

Fertilizer Policy Research Program for Tropical Africa

**Structural Constraints and Maize Marketing Efficiency
in Ghana: Implications for Increased Fertilizer Use**

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**STRUCTURAL CONSTRAINTS AND MAIZE MARKETING EFFICIENCY IN GHANA:
IMPLICATIONS FOR INCREASED FERTILIZER USE**

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SUMMARY

Ghana has a comparative advantage in maize production at the farm level. This comparative advantage is however lost at the retail level due to high marketing costs. Therefore the overall comparative advantage (to trade) of a country, depends both on its production structure and its internal marketing structure.

The classic definition of a market, describes the marketing functions as buying, assembly, financing, transporting, grading and standardization, provision of market information, storage, processing and selling. In Ghana, buying and selling are well-known to most market participants as marketing functions. The supportive functions of assembly, financing, grading and standardization, and provision of market information are yet to be fully developed into the marketing system in Ghana.

Lack of required data restricted the depth of the analyses. Even then the available data had to be handled with care due to questions of reliability.

The Ghanaian maize market can be classified as being efficient given the constraints. The identified constraints to increased marketing efficiency include:

- (1) Inadequate post harvest management: use of inefficient methods for storage,
- (2) Insufficient marketing and trade outlets to absorb increases in supply at harvest,

- (3) Lack of marketing intermediary,
- (4) Lack of information on supply and price conditions to market participants,
- (5) Inadequate rural infrastructure such as feeder roads and extension services,
- (6) Lack of credit facilities to farmers and market participants.

This situation leads to low producer prices, high marketing costs, high retail prices and inability of the market to handle rapid increases in supply, resulting from a widespread adoption of fertilizer-seed technology, without significant decreases in price. Policy actions have to be initiated to remove the structural constraints outlined above.

1. INTRODUCTION

Although the potential exists for increased maize production with increased use of fertilizer, traditionally, increases in production have had adverse effects on price. The principal objective of this study is to identify the constraints to increased efficiency in the Ghanaian maize market. Recommendations are then made as to government policies that would remove these constraints to enable the market to absorb increases in supply, due to increased fertilizer use and other possible technological innovations, without the usual adverse effect on price.

Food marketing has been written about on several occasions in the local Ghanaian newspapers.¹ It has also been discussed at policy meetings as an issue of concern, thus reinforcing the timeliness of this study for policy makers.

BACKGROUND

Maize is one of the most important food crops in Ghana. It is present in most of the food staples and can be described as a major source of carbohydrates in the Ghanaian diet. Among cereals, the production and consumption of maize is higher (Figure 1.1). Given that maize is an important food staple, its importance in enhancing food security need not be overemphasized. As a source of carbohydrates, it can be combined with soybeans, which is an increasingly popular source of protein, to produce nutritious meals. These characteristics can be

¹Daily Graphic. Various issues, 1991, 1992.

said to pertain throughout Africa, making maize an important food item in Ghana and in most parts of Africa.

Increases in population imply the need to increase the production of staple foods. Natural disasters such as the recent drought in eastern Africa described as the "worst drought of the century" also point to the need to increase food production in western and central Africa so as to provide for shortfalls of production in the eastern and southern Africa. Successful intensification of production requires greater use of inputs such as inorganic fertilizers which provide about 40 percent of nutrients for the world's crops.²

Some schools of thought have pointed to the misuse of fertilizer in Africa. However, according to the World Development Report, "In the developing world, low use rates and the consequent mining of soil nutrients are far greater problems than excessive and poorly managed fertilizer applications." Comparing fertilizer use in Sub-Saharan Africa with that of Asia in Sub-Saharan Africa grain yields average about a third those of East Asia. Differences in land quality are part of the reason, but so too is Sub-Saharan Africa's low fertilizer use -- less than one fifth of Asia's average."³ The continued use of fertilizer and improved farming techniques can double maize yields by 1995 (according to results from the Global 2000 program in Ghana), however some farmers are reluctant to adopt this yield-increasing technology.

²World Development Report 1992, 138.

³Ibid.

RESEARCH PROBLEM

One of the constraints to increased fertilizer use in Ghana can be identified in the area of marketing and distribution of the crop output. Historically, when production has been high, price has fallen and profits have decreased. Post-harvest losses also increase much with increased production.

Maize is an annual crop. Increased output leads to low prices, farmers grow less next season and there is a shortage, leading to an increase in price. Generally, barring the occurrence of natural disasters, periods of low prices have been followed by periods of high prices. There seems to be a Cobweb type cycle such as:

increased output >> decreased prices >> low revenues >> low farmer incomes >> declined moral and interest >> low input purchases >> low production next period >> increased prices next period >> increased output. This cycle is associated with increased price instability, income risk and the corresponding negative welfare implications.

The available time series data from 1961-88 (shown in Table 1.1 and illustrated in Figures 1.2, 1.3, 1.4 and 1.5) provide some evidence as to these effects. Increased yield in 1984, 1985 and 1986 (Figure 1.2) led to decreases in producer price (Figure 1.3). From 1983 to 1984, yield increased by 120 percent, leading to an increase in production by 305 percent (Figure 1.4). This increase in production led to a reduction in producer price of 53 percent. During this period of increased production, waste increased by 83 percent (Figure 1.4). Between 1984 and 1986 yield increased by 23 percent, however a decrease in area

cultivated by 35 percent, (Figure 1.5) led to a decrease in production of 20 percent. As a result of this decrease in production, producer price rose by 39 percent. When domestic production has been low, maize has been imported in large quantities as in 1978 and 1982 (Figure 1.6).

The rapid decrease in price associated with increases in production can be attributed to structural constraints to increased efficiency in the maize marketing and distribution system in Ghana. Enhancing maize marketing efficiency indirectly has positive food security implications.

THEORETICAL FRAMEWORK

Theoretically, efficiency refers to economic efficiency which denotes the situation of least cost operation, or obtaining maximum output from given inputs. Both technical and pricing efficiency are implicated (Bressler and King 1978, 403). A second aspect of marketing efficiency is degree of price integration. These issues are considered micro aspects of marketing efficiency. The macro aspect of efficiency, as used in this study, refers to the degree to which the macro structures support the marketing system. These structures include the road and transport network systems, the storage system, the financial sector and government pricing and trade policies.

The competitive market framework has usually been used as the norm, in evaluating marketing efficiency and in identifying the constraints facing the existing system. Although this perfectly competitive world departs from the real world, it is often used as the norm because it results in the maximization of consumer and producer surplus. Deviation

from this norm leads to a redistribution of resources with some gains and some losses; however the total gains do not outweigh the total losses so that a redistribution does not make everyone better-off.

In analyzing commodity markets, prices are important since prices established through the marketing system transmit demands back to producers and also transmit supply conditions forward to consumers. For an efficient allocation of resources in the economy this transfer must be done with minimum lag, imperfection or distortion (Bressler and King 1978, 74). In this way, prices through a complex system of interrelated commodity and factor markets, become the primary directors of economic activity.

Using this framework, according to French (1977, 95), a marketing system can be defined as efficient if: (1) all the marketing firms are economically efficient; (2) the industry is organized to utilize capacity and to take full advantage of scale and locational economies; and (3) the industry operates under exchange mechanisms that generate prices which conform to the perfectly competitive market standards.

The importance of the underlying marketing and economic structure has been stressed by many studies, two of which are discussed here. Jones (1970, 176) states that the effectiveness of a marketing system depends on the rules formulated for its conduct by market participants and the state. Ladd (1983) also argues that efficiency is defined by the criteria and constraints imposed on the marketing system. The concept of efficiency adopted in this study is consistent with these

definitions.

OBJECTIVES OF THE STUDY

The general objective of this study is to provide useful information that could help policymakers formulate policies to increase maize marketing efficiency in Ghana. The specific objectives are to:

- (1) Obtain information about the structure and conduct of maize marketing in Ghana;
- (2) Assess government policy effects on the maize market;
- (3) Identify the macro constraints to increased marketing efficiency of Ghanaian maize;
- (4) Make recommendations as to structural modifications that are likely to improve maize marketing efficiency;
- (5) Derive implications for increased fertilizer use in Ghana.

Increased efficiency in maize marketing is important in order to make it possible for the market to absorb the possible increases in supply due to increased use of improved techniques such as fertilizer, without the usual adverse effect on price.

THE DATA AND ORGANIZATION OF THE STUDY

Both primary and secondary information are used in this study. The use of primary information is mainly to identify the constraints to increased marketing efficiency and to validate the observations derived from use of the secondary data.

The study is organized, aside from the introductory part, around five sections. Section II includes a review of literature on marketing efficiency issues and maize marketing in Ghana. Section III contains a description of the maize production and marketing network in Ghana. Past government policies and their effects on maize marketing are analyzed in section IV. Section V is an identification of constraints faced by the current maize marketing set-up. Policy recommendations to improve the present maize marketing set-up are presented in section VI.

2. LITERATURE REVIEW

The review of literature includes: (1) studies on markets and marketing efficiency issues by Ahmed, Alderman, Badiane, Bressler and King, Delgado, French, Harriss, Heytens, Jones, Kilmer, Ravallion and Southworth, (2) domestic (Ghanaian) literature on marketing of food commodities, especially grains with among others, studies by Asante et al., Asuming Brempong et al., Nyanteng, Okyere and Oteng.

Based on the findings of these studies, they can be classified into two groups. The earlier studies conducted in the 1960s have usually found the marketing systems studied to be inefficient. The traditional food marketing system was criticized and blamed for the high price of food, shortages and spoilage.

Recent studies conducted in the 1970s have found some of these traditional markets to be efficient, given the constraints. The high retail prices mainly reflected the high marketing costs. There have not been many studies analyzing marketing efficiency in the 1980s, the few studies have confirmed the views of the 1970s that these markets are efficient given the constraints.

Yawson's (1979) study found the Ghanaian maize market to be competitive. There were many buyers and sellers, none of whom had the ability to single-handedly affect price. Any non-market influences on price was from the government.

Comparing the current with previous problems faced in the food

marketing system, it is deduced from the study by Nyanteng and van Apeldoorn (1971) that the farmers' problems in food marketing seem not to have changed over the years. The solutions to their problems can however be approached differently within the context of structural adjustment and liberalized markets: emphasizing issues such as private participation, while limiting government participation especially in handling of the produce.

