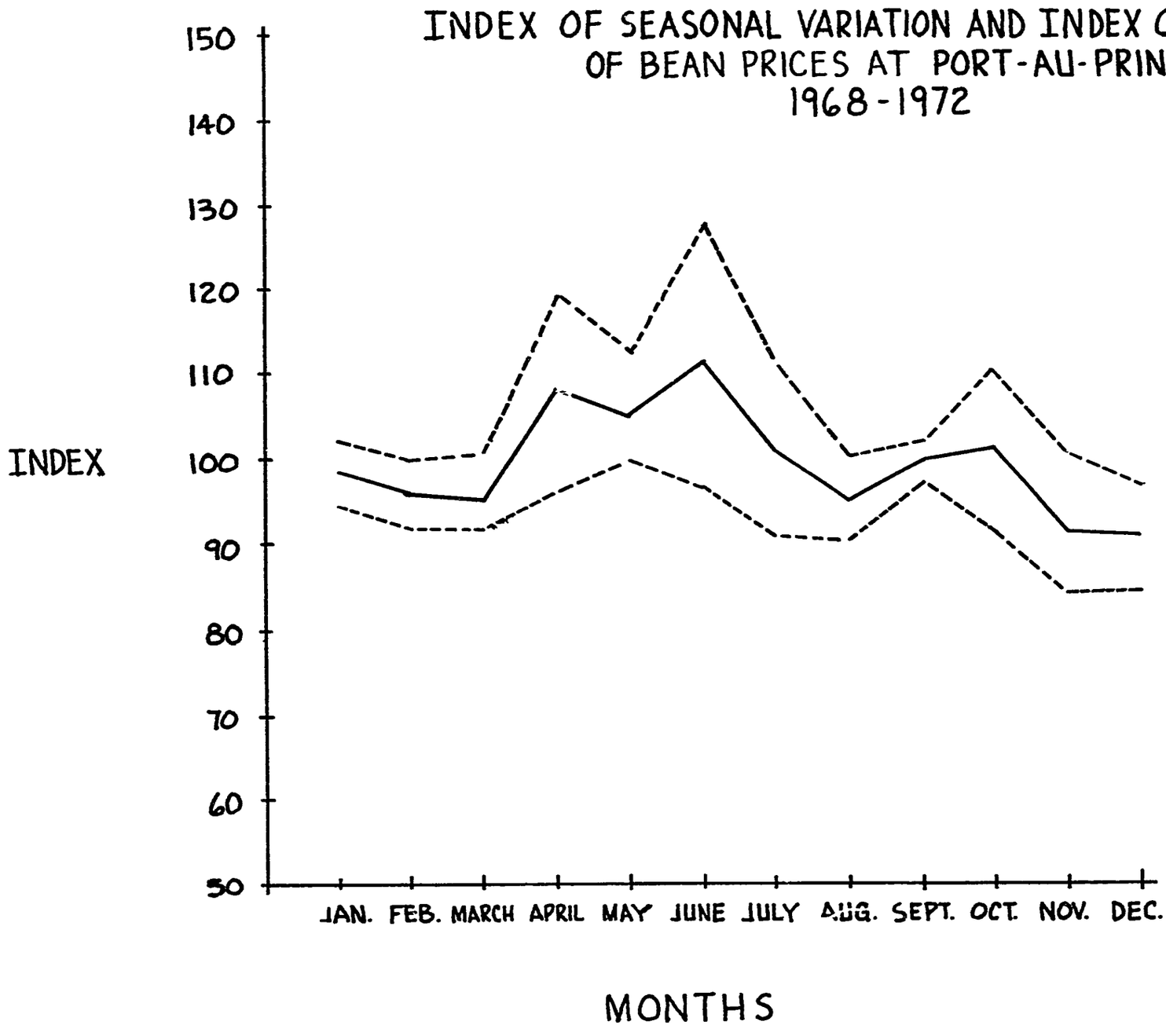
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