AN ASSESSMENT OF THE EFFECTS OF THE TRADE LIBERALIZATION AND RELATED POLICIES ON THE DOMESTIC RICE INDUSTRY IN GHANA

BY

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DECLARATION

I Vivian Fiatusey, do hereby declare that, except for the various forms of assistance and literature which has been duly acknowledged, this thesis "AN ASSESSMENT OF THE EFFECTS OF THE TRADE LIBERALIZATION AND RELATED POLICIES ON DOMESTIC RICE INDUSTRY IN GHANA" is the result of research work undertaken by me a student of the Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology, Kumasi, from August 2005 to November 2006.

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DEDICATION

THIS THESIS IS DEDICATED TO GOD ALMIGHTY FOR HIS GRACE, GUIDANCE AND PROTECTION DURING THE PURSUIT OF THIS WORK. IT IS ALSO DEDICATED TO MY PARENTS, SIBLINGS AND DR. B. OWUSU BOATENG, WHOSE MORAL SUPPORT AND PRAYERS WERE INDISPENSABLE IN THE COURSE OF THIS STUDY.

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ABSTRACT

Prior to the trade liberalization, a number of consumer commodities, particularly rice enjoyed a substantial protection from international prices. Restrictions generally took the form of higher tariffs on imports, quantitative controls and administrative regulations. The institution of the trade liberalization saw the abolishing of the import licensing and quantitative restrictions. Consequently, the local market in Ghana has been inundated with cheap imported rice. The main objective of this study is to assess the effect of the rice trade liberalization and its related policies on the domestic rice industry in Ghana.

An econometrical analysis of secondary data using the multiple regression models was applied. The study indicated that trade liberalization resulted in decreased domestic producer price of milled rice so the hypothesis that trade liberalization did not have a significant impact on the producer price of rice in Ghana was rejected.

The study also found a rise in the area under rice cultivation and a decline in the annual growth rate of rice production in the post-liberalization era. This was corroborated by the results of a survey which was carried out among rice farmers in the Northern Region.

Findings from the study also indicated that rice consumption *ceteris paribus* has increased in the era of the trade liberalization. However, the increase in the demand for rice cannot be attributed to the trade liberalization alone but other factors like the change in the consumption patterns of consumers, urbanization and economic growth.

The study concluded that, on the whole, the trade liberalization has impacted negatively on the domestic rice industry in Ghana.

TABLE OF CONTENTS

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

CHAPTER SIX

APPENDICE **PAGE**

LIST OF TABLES

LIST OF FIGURES

FIGURE **PAGE**

ACRONYMS

AfDB	African Development Bank
BOG	Bank of Ghana
CIDA	Canadian International Development Agency
GSS	Ghana Statistical Service
IFAD	International Fund for Agricultural Development
MOFA	Ministry of Food and Agriculture
PPMED	Policy Planting, Monitoring and Evaluation Directorate
SRID	Statistics, Research and Information Directorate
USAID	United State Agency for International Development
USDA	United State Development Agency

CHAPTER ONE

INTRODUCTION

1.1. Background

The Economic Recovery Programme (ERP) embarked upon in 1983, led to the implementation of a reform programme for the agricultural sector in Ghana. The third phase of this programme dubbed, the liberalization and growth phase, started in 1989. The major goals of this programme included deregulation of commodity and service markets to reduce domestic price distortions, as well as, the liberalization of the export and import markets. As part of the economic reform programme, in 1983, Ghana signed an agreement with the World Bank and International Monetary Fund (IMF) for new loans. As part of this agreement, Ghana promised to make extensive economic reforms. This led to the removal of farm subsidies and the opening up the country's markets to foreign imports. The government was therefore compelled to remove input subsidies on fertilizer and other farm inputs used in agricultural production. On the average, the prices of most agricultural chemicals used in cereal production increased in excess of 40% per annum between 1986 and 1992 (Asuming-Brempong, 1994). Fertilizer importation and sales for example, which hitherto had been under the control of the government, was privatized. Consequently, the domestic prices of fertilizer more than doubled between 1990 and 1992.

Prior to Ghana's joining of the World Trade Organization (WTO) and before the adoption of the principles of the General Agreement on Tariffs and Trade-World Trade Organization (GATT-WTO) negotiated under the Uruguay Round, rice had been a protected commodity through import licensing, subsidies, and quantitative restrictions.

However, the import licensing, subsidies and quantitative restrictions were abolished in 1989 under Economic Recovery Programme (ERP) and with the country acceding to GATT-WHO in 1995; tariffs became the binding control on imports. Indications are that, more rice has been imported since 1990 when the trade liberalization policy came into effect. For instance, rice imports increased from 116,000 tonnes in 1989 to 216,000 tonnes in 1992, an increase of 86 percent and from 255,000 tonnes in 1993 to 507,000 tonnes in 2002, representing an increase of 99 percent (Edache, 2005). Table 1.1 gives the trends in importation of rice in Ghana from 1970 to 2004.

Table 1.1: Four- Year Average Rice Imports in Ghana, 1970-2004.