With respect to problems of marketing in other African countries. In Tanzania, in the 1950s, marketing of maize was initially handled by cooperatives. By the mid-1960s it was realized that their operating costs were high. They employed excess labor, paid excess rates for service, and losses from handling, storage and transportation were high. By the late 1960s the marketing function was turned over to government parastatals. Costs continued to rise as parastatals suffered from mismanagement and operational losses. In 1980, the issue of reinstatement of cooperatives was discussed and by 1982 legislation was enacted for the reformation of cooperatives. In general private participation in food marketing is more predominant in Asia than in Africa (Ahmed and Rustagi 1987, 105).

The first set of literature on marketing efficiency studies have mainly analyzed the micro aspect of marketing efficiency alone, treating the macro aspects as given. Their emphasis have been on measuring market integration. Some attempts have also been made to quantify marketing efficiency. Their findings have been that the micro indicators show that the markets are efficient. The argument

pursued by this study is that in the case of Africa, adjustments or modifications in the macro structure are necessary to enhance the micro indicators of efficiency.

The focus of this research is therefore to identify the structural constraints to increased efficiency and their effect on marketing channel costs; and not in determining or quantifying the extent of marketing efficiency per se. Efficiency as discussed in this study would be a relative term: relative to maintaining the status-quo ante.

3. MAIZE PRODUCTION AND MARKETING IN GHANA

MAIZE PRODUCTION IN GHANA

Maize cultivation is largely rain-fed. Based on the rainfall pattern there are two seasons, the major and minor. The major season for maize cultivation starts with land preparation in December, January or February. Planting is done in March or April. Dried maize is then harvested in August. The minor season begins with land preparation in August or September. Planting is in September, and harvest is in February. Among other factors, harvested output is dependent on the amount and spread of rainfall.

Maize is grown to some extent in all the regions in Ghana. Regional production data (Figure 3.1) indicate that the major maize producing regions are Brong Ahafo region (18%), Northern region (17.1%), Eastern region (16.1%) and Ashanti region (14.5%). The area cultivated shown in Figure 3.2, also confirms this observation.

Eighty-five percent of Ghana's agricultural land is cultivated by small-scale operators who farm less than two hectares, using mainly traditional labor intensive methods.⁴ Most of the maize in Ghana is produced by small farmers (households) on small, non-irrigated farms. Some of these farmers are mainly multi-croppers, their costs of production for maize are therefore difficult to assess. Unlike

⁴Ghana, Ministry of Agriculture. Policy, Planning, Monitoring and Evaluation Department (PPMED). 1991. Accra.

commercial farmers the problems of this group are unique and require close study.

Maize production in Ghana is on an upward trend (Figure 1.4). Acreage cultivated has also increased (Figure 1.5). With yield per hectare almost unchanged (Figure 1.2), it can be said that the increase in output is mainly from increased land use. Not much has been made of the potential for increasing output per unit land through increased use of fertilizer. There is therefore very high potential increase in maize output through increased use of fertilizer.

Another potential source of increased output is the development and use of improved seeds. After years of research, improved varieties of maize have been developed. These new varieties with shorter maturity dates, higher yields and improved characteristics are presented in Table 3.1. Most of these have not yet been presented to farmers.

It is important that characteristics of improved varieties of maize be coordinated with the tastes and preferences of end users. There have been cases whereby after research into improved varieties they were not acceptable to maize processors such as kenkey makers, (Yawson 1979).

There are potential increases in maize production due to increased fertilizer use. However, unless there is improved efficiency in marketing of maize, the increased supply is likely to have adverse effects on price and total revenue. Compared to other Sub-Saharan African countries, the unit cost of maize production is

low, implying that Ghana has comparative advantage in maize production at the farm-gate level (Asuming-Brempong et. al, 1991).

POST-HARVEST MANAGEMENT

With the increase in production, post-harvest losses have also increased (Figure 1.4). Post-harvest management is therefore an important issue. The processes involved in post-harvest management are explained below. In the harvesting of maize, the shell is broken from the plant. This product is ready for the fresh corn market. For the other uses, the shell has to be dried.

Thereafter, the shell surrounding the cob is then removed. This is sometimes called shelling. Further drying is done after which the dried maize grains are removed from the cob. After removal from the cob the maize grains are spread and then dried further to lower the moisture content. The dried maize grains are then ready for further processing, storage or marketing.

MAIZE MARKETING

Maize is mainly sold on the domestic market. Utilization in the domestic market is mainly for food and some commercial use in the manufacture of poultry feed. The participants in the Ghanaian maize market can be described as farmers, wholesalers, middlemen and retailers. A description of the maize marketing network is shown in Figure 3.3.

MAIZE MARKET STRUCTURE

The components of market structure are seller concentration, buyer concentration, degree of product differentiation and conditions of entry and exit into the maize market.

Seller and buyer concentration is not restricted by any barriers to entry and exit specific to the maize market. Product differentiation is practiced mainly by kenkey sellers based on ease of preparation, realized texture of their output and consumer response. There are no perceived conditions to entry and exit in the Ghanaian maize market.

MAIZE MARKET CONDUCT

The elements of interest in maize market conduct include the mode of output and price determination. Output levels are mainly farmer determined without any restrictions. With respect to price, until recently there was a guaranteed minimum price which was still optional and pertained to less than ten percent of total sales.

PRICE DISCOVERY AND ITS CHANGES

Individual farmer production levels are low and not likely to influence market price. Oligopolistic behavior is therefore minimal. The maize produce in one area is homogeneous to some extent barring slight differences in variety. The farmer does not fix price, to a large extent he is a price taker. The practice of haggling may cause the price received by some farmers to differ slightly.

Three price differentials can be identified in the Ghanaian maize

market: (1) inter-annual price differences, (2) intra-annual price differences, and (3) spatial price differences. With respect to intra-annual price differences, price of maize is lowest at harvest and highest in the month just before harvest. The factors affecting this price spread include the extent of perishability, availability of storage, imports, seasonality in production and duration of harvest (Nyanteng 1978, 11). From the monthly maize price schedule in Figure 3.4, maize price in Ghana reaches its peak in May-June and declines to its lowest level in September-October.

Spatial price differences also occur as prices are lower in the areas near the producing area. The margin is explained by the cost of handling and transportation. In Ghana, the cost of transportation of food accounts for as high as 70-80 percent of the marketing margin (Nyanteng 1978, 13).

Previously, in order to dampen the intra-year price fluctuations, the government set minimum prices to farmers. At harvest, the Guaranteed Minimum Price (GMP) is higher than the open market price. At this time the government makes purchases of maize. On some occasions, the government had no money to make full purchases of farmers' offers. A few weeks after harvest, the open market prices increase rapidly to exceed the guaranteed minimum prices, at which time the government sells off its stocks.

A study by Okyere (1990) on the GMP scheme concluded that it was not effective as an income and price stabilization scheme. Among the reasons was that it covered only ten percent of the farmers and handled

about three percent of total maize production. Substantial amounts of money are needed to purchase maize at harvest, if coverage is to be increased. Apart from this problem, the purchasing program was sometimes badly timed. The GMP system has since been abolished.

The farm gate price can be broken into unit costs of production plus a margin of about fifteen percent. The wholesale price comprises of the purchase price plus a margin of about twenty-five percent. The retail price comprises of the purchase price plus a margin of about twenty percent (Yawson 1979, 4). The wholesale market therefore carries the largest margin which may be commensurate with costs at that level.

For maize, with the same destination (Accra) and different sources (Mampong and Techiman): the marketing cost was 18.58 from Mampong and 21.76 from Techiman. The margins were 2.02 and 1.84 respectively, even though the Mampong passed through three intermediaries while the Techiman maize passed through four (Tables 3.2 and 3.3). As a percentage of retail price, the margin of Techiman maize was 2.6 percent and the margin of Mampong maize was 2.8 percent (Ghana 1988). These margins are low compared to those obtained in the non-agricultural sector.

MARKETING COSTS

Ghana's comparative advantage in maize production is lost due to a marketing system with high marketing costs. There is a high cost in performing the necessary marketing functions to transfer maize from the farm gate to the urban retail markets. This high marketing cost is attributed to high cost of transportation, and poor and inadequate

storage facilities among others. Eventually the total marketing costs have been found to constitute about 70 percent of the final retail price. The composition of farmers', wholesalers' and retailers' marketing costs are discussed in the next few paragraphs.

Farmers' marketing costs can be broken down into three components: costs associated with the buying and selling function, storage costs and transportation costs. Costs associated with buying and selling include local council tax, agent's commission, stall rent, jute bag for packaging and market tolls. Storage costs include cost of barn construction, maize stacking, purchasing of chemicals and storage losses. Transportation costs include charges for movements of maize from one place to another and loaders and unloaders fees.

Wholesalers' marketing costs include transport charges, loading and unloading charges, commission for purchasing agents, warehouse charges, administrative costs and market tolls. Retailers' marketing costs include transportation costs, labor costs (for headloading) and stall rent.

High marketing costs result in high wholesale/retail price margins. The high marketing cost is the result of factors such as: (1) the deplorable state of feeder roads; (2) high transportation costs due to high cost of operating and maintaining vehicles; (3) high cost of credit (interest rates) where available; (4) uncompetitive purchasing system due to some barriers to entry; and (5) high storage cost.

MAIZE STORAGE

Due to seasonality in production and year-round consumption, storage is important. Farmers currently perform this function on a small scale and are able to store maize for a period of three months to one year.

The traditional mode of storage involves the use of barns constructed with bamboo or other wood. These barns are supported above ground by wooden sticks fitted with rodent baffles to prevent rodent attacks. Some farmers fumigate their maize while in the barns with lindane, DDT or ethylene dibromide dust or liquid. Other farmers use smoke to fumigate by setting fire underneath their barns at intervals of two or three weeks. The traditional maize crib lacks good ventilation, is too wide and is susceptible to rodent attacks.

Research has led to improvements in the design of the traditional storage system to derive the "improved maize silo" and the "improved maize crib". Both of these structures are designed to reduce storage losses by improving ventilation and reducing attacks by fungi and rodents. The difference between the silo and the crib is that the former is for indoor use whereas the latter is for outdoor use.

The improved maize silo has a capacity of about half a ton (4.5 maxi bags). It can be made from plywood. Dried maize grains are treated with Actellic and stored here through the lean season. The use of Actellic reduces attacks by an insect called the "Larger Grain Borer."

The improved maize crib can be made from sawn timber or bamboo. Maize on husk are stored here for two to three months to dry. They are dehusked, treated with Actellic, put in sacks and stored in the crib through the lean season. They can be built to any size however for proper ventilation the width must not exceed 1.5m with the long side facing the wind. To prevent rodent attacks the supporting stilts must be at least one meter from the ground and must have rodent guards. The use of these improved storage methods can hold some produce to the lean season with reduced storage losses.