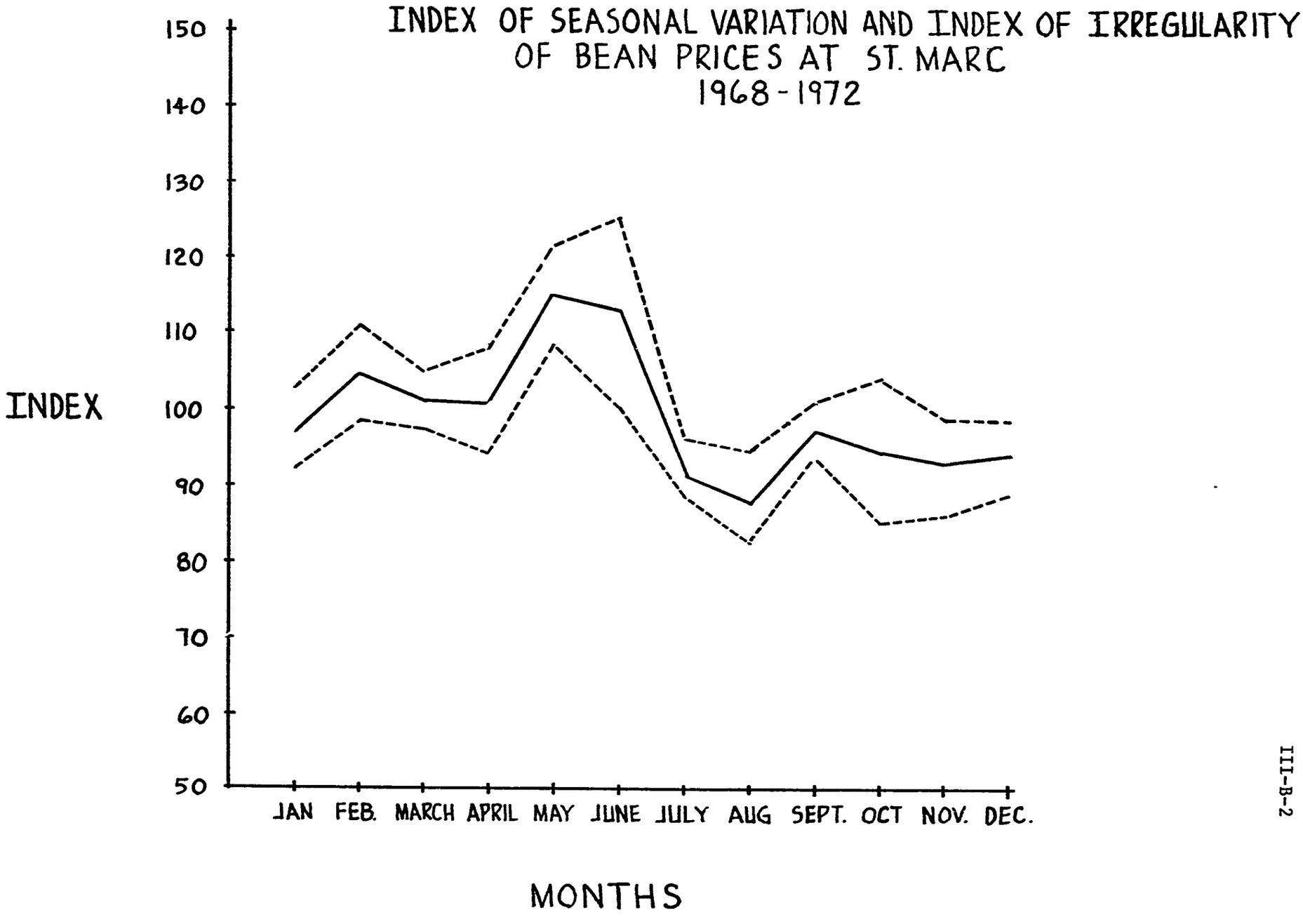
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