MAIZE IMPORT

Sometimes maize has had to be imported to provide for shortfalls in domestic production. Maize is not a major food import for Ghana; wheat and rice are the major food crops imported into Ghana. Government policy has been towards restricting maize imports except where necessary.

The maize import schedule is illustrated in Figure 1.6. From 1961 to 1975 imports were below 10,000 metric tons. Imports rose sharply from 1975 to peaks in 1978 and 1982 to compensate for shortfalls in domestic production. The periods from 1976 to 1985 saw imports of maize above 10,000 metric tons. There were no imports in 1985 and 1986; after 1985 imports have been low.

MAIZE EXPORT

Maize is mainly sold on the domestic market with little export (in good crop years). There exists some potential for export within the sub-region given Ghana's comparative advantage in maize production. Unlike other export crops such as cocoa and coffee, maize is an annual crop, thus is more flexible to supply management.

Trade in maize, especially within Sub-Saharan Africa, is important for achieving economies of scale in domestic production with its associated cost advantages. It is also a source of foreign exchange, an important ingredient for economic growth and development.

In the absence of a well coordinated food trading system within Sub-Saharan Africa, since 1988 most of the increases in supply of maize produced in Ghana have remained within the nation's boundaries. This reflects on the domestic market as excess supply, thus dampening maize producer prices. The world price of maize was high in 1982-83 but fell sharply to a fourteen year low in 1987 (Figure 3.5). As with most agricultural commodities produced in Sub-Saharan Africa, in the wake of falling world commodity prices, export potential can be maintained only by reductions in cost of production and marketing (Amuah 1991).

Bad weather conditions in East Africa during the first half of 1992, described as the "drought of the century", created an avenue for Ghana and other West African countries to export maize to the East. If well coordinated, such interregional flows during bad weather in some parts, will enhance food security on the continent. Information on weather, supply conditions, prices and exchange rates is the key to

effective planning for both governments and private entrepreneurs.

CAPITAL AND CREDIT

A major factor inhibiting the adoption of improved farming and marketing methods is lack of capital. Provision of credit is therefore an important efficiency-enhancing factor. Most farmers obtain credit from retailers on condition that they would sell their produce to them. The final price of the produce negotiated may be low. Commercial bank interest rates for agriculture are one or two points below that given to other prospective debtors, however their collateral requirements are difficult to meet, especially by landless farmers. A more favorable formal credit system would be useful to farmers and other participants in the marketing channel.

4. GOVERNMENT POLICY AND INSTITUTIONAL EFFECTS ON MAIZE MARKETING

GOVERNMENT POLICY OBJECTIVES

It has been the objective of governments of Ghana to reward farmers with "fair" remunerations for their food crops. This producer price incentive aims at sustaining increased food production domestically to meet increasing domestic demand. A second objective is to improve the standard of living for the majority of Ghanaians whose incomes depend on revenue from sale of their food crops.

A seemingly contradictory objective is to make food prices affordable to urban workers, given the low salaries. This objective is mainly to avert political strife in the politically volatile urban centers. The simultaneous achievement of the producer price incentive and consumer welfare objectives requires the adoption of strategies aimed at enhancing food crop marketing efficiency so that food can be provided to consumers at least marketing cost.

In terms of enacting government policy, cereal marketing can be said to have received special attention. Maize and rice are the two cereals that benefitted from the guaranteed minimum price scheme. Some other government policies that affect the marketing of cereals include: (1) construction of feeder roads, (2) provision of storage facilities, (3) extension services for post-harvest management, (4) subsidies and credit to marketing intermediaries, (5) price controls, and (6) buffer stock and food security strategies. These tasks are implemented by

various governmental agencies.

GOVERNMENT AGENCIES

The Department of Feeder Roads under the Ministry of Roads and Highways is the government agency directly responsible for the implementation of feeder road construction and rehabilitation.

The Ghana Food Distribution Corporation (GFDC) and the Grain Warehousing Company (GWC) are two parastatal marketing intermediaries under the Ministry of Agriculture (MOA). They operate alongside the private sector intermediaries. The GFDC and GWC implement government buffer stock strategy, provide storage facilities. GFDC operated price controls such as the guaranteed minimum price (GMP) scheme for maize and rice inter alia that were abolished in September 1990.

The Policy, Planning, Monitoring and Evaluation Department (PPMED) of the MOA analyzes the impact of various policy options, and makes recommendations to policymakers (Ghana 1990, 53). The statistical and marketing sections of PPMED collect and provide data and marketing information on food crop marketing.

The Crop Services Dept and Extension Services units under the MOA has a section responsible for the provision of post-harvest management extension services.

The Commercial Banks and particularly Agricultural Development Bank (ADB) and lately, the rural banks are responsible for the provision of institutional credit for food crop marketing.⁵

⁵ Ghana 1990, sections 3.23-3.24:44-45.

GOVERNMENT POLICY CHANGES AND THEIR EFFECTS

Until 1986, agricultural development strategies have been focused on increasing national food-crop production. The use of the nation's scarce resources to promote increased output has led to deterioration in the marketing infrastructure and parastatal agencies involved in food-crop marketing.

Food-crop marketing is gradually being shifted into the hands of the private sector. The private sector made up of small-scale market women, handle about 90 percent of maize marketing surplus currently, with the parastatal handling about 10 percent (Asante et al, 1989).

Since 1988, producers and the parastatals have encountered problems of unsold stocks from previous production periods. It became obvious that the current marketing system could not handle the increasing marketable surplus of food crops, notably maize, because national output exceeded the capacity of the neglected marketing intermediaries.

Most of the feeder road network presently remains unusable due to lack of routine maintenance. The most recent road condition data indicate that only one-third of the network is in good or fair condition (6900 km), while two-thirds (14100 km) is in poor or very poor condition.⁶

Poor roads, poor telecommunications and inadequate information network are constraints to increased marketing efficiency. In this situation transportation costs add appreciably to marketing cost. A current study undertaken by MOA has revealed that transportation cost

⁶Ibid. Section 3.34:50.

forms about 70 percent of the margin between farm gate price and the retail price in urban centers.⁷ Efforts to improve intra-rural transport are in the 1991 Budget Statement and Economic Policy.⁸

Recent studies (Asante et al. 1989; Asuming-Brempong et al. 1991) indicate that the GFDC and GWC were facing problems such as:

-- insufficient funds to purchase cereals at the GMP which in times of excess supply (as has been the case for the past five years) made reselling difficult.

-- high cost of borrowed funds, inadequate transportation, and for the GFDC in particular, insufficient storage space.

The major constraint reported to be facing the private marketing intermediaries has been insufficient funds to operate on substantial scale and lack of institutional credit availability.

Among the problems facing the PPMED are lack of personnel and inadequate equipment. In 1990 it was recorded that PPMED has only 23 percent of the required number of staff most of whom require additional training.⁹

With the emphasis on food production, the extension services and crop services virtually remained dormant as far as post-harvest management extension services was concerned.

Through series of workshops and research studies on food-crop marketing towards sustainable agricultural production, the government of

⁷Ibid. Section 3.19:42.

⁸Ghana Budget 1991, section 3a:28.

⁹Ghana MTADP 1990, 53.

the PNDC with the assistance of international donor agencies developed the Medium-Term Agricultural Development Program (MTADP), launched on February 9th, 1990.

The 1991-2000 MTADP emphasizes the strengthening of agricultural support services including research, extension, storage, marketing. Other services include fertilizer and seed management, feeder roads and inter-sectoral links in processing.¹⁰

Under the MTADP, government aims at stimulating the public sector to play a role in ensuring that the enabling environment is maintained through:

(1) The creation of adequate infrastructure especially feeder roads and communication facilities for the smooth dissemination of market information.

(2) Promotion of efficient financial market to support commodity markets, through the increased availability of credit to traders, transporters, wholesalers, etc.

(3) Establishment of legal and institutional mechanisms for the standardization of weights and measures and guarantees of free entry into markets.¹¹

A National Feeder Roads Rehabilitation and Maintenance Project (NFRMP) has been launched which receives international funding as well as government funding. However, at the present rate of funding, which is about US\$5 million per annum from IDA, USAID and the Road fund,

¹⁰Ibid, v.ii:21.

¹¹Ibid.

rehabilitation of Ghana's feeder roads has been predicted to take more than 30 years. Under IDAs ongoing transport rehabilitation project 1, some 1800 km of feeder roads are expected to be rehabilitated between 1990 and 1992 in four selected zones.¹²

The other state agencies including the GFDC and GWC are undergoing reorganization. The GMP was abolished by the end of 1990, enabling the GFDC and GWC to operate more commercially as the private sector. More silos are being provided for GFDC to increase their storage capacity.

As a result of the restructuring and refurbishment, the PPMED has been strengthened. They are currently providing weekly market information on location of lowest prices and highest prices for various food crops in the national dailies and radio.

An Agricultural Research Development and Advisory Committee (ARDAC) has been constituted to improve the coordination of research and extension.¹³

With the assistance of Global 2000 and USAID funding, the post-harvest management unit has been created under MOA. This unit is providing extension services on improved traditional storage facilities.

Although there has been an improvement in credit availability with the inception of the rural banks, inadequate and lack of institutional credit occupies prime position among the constraints faced by the private marketing intermediaries.

¹²Ibid. Section 3.34:51.

¹³Ibid. Section 3.38:52.

MAIZE EXPORT POLICY

As a complement to strategies towards improving maize marketing efficiency under the MTADP, the government has put in place an export incentive package in line with its export diversification policy.

The key macro-economic policy measures that are in place to enhance exports includes:

(1) Exchange rate policy -- the introduction of realistic exchange rates has provided attractive price incentive to both producers and exporters of agricultural commodities.

(2) Liberalization of trade and foreign exchange transactions, control of inflation, and direct incentives.

The direct incentives which are aimed at making exports attractive includes the following:

(1) Exporters are allowed to retain 35 percent of their export earnings in foreign exchange accounts in Ghana or abroad. These earnings may be used for the importation of raw materials or for promotional purposes among other uses.

(2) Producers for exports are entitled to income tax concessions or a reduction of tax on profits ranging from 25 to 75 percent, depending on the percentage of the total production exported.

(3) The import of raw and auxiliary materials needed for export production are allowed duty-free entry.

Export procedures have been streamlined and export documentation minimized. The 32 separate steps needed in 1984 to export, have been simplified to 8 steps in 1990. The export license requirement has been

abolished since 1986 and replaced by the exchange control form A2, which could be obtained at the Ministry of Trade, Export Promotion Council, Bank of Ghana and the Commercial Banks.

Exporters enjoy export tax rebates, which is a percentage rebate of taxes payable on local production exported depending on the proportion of production exported. In the agricultural sector for instance, 5-15 percent of production exported attracts 40 percent tax rebate, 16-25 percent attracts 60 percent, and 25 percent and above production exported attracts 75 percent tax rebates.¹⁴

MAIZE IMPORT POLICY

Maize imports have mainly been at times of shortages. It is now possible to import selected agricultural commodities such as maize with prior MOA notification¹⁵. There are tariffs to control maize imports due to recent instances of domestic market gluts in maize.

Storage has sometimes been criticized as an expensive option, with imports being a cheaper alternative to meeting domestic demand during production shortfalls. The issue of whether government policy should be directed towards maize production (towards self sufficiency) or imports depends on Ghana's comparative advantage in maize production.

¹⁴Ghana Budget 1991.

¹⁵Ghana MTADP 1990, section 4.10:58.

RESEARCH INTO IMPROVED MAIZE PROCESSING AND STORAGE TECHNIQUES

Apart from the traditional maize storage silo, some improved post harvest management techniques are being developed by government research institutions. These are likely to increase the shelf life of maize.

MAIZE FLOUR PRODUCTION

One of the methods for storing maize is to grind into a flour and package. CSIR produces fermented maize flour for sale. The production steps are similar to the day to day processing by households. After harvest, the maize is dried and removed from the cob. Dried maize grains are then soaked in water for about 24 hours. The soaked grains are then milled, mixed with water and left overnight to ferment. The paste is then dried, milled and packaged airtight in plastic bags.

There are two differences between this method and that used in some developed countries. The first is the fermentation process which is done because most African foods are produced from fermented corn meal. Fermentation is considered as a method of preservation. A second difference between this method and the one used in some developed countries is the absence of preservatives.

Apart from maize, CSIR also produces flour from other food staples such as cassava, yam, cocoyam and plantains. Currently, CSIR cannot meet market demand for these products.

MAIZE IRRADIATION

Three major advances in food irradiation were achieved in 1980, 1983 and 1992. In 1980 the International Committee of experts of the FAO, WHO and IAEA (International Atomic Energy Agency) recommended the acceptability of food irradiated up to an overall average dose of 10kGy (kilograys, unit of radiation). In 1983 the Codex Alimentarius Commission adopted the Codex's general standard for irradiated foods.

The WHO in May 1992 accepted irradiation as a means of food preservation describing it as a "perfectly sound" way to preserve world food supplies.¹⁶ Furthermore, the United States Department of Agriculture (USDA) in May decided to allow irradiation of poultry to control harmful bacteria such as Salmonella.¹⁷ These achievements have enhanced the commercialization of irradiated foods for human consumption.

The process involves exposing food to Gamma rays, X-rays or electrons in a special chamber for a specified duration. Currently used is the cobalt sixty gamma radiator. In the case of maize, the process is to put the dried maize in airtight polytene bags and irradiate. Irradiated maize can be stored for about six years (GAEC).

¹⁶Daily Graphic 1992. May 29:2.

¹⁷Ibid.

COMMERCIALIZATION OF THESE PROCESSES

The methods mentioned above are all at their experimental stages. There has been little commercialization of these processes in Ghana. This cannot be said about other West African countries. A private food irradiation facility is reported to have been set-up in Cote d'Ivoire (Ghana 1992).

5. CONSTRAINTS TO INCREASED MARKETING EFFICIENCY

CONSTRAINTS TO INCREASED MARKETING EFFICIENCY

The identified structural constraints to increased marketing efficiency can be listed as:

- (1) Inadequate post harvest management: use of inefficient methods for storage,
- (2) Insufficient marketing and trade outlets to absorb increases in supply at harvest,
- (3) Lack of information on supply and price conditions to market participants,
- (4) Inadequate rural infrastructure such as feeder roads and extension services,
- (5) Lack of credit facilities to farmers and market participants.

INFORMATION FROM PILOT SURVEY OF MARKET PARTICIPANTS

A pilot survey of market participants led to the identification of the following constraints.

- (1) Lack of market intermediary who is prepared to pay for produce on collection. This delays flow of goods through the marketing channel.
- (2) High transportation costs and high handling charges, and
- (3) Lack of capital. Most retailers had some capital locked-up through delivering before payment.
- (4) Given the high marketing costs, maize retailers merely break

even or sometimes lose money. However, compared to the other food commodities, some of which are more perishable, profits in maize trading are higher.

With respect to competitiveness, the only entry and exit restrictions to the Ghanaian maize market identified were availability of capital, and accessibility to the maize growing areas. Since these restrictions are not due to market conduct the Ghanaian maize market can be classified as competitive. There may however be some trend towards thinness due to the volume of trade, low number of participants and arranged sales which do not depend on market conditions but depend on convenience.

6. POLICY RECOMMENDATIONS AND IMPLICATIONS FOR INCREASED FERTILIZER USE

POLICY RECOMMENDATIONS

With the drive towards the free markets, trade liberalization and private sector development, it appears that most of the constraints associated with increased efficiency in maize marketing are government policy related. Agriculture remains one of the most risky businesses competing with others for capital investment. The environment has to set by the government for increased efficiency in agricultural markets in order to attract investors.

Most of the recommendations are to improve the role of government in an increasingly open market for maize in Ghana vis-a-vis the Sub-Saharan African region. In the short run policies should be aimed at increasing the use of storage by farmers. This would decrease the intra-annual price changes. In the long run government policies must provide a conducive environment for private participation in various parts of the Ghanaian maize marketing channel. Possible outlets for the increased output due to increased fertilizer use include storage, processing, increased domestic demand and export.

The specific policies that would improve marketing efficiency by eliminating structural constraints are listed below.

Expedite work on provision of rural infrastructure. Government must expedite the improvement of infrastructure necessary for increased efficiency in the maize market with particular reference to: (1) physical infrastructure such as feeder roads; (2) institutional credit to farmers and food market participants; (3) development of the marketing functions of grading and standardization.

Improve the supply of information to market participants. Government must facilitate the transfer of information on prices and output levels to farmers and market participants. This is important for rational decision making by farmers and food market participants.

Establish an effective link between research and industry. There is the need to establish an effective link between research and industry. Research on improved food storage, processing techniques and new maize products done by government institutions must be made available to farmers, existing food industries and prospective private investors. Some new methods have currently been developed on:

(1) Maize Storage -- improvements to the storage systems built by farmers have been made by the Crop Services Division of the Ministry of Agriculture.

(2) Maize Packaging -- a process of drying, soaking, fermenting, grinding, redrying and then packaging of maize has been found to increase shelf life. This process was developed by the Food Research Institute (FRI) of the Center for Scientific and Industrial Research.

FRI is the only producer of this item and currently cannot meet market demand.

(3) Food irradiation has been researched by the Ghana Atomic Energy Commission. The World Health Organization has approved the use of atomic energy in food treatment for preservation, this year. A private food irradiation facility has subsequently been set up in Cote d'Ivoire. Not much has been done as to commercializing this process in Ghana.

The acceptability of these food preservation methods and their final products must be considered not only based on health and nutrition but also on consumer tastes and market participants' preferences.

Maize product development to increase domestic demand. There are potential uses of maize that would increase domestic demand. Much of the scientific research work has been done on maize processing as food for humans, with little work done on processing maize as feed for poultry. Increased use of white maize as livestock feed would increase domestic demand.

Other uses of maize that can be commercialized are in production of consumer products such as breakfast cereals, confectionery products and in breweries. Previously, a breakfast cereal was developed called maize grits. Consumer demand for this product was high but production suddenly stopped.

Innovative product development would improve the domestic demand situation. Seasonality of excess supply situation would also be reduced since these industries are capable of making input purchases at harvest

time for year round production.

Agro-processing. Government has to provide a conducive environment for the setting up of agro-processing industries by private investors, especially in the rural areas. A positive drive would be private setting up of rural based maize processing industries with drying systems, grinding and packaging units. This would convert the maize grains into a more storable or convenient form.

The setting up of these industries in the rural areas is consistent with industry location theory and will also help generate employment for laborers displaced from increased mechanization.

Encourage maize export to neighboring countries. Government must encourage the export of maize to other West African countries. Although there are reports of this movement, it has not yet been formalized, given that previously it was some public considered a crime to export food outside Ghana. encouragement would be more reassuring.

Establish a regional commodity cash and futures market. Development of a regional (West Africa) commodity cash and futures market will provide insurance (futures price) for farmers for their output with hedging opportunities. The participants will be producers, speculators, brokers and manufacturers. Due to the thinness of the domestic (Ghanaian) market, a regional market will have the necessary large volume of transactions.

Re-define the role of government. It is important that the government adopts the role of monitoring, research and facilitating of markets and reduce the physical handling of produce except probably strategic stocks. Government must support research into supply, demand, price and trade prospects: analyzing the effect of changes in population, incomes, prices (own and related), tastes and exchange rates.

There may therefore be a need to reassess the role of government institutions such as MOA, GFDC and GWC within the context of a free market, in the light of changes in Ghana's economic structure and direction.

Government policies such as price of petroleum and wage rates eventually affect retail prices of farm output and eventually affects comparative advantage of the country in producing and marketing the final output. International market prices must be considered in setting these instruments in the annual budget.

IMPLICATIONS FOR INCREASED FERTILIZER USE

Some recommendations have been made, intended to reduce the constraints to increased efficiency of marketing of maize and other food grains in Ghana in order to accommodate possible increases in production, due to increased use of fertilizer without the usual adverse effect on price. Adoption of the structural adjustment policies implies the need for increased efficiency in production and marketing for the

Ghanaian maize market.

Farmers adoption of improved technology such as use of fertilizer and improved seeds is important for increased productivity in the rapidly changing world where productivity is the key to business (farm's) survival.

Another factor for increased efficiency is possibly a movement from the subsistence type of farms to large scale commercial farms with mechanization and irrigation in order to take advantage of economies of scale and specialization. This is recommended especially for cereals. Fertilization and irrigation are important in this process. Land tenure has always been a problem in this direction. Contrary to some development strategy arguments, farms in developing countries do not have to be labor intensive, given that the technology is available for increased mechanization of especially cereal farms.

Increased productivity in maize farming imply lower costs per unit output, possibly compensating for the decline in prices due to increased supply. Decreased costs of production also reinforces the comparative advantage position, thus maintaining trade as an outlet for increased supply.