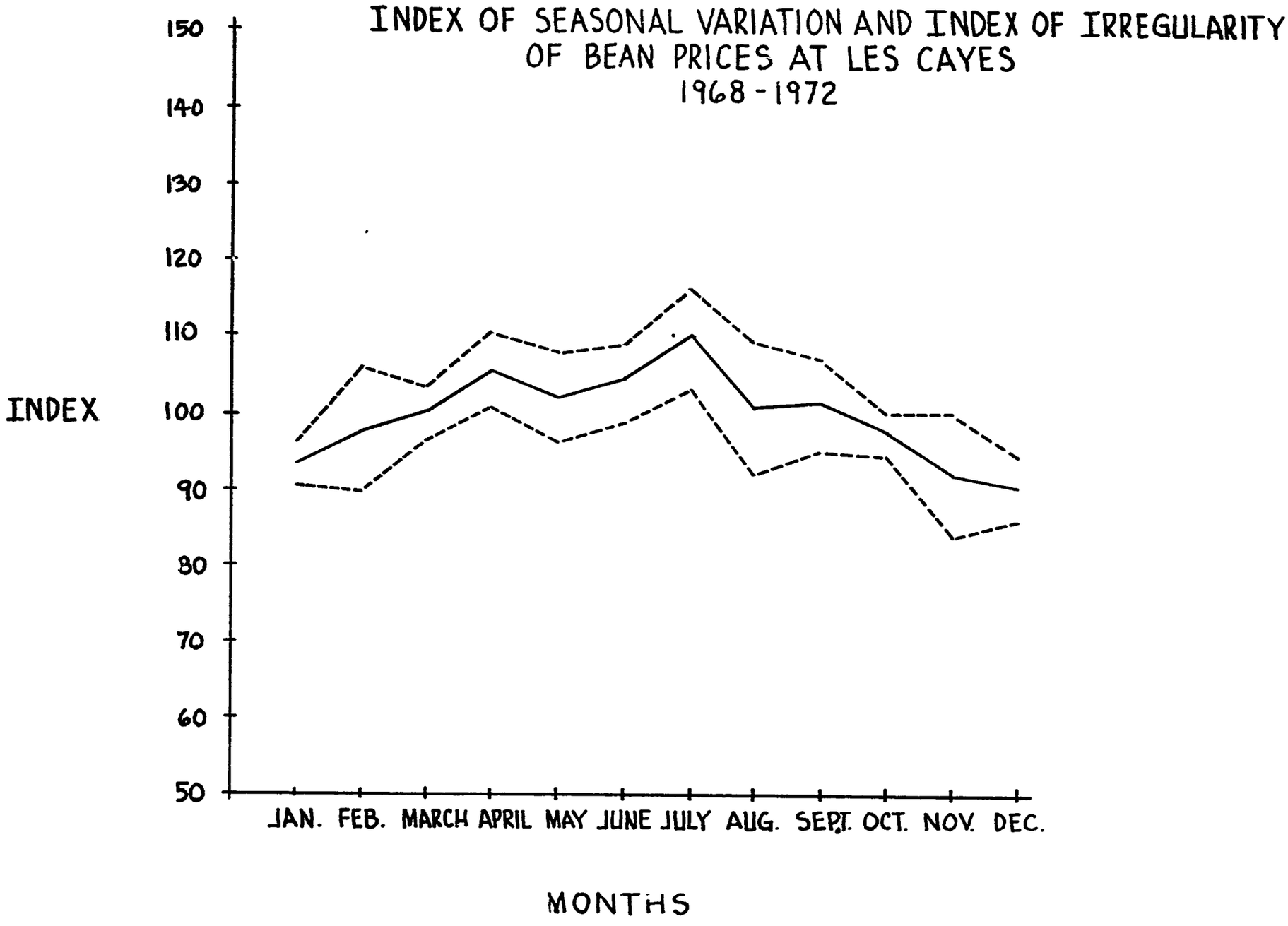
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