With the anticipation of supply shifts, due to increased use of fertilizer, some research needs to be done on demand shifts which can be induced by both product and market diversification and development. Some avenues were suggested in the policy recommendations.

Overall, government policy seems to be in the right direction for increased efficiency in agricultural markets, the rate of change is

however slow. There is also the need for education of farmers and market participants on the changes in government policy and its directions to enable them make rational economic decisions.

Table 1.1: Ghana Maize Market Data

Year	AREA HARVESTED		YIELD KG/HA	PRODUCTION MT	IMPORTS MT	EXPORTS MT	WASTE MT
	HA	HA					
1961	237000		9536	226000	600	0	25000
1962	237000		9283	220000	600	100	25000
1963	202340		9039	182889	700	400	20000
1964	202340		8537	172728	3500	0	18000
1965	173277		12062	209001	1300	40	20000
1966	250900		16026	402100	5318	1	70000
1967	294600		11640	342917	7348	38	40000
1968	271500		11089	301056	106	11	31600
1969	275182		11047	304000	1964	3	32000
1970	452500		10643	481600	5271	5	100000
1971	432600		10758	465400	3368	0	90000
1972	388500		10358	402400	2	0	80000
1973	405500		10525	426800	2414	913	85000
1974	424900		11431	485700	292	12	100000
1975	319700		10741	343400	44	13397	39000
1976	274000		10438	286000	10573	0	28000
1977	256000		10703	274000	47000	0	25000
1978	205000		10634	218000	92000	0	20000
1979	358000		10615	380000	28000	0	38000
1980	440000		8682	382000	40000	0	38000
1981	372000		10161	378000	26985	0	38000
1982	373000		9276	346000	81710	0	34000
1983	400000		4300	172000	65800	0	12000
1984	724000		9613	696000	49340	0	100000
1985	579000		10086	584000	0	0	75000
1986	472000		11843	559000	0	0	60000
1987	489000		11309	553000	10000	0	60000
1988	551000		10889	600000	0	0	80000
1989	567000			715000	0		
1990	465000			553000	0		

Sources: FAO; PPMD, Ministry of Agriculture.

Table 3.1: Improved Varieties of Maize and their Characteristics

	Height (cm)	Maturity (days)	Yield (tons/ha)	Characteristics
1. Dorke SR	170	90	3.2	
2. Aburotia	150	105	4.6	
3. Abeleehi	158	110	4.0	Streak resistant
4. Okomasa	198	120	5.5	Streak resistant
5. Safita 2	165	95	3.8	
6. Golden Crystal	200	110	4.6	Yellow Variety
7. Kawanzie	160	95	3.5	Yellow Variety
8. High Lysine Maize	160	110	3.0	Solution to Kwashiokor
9. Quality Protein Maize	187	110	5.0	

Sources: Crop Services Division, Ministry of Agriculture, Accra.
Center for Scientific and Industrial Research, Accra.

Table 3.2: Maize Marketing Margin for Producer in Mampong (Ashanti Region) to Consumer in Accra

Prices

Stage	Cedis/Kg
a. Farmer (at Abontam) to Assembler (at Mampong)	54
b. Assembler (at Mampong) to Wholesaler (in Accra)	64
c. Wholesaler (Accra) to Retailer (Accra)	70
d. Retailer's selling price to Consumer	80

Costs

Stage	Cedis/Kg
a. Farmer (Transfer costs from Abontam to Mampong):	
Transportation cost at C 140/100 kg	1.40
Market toll at C 50/100 kg	0.50
Total Cost	<u>1.90</u>
b. Assembler at Mampong	
Cost of jute bag C 20/100 kg	0.20
Cost of bagging, storage and Handling at C 80/100 kg	0.80
Cost of loading and unloading at C 50/100 kg	0.50
Transportation cost to Accra, a distance of 340 km at C 600/100 kg	6.00
Total Cost	<u>7.50</u>
c. Wholesaler in Accra	
Storage cost including handling at C 240/100 kg	2.40
Cost of jute sack at C 80/100 kg	0.80

Unspecified cost at C 70/100 kg	0.70
Total Cost	<u>3.90</u>

d. Retailer in Accra

Transport cost at C 65/100 kg	0.65
Loading /unloading costs at C 80/100 kg	0.80
Handling and storage at C 140/100 kg	1.40
Market toll at C 20/100 kg	0.20
Unspecified costs at C 270/100 kg	2.70
Total Cost	<u>5.75</u>

Estimated Losses

Stage	Loss (%)
a. Farmer	
b. Assembler	0
c. Wholesaler	3
d. Retailer	3
	4

Conversion Factors of 1kg Maize Sold by Farmer

Stage	Factor
a. Farmer's selling price (Abontam) to Assembler (Mampong)	1.00
b. Assembler (Mampong) to Wholesaler (Accra) with Loss of 2 % (1 x 0.98)	0.98
c. Wholesaler (Accra) to Retailer (Accra) with Loss of 3 % (0.98 x 0.97)	0.95
d. Retailer (Accra) to Consumer (Accra) with Loss of 4 % (0.95 x 0.96)	0.91

Marketing Costs at Different Stages of 1kg Maize Sold by Farmer

Stage	Cedis/Kg
a. Farmer (1 x 1.90)	1.90
b. Assembler (1 x 7.50)	7.50
c. Wholesaler (0.98 x 3.90)	3.82
d. Retailer (0.95 x 5.75)	5.46
Total Marketing Costs of 1kg Maize	18.68

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Summary of Farmgate-Retail Account

Item	Revenue	Costs	Margin
Retail Price for 0.91kg maize (80 x 0.91)	72.80		
Farmgate Price (54 - 1.90)		52.10	
Marketing Cost		18.68	
Total Costs		<u>70.78</u>	
Net Margin			<u>2.02</u>

Source: PPMED (1988), Report on The Pilot Studies on Marketing Costs and Margins, p. 24, Ministry of Agriculture.

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Table 3.3: Maize Marketing Margin for Producer in Techiman (Brong Ahafo Region) to Consumer in Accra

Prices

Stage	Cedis/Kg
a. Farmer to Assembler (in rural market)	50
b. Assembler (in rural market) to Wholesaler (from Accra)	55
c. Wholesaler (from Accra) to Wholesaler (in Accra)	64
d. Wholesaler (in Accra) to Retailer (in Accra)	70
e. Retailer to Consumer	80

Costs

Stage	Cedis/Kg
a. Farmer	
Loading at C 40/100 kg	0.40
Transportation cost at C 200/100 kg	2.00
Total Cost	<u>2.40</u>
b. Assembler in rural market	
Cost of jute bag C 350/100 kg	3.50
Loading cost at C 40/100 kg	0.40
Market toll at C 100/100 kg	1.00
Total Cost	<u>4.90</u>
c. Wholesaler (from Accra)	
Loading /unloading costs at C 40/100 kg	0.40
Transportation cost at C 700/100 kg	7.00
Total Cost	<u>7.40</u>

d. Wholesaler (in Accra)	
Cost of jute sack at C 350/100 kg	3.50
Storage cost at C 120/100 kg	1.20
Market toll at C 20/100 kg	0.20
Total Cost	<u>4.90</u>

e. Retailer in Accra	
Transport cost at C 150/100 kg	1.50
Handling and materials at C 100/100 kg	1.00
Market toll at C 20/100 kg	0.20
Total Cost	<u>2.70</u>

Estimated Losses

Stage	Loss (%)
a. Farmer	0
b. Assembler	2
c. Wholesaler (from Accra)	2
d. Wholesaler (in Accra)	3
e. Retailer	4

Conversion Factors of 1kg Maize Sold by Farmer

Stage	Factor
a. Farmer to Assembler	1.00
b. Assembler to Wholesaler (rural market) with Loss of 2 % (1 x 0.98)	0.98
c. Wholesaler (from Accra) to Wholesaler (in Accra) with Loss of 2 % (0.98 x 0.98)	0.96
d. Wholesaler (Accra) to Retailer (Accra) with Loss of 3 % (0.96 x 0.97)	0.93
e. Retailer (Accra) to Consumer (Accra) with Loss of 4 % (0.93 x 0.96)	0.89

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Marketing Costs at Different Stages of 1kg Maize Sold by Farmer

Stage	Cedis/Kg
a. Farmer (1 x 2.40)	2.40
b. Assembler (1 x 4.90)	4.90
c. Wholesaler from Accra (0.98 x 7.40)	7.25
d. Wholesaler in Accra (0.96 x 4.90)	4.70
e. Retailer in Accra (0.95 x 5.75)	2.51
Total Marketing Costs of 1kg Maize	21.76

Summary of Farmgate-Retail Account

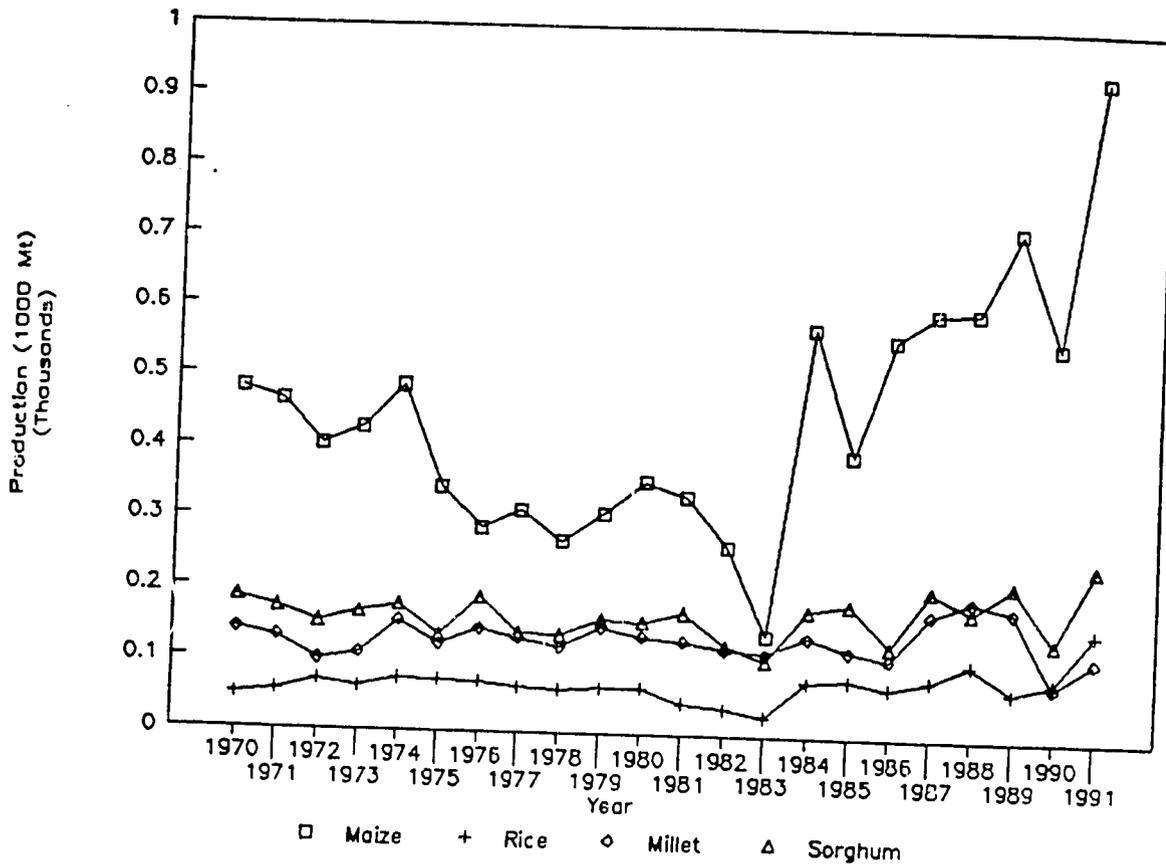
Item	Revenue	Costs	Margin
Retail Price for 0.89kg maize (80 x 0.89)	71.20		
Farmgate Price (50 - 2.40)		47.60	
Marketing Cost		21.76	
Total Costs		<u>69.36</u>	
Net Margin			<u>1.84</u>