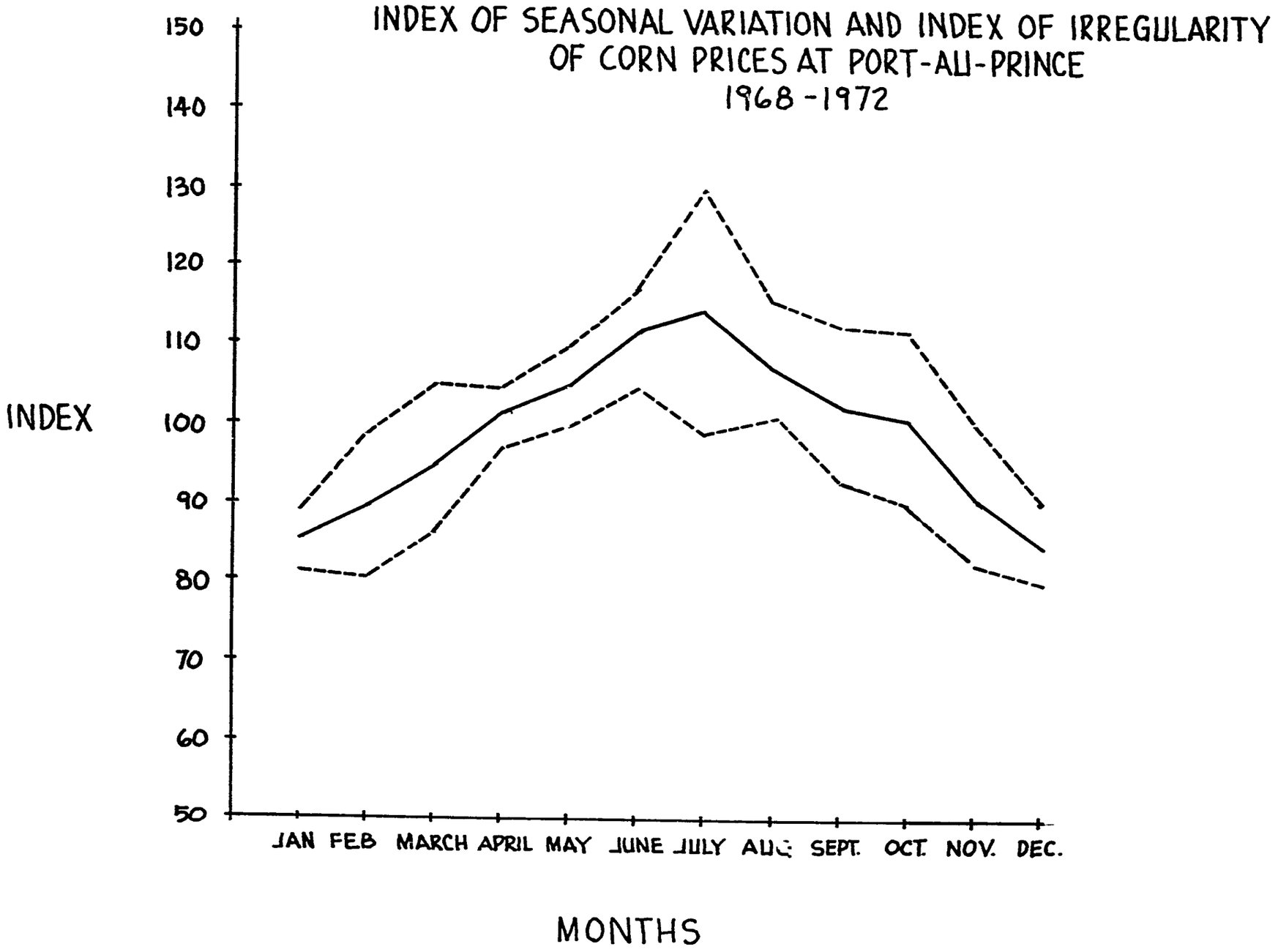
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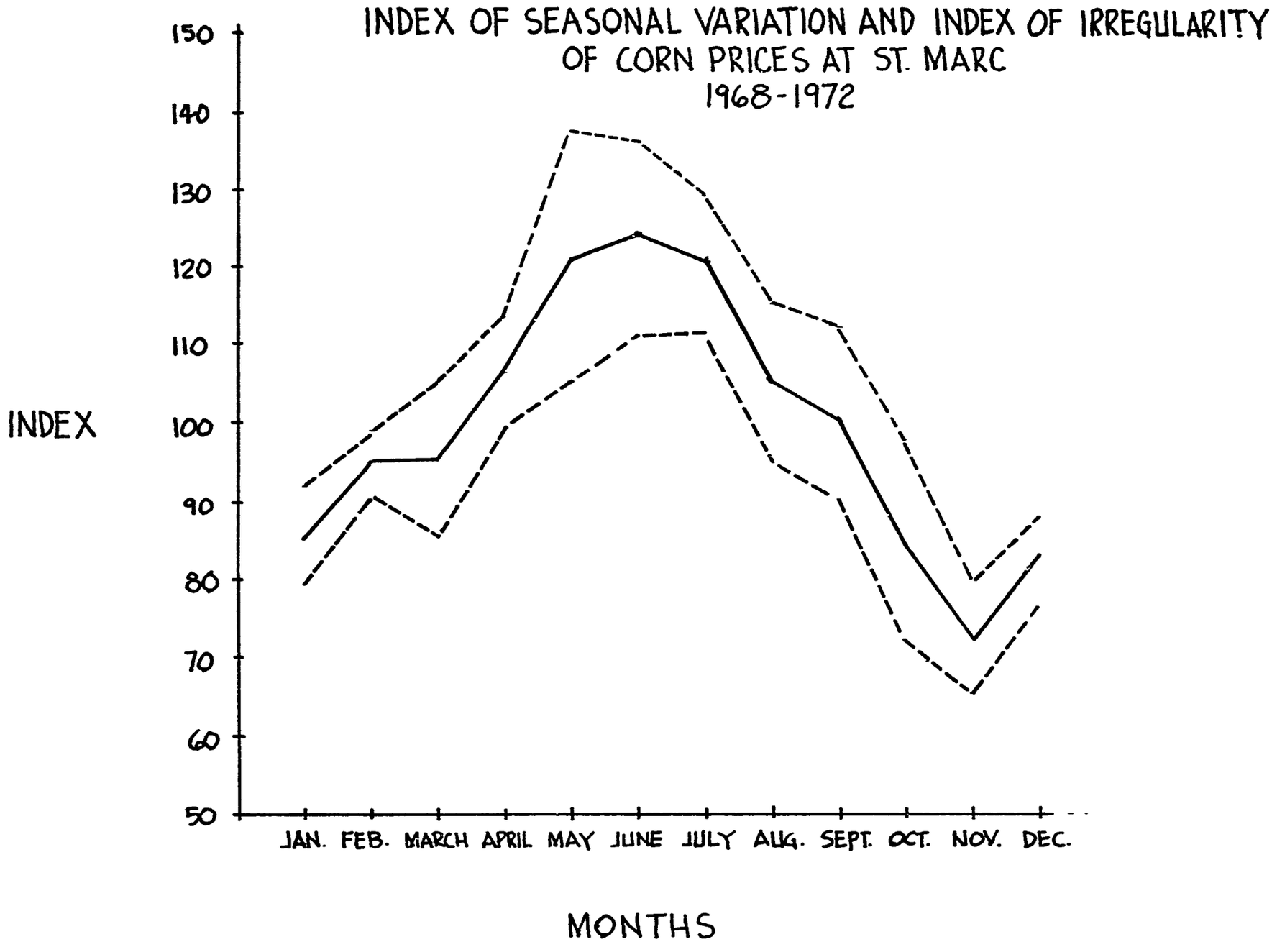
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