Source: PPMED (1988), Report on The Pilot Studies on Marketing Costs and Margins, p. 27, Ministry of Agriculture.

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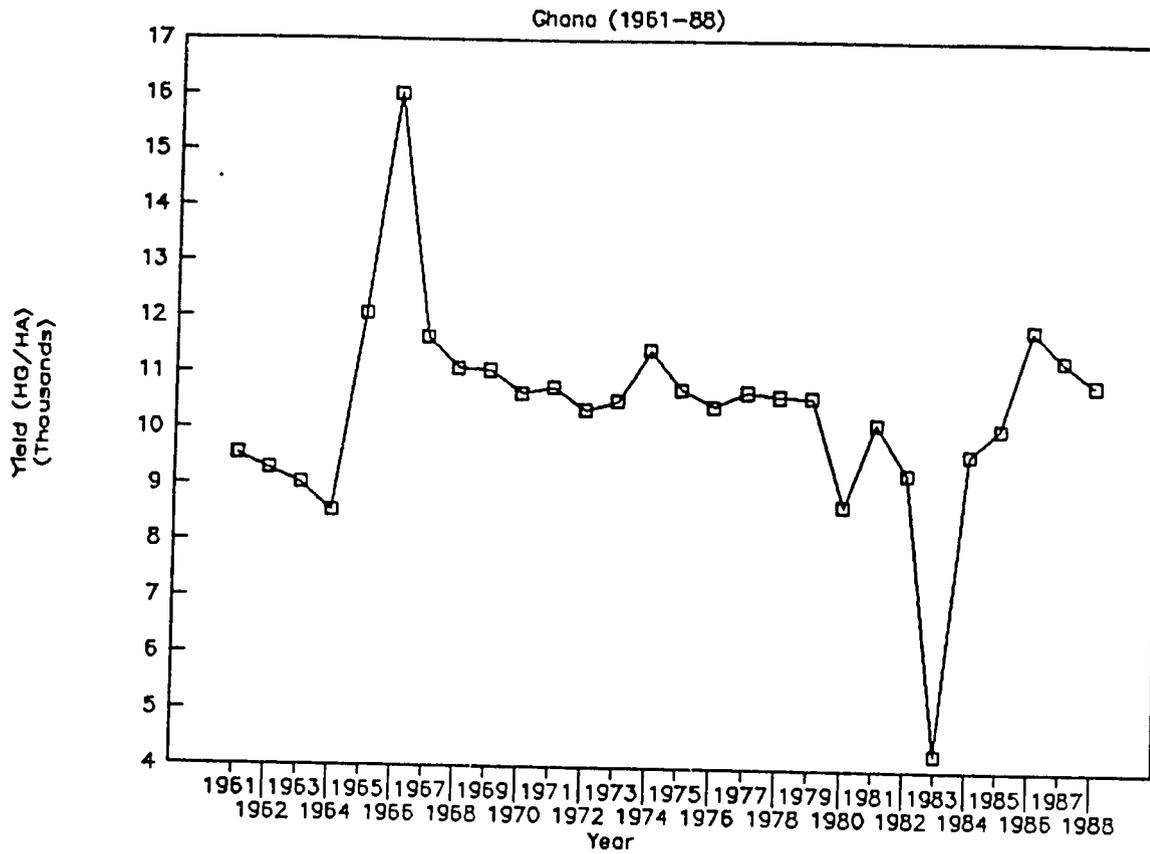
Figure 1.1

Production of Major Cereals in Ghana



Source: PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 1.2
Maize Yield

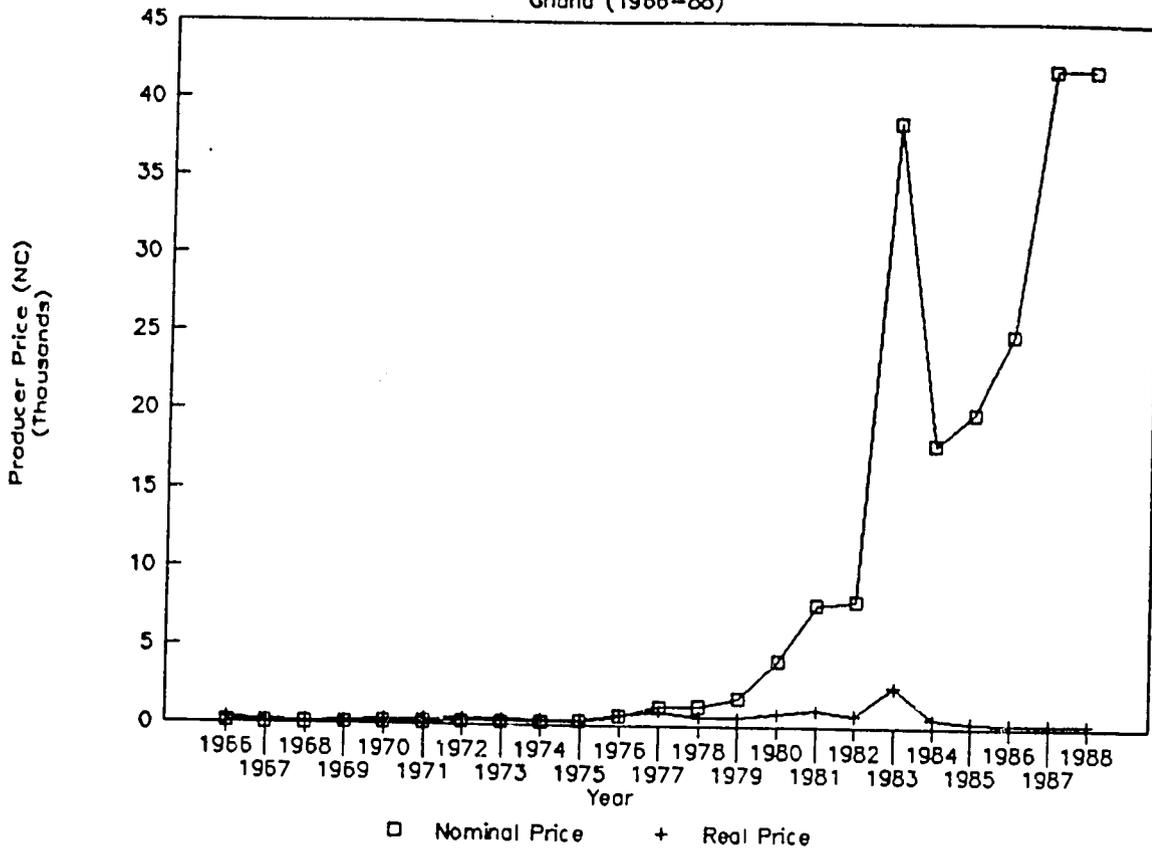


Sources: FAO; PP MED, Ministry of Agriculture, Accra, Ghana.

Figure 1.3

Maize: Nominal and Real Producer Price

Ghana (1966-88)