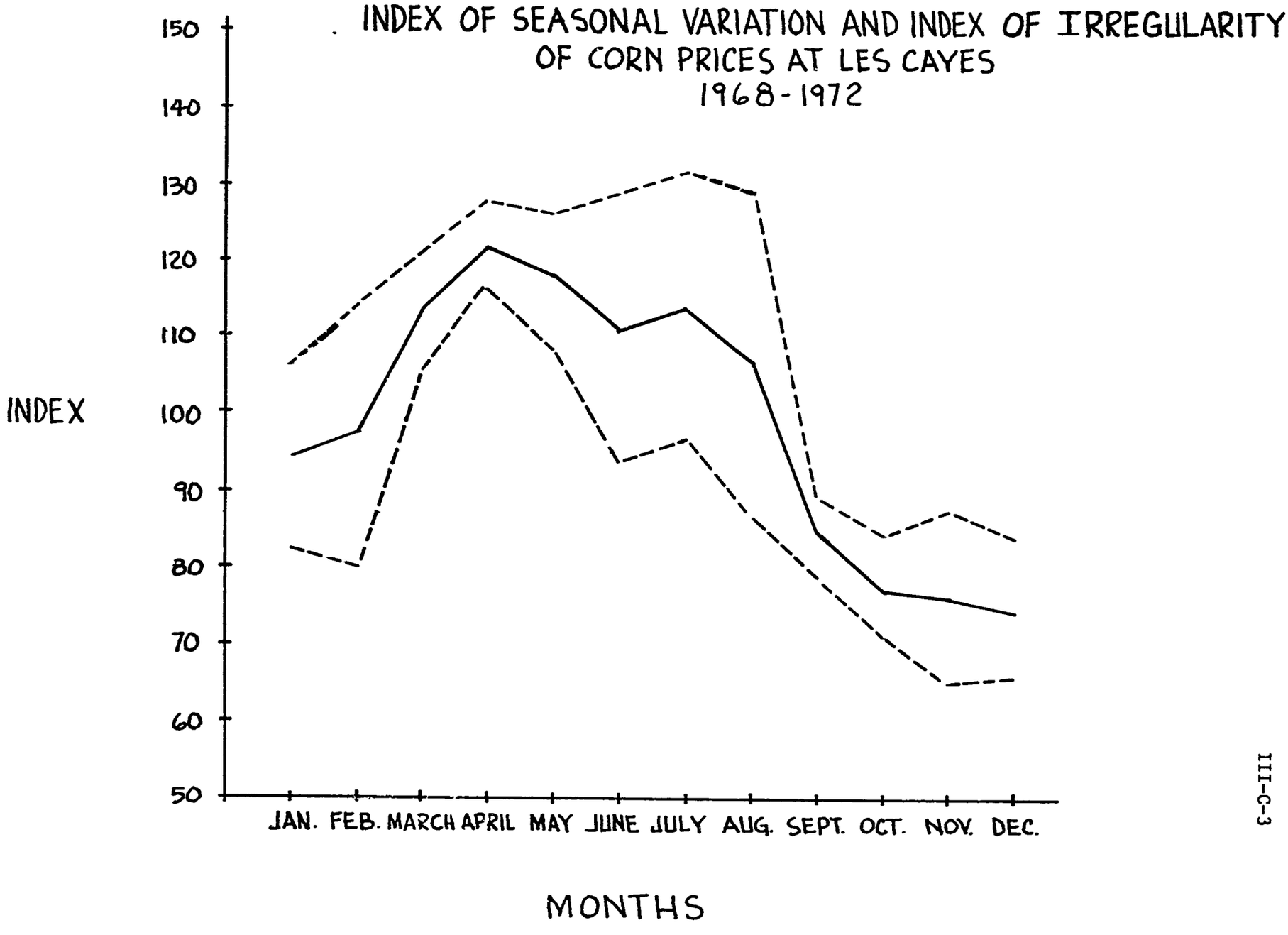
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