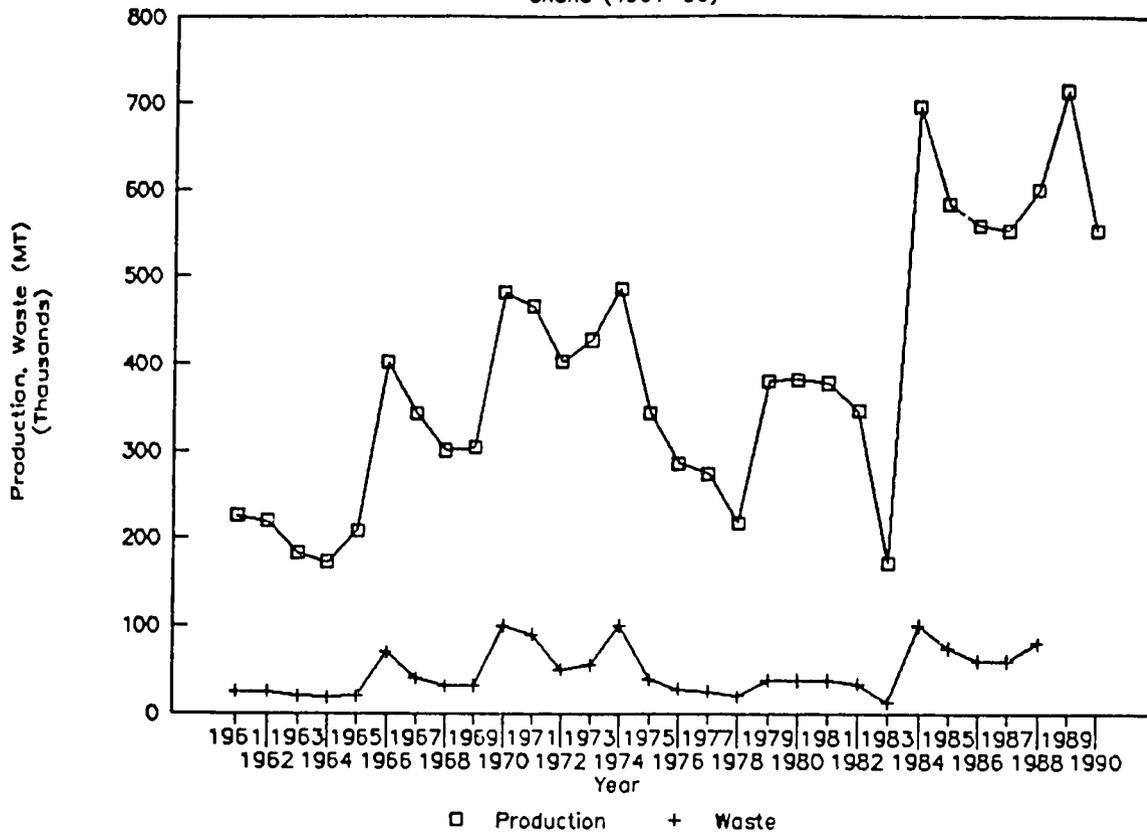


Sources: FAO; PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 1.4

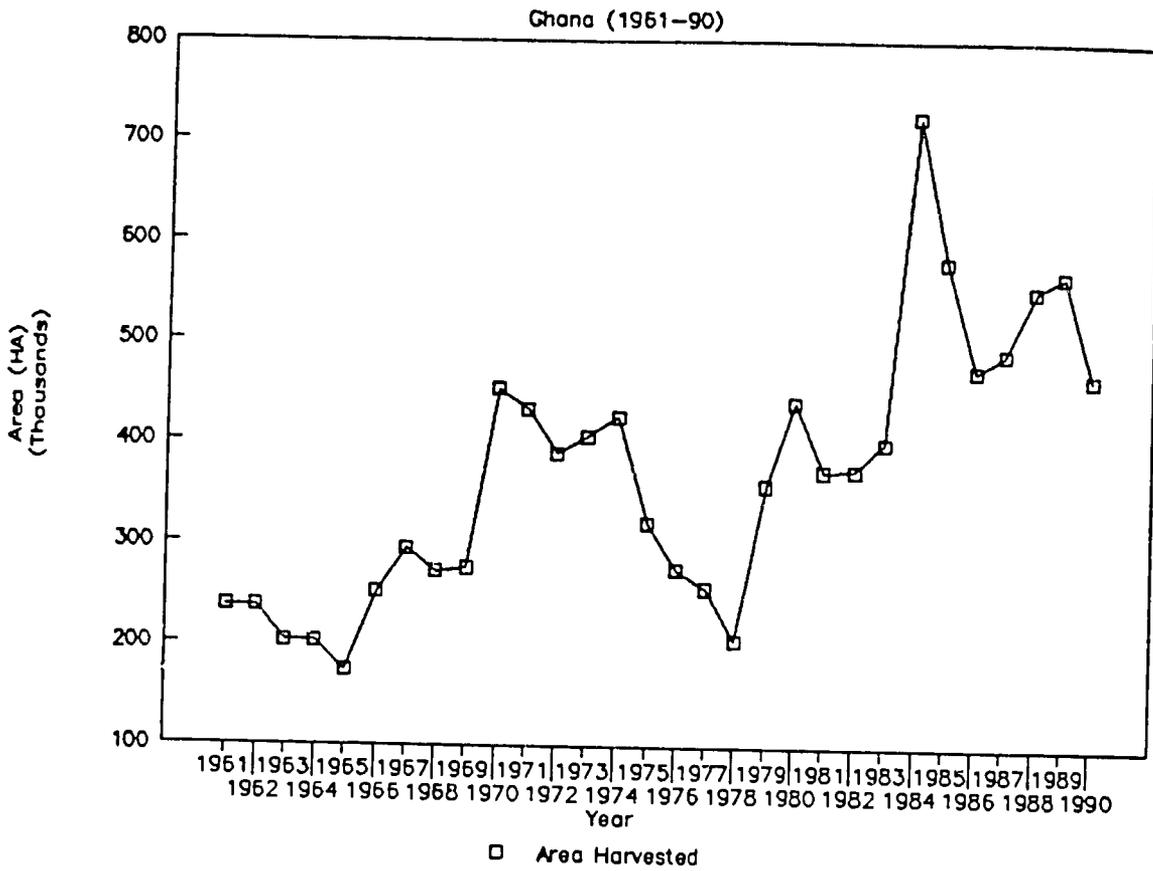
Maize Production and Waste

Ghana (1961-90)



Sources: FAO; PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 1.5
Maize Area Harvested

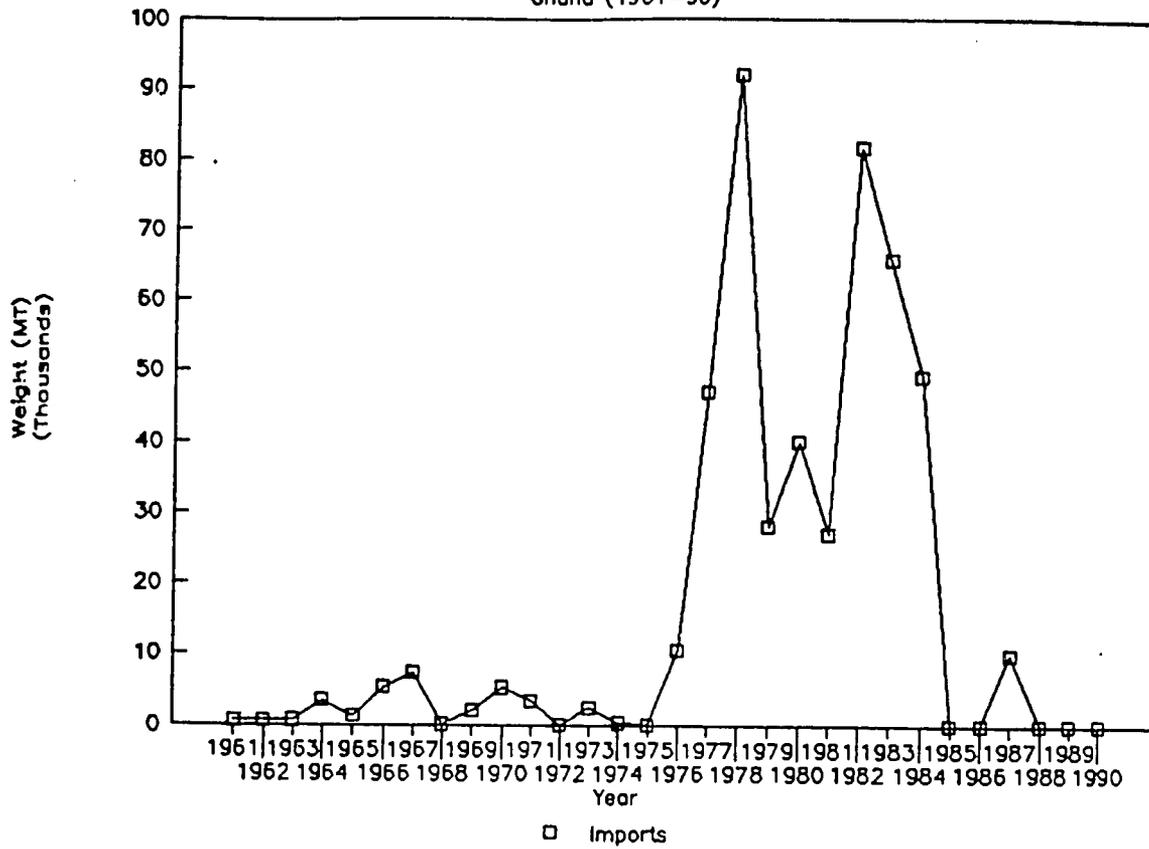


Sources: FAO; PPED, Ministry of Agriculture, Accra, Ghana.

Figure 1.6

Maize Imports

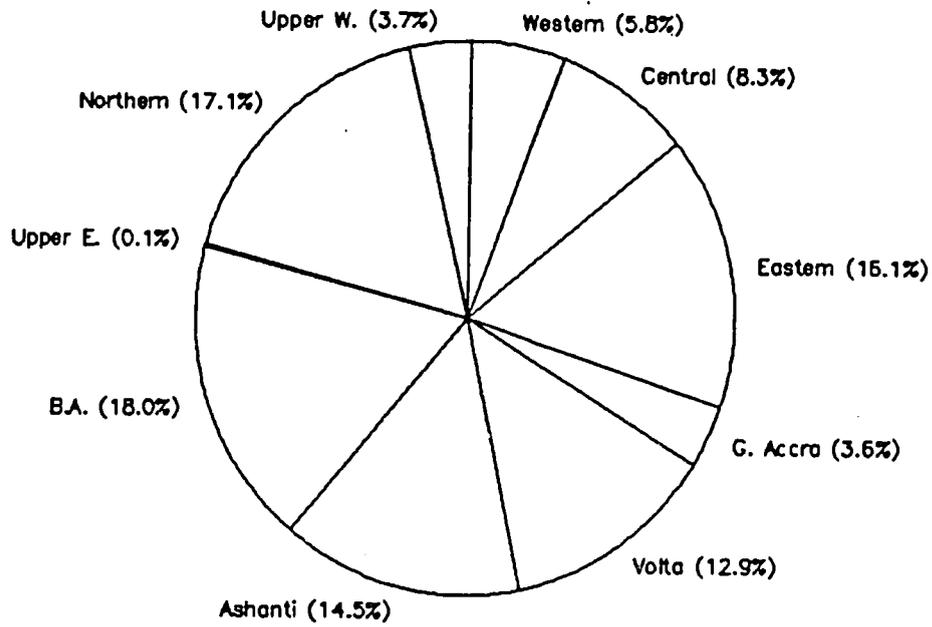
Ghana (1961-90)



Sources: FAO; PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 3.1

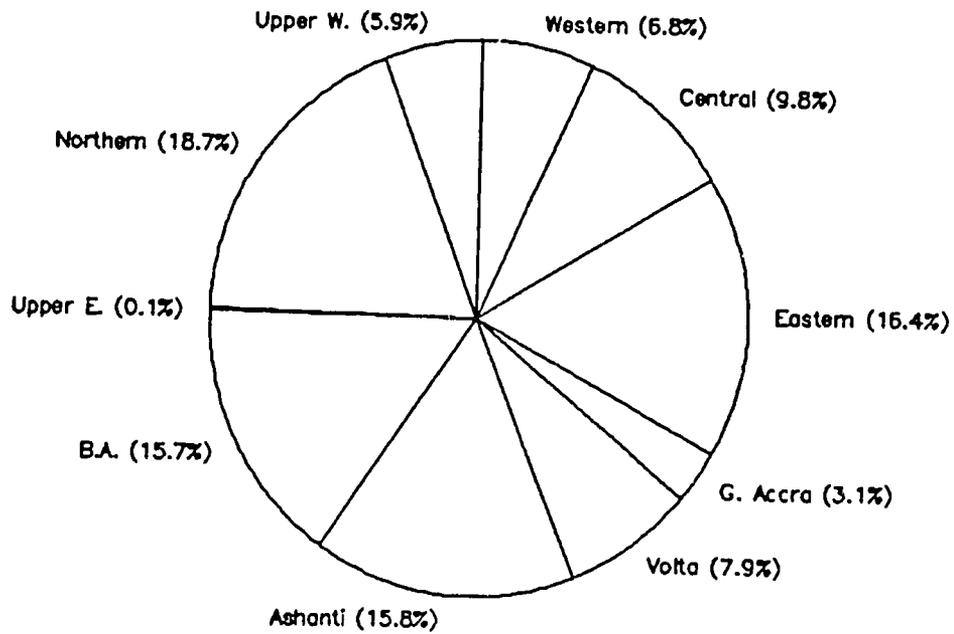
Maize Production in Ghana by Region '91



Source: PP MED, Ministry of Agriculture, Accra, Ghana.

Figure 3.2

Maize Cropped Area by Region '91



Source: PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 3.3

MAIZE MARKETING CHANNEL IN GHANA

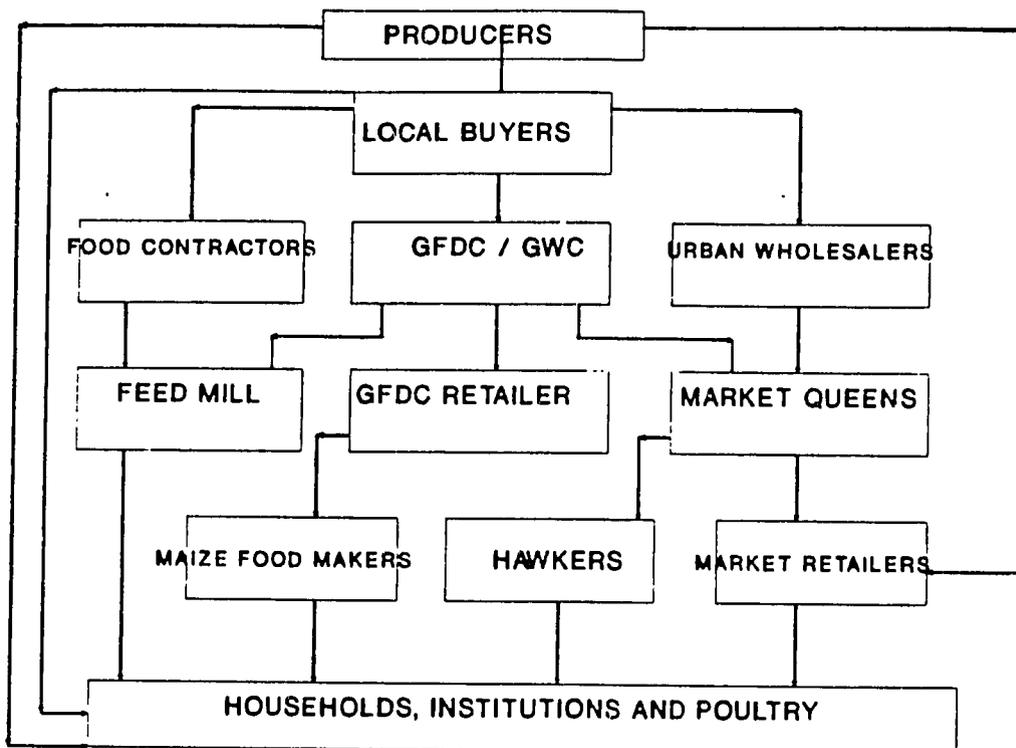
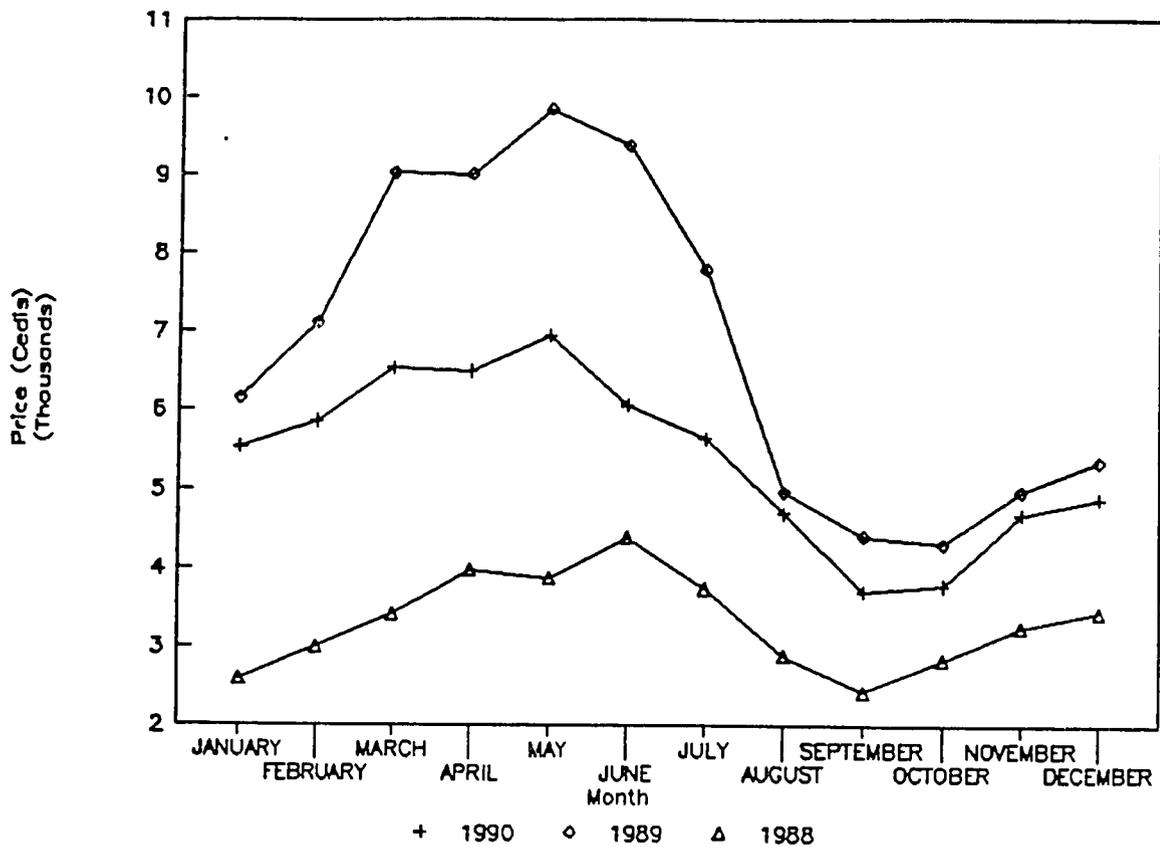


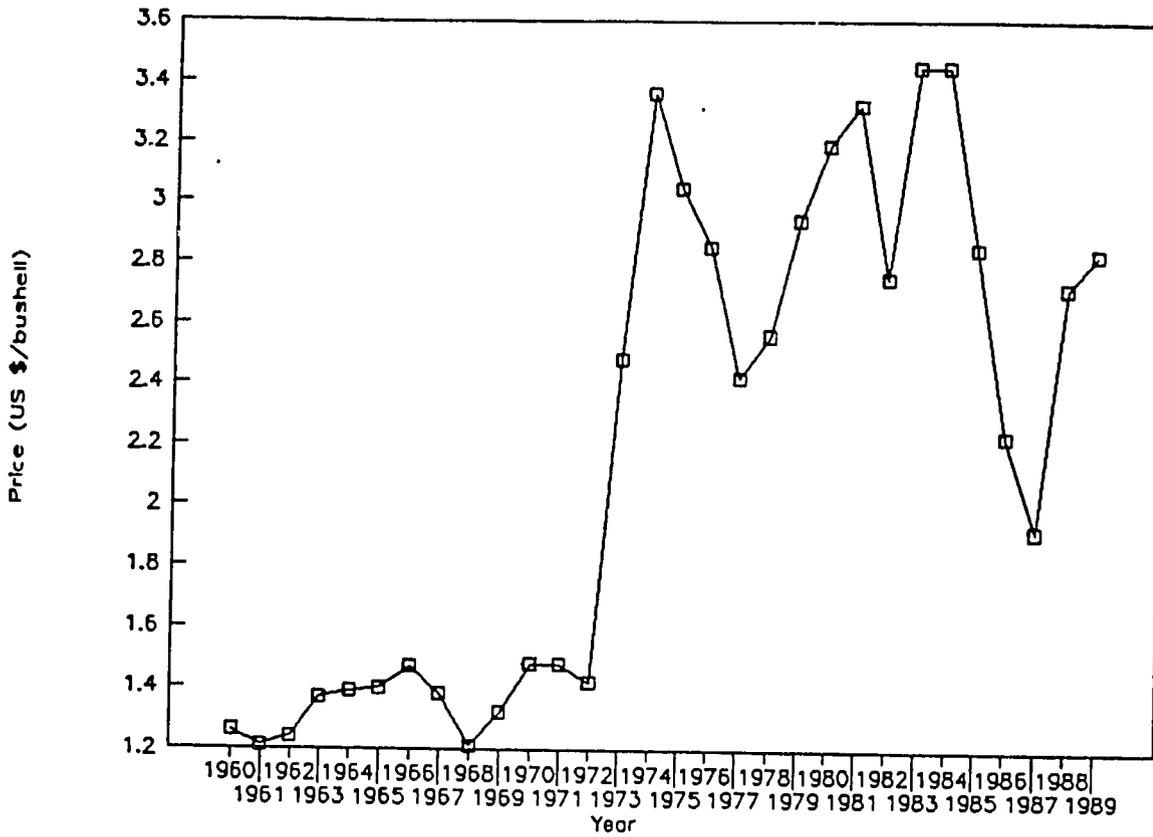
Figure 3.4
Monthly Maize Prices (1990, 1989, 1988)



Source: PPMED, Ministry of Agriculture, Accra, Ghana.

Figure 3.5

Nominal World Maize Price



Source: International Financial Statistics, 1990

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