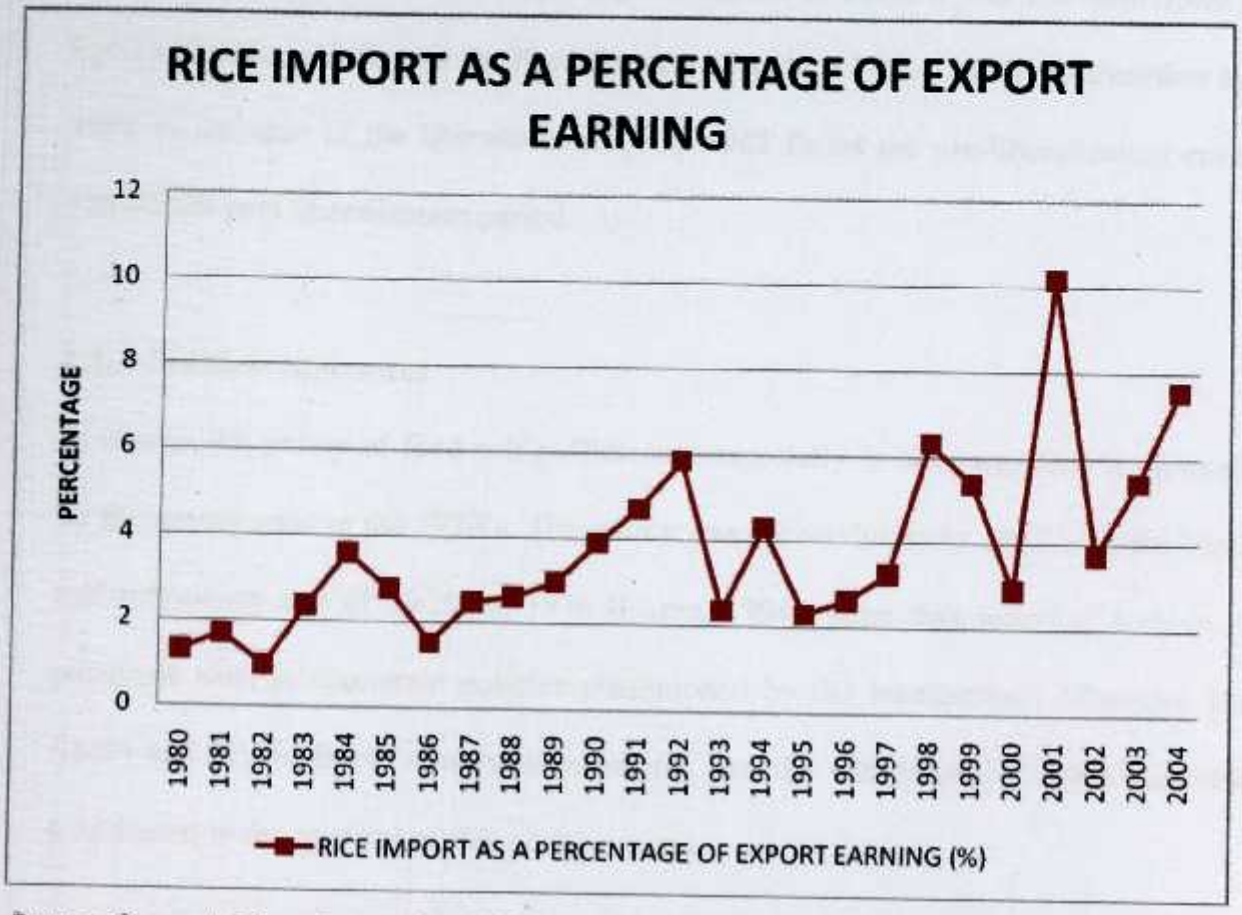
Before Liberalization		**After Liberalization**	
Period	Average Percentage increase in importation	Period	Average Percentage increase in importation
1970-1973	1	1989-1992	86
1974 -1977	-77	1993 -1996	66
1978-1981	-65	1997- 2000	84
1982 - 1985	-32	2001 - 2004	147

Source: Computed from data from Ghana Statistical Services, 1990 (for 1970-1990) and MoFA; SRID 2004 (for 1991 to 2004).

One of the sub-sectors in agriculture which has been greatly affected by the trade liberalization polices in recent times is the local rice industry. As a result of the current trade polices, the local market in Ghana has been inundated with cheap imported rice. The imported rice is subsidized both at the level of cultivation and export, and as a result pose a great challenge to local farmers with respect to marketing. The United States of America which is one of Ghana's major sources of imported rice continues to provide subsidies to its rice farmers. The federal government of the US has paid over $17.5 billion as subsidies to rice famers since 1986. The subsidies paid to US rice farmers have even been increased in recent years. For instance, in 2003 rice farmers in the US received $1.3 billion which is $200 million increase over the previous year (USDA, Farm Service Agency Budget Division, 1990-2004).

In May 2005, a Ghanaian Minister of Agriculture at the launch of the "International Year of Rice" made it categorically clear that no alternatives to liberalized trade is available to the government, because such alternatives will prevent the government from receiving financial assistance from the developed nations and their related donor agencies (Daily Graphic, May, 2005). Ghana's agreement with the World Bank limits rice import tariffs to a maximum of 20%, but recent agreements with IMF require that this rate be as low as 10% (Ghana Trade Policy cited in Ayambila, 2004).

Figure 1.1: Percentage of foreign exchange earned from export used on rice import, 1980 to 2004.



Source: Computed from International Monetary Fund, International Finance Statistics Year Book (data from 1980 to 1995) and Ghana Statistical Service (data from 1996 to 2004).

Available statistics show that, the percentage of Ghana's foreign exchange from exports spent on rice importation has been increasing steadily since the 1980s. The trend is as depicted in figure 1.1 above. In 2001, the percentage of Ghana's earned foreign exchange used in rice importation went as high as 10 percent. Currently, more than 50% of all rice consumed in the country is imported.

This study intends to assess the effect of the rice trade liberalization and its related policies on the domestic rice industry in Ghana.

Although the Economic Recovery Program started in 1983, it was not until 1989 that rigorous implementation of the liberalization of trade started. This study therefore takes 1989 as the start of the liberalization. 1970-1988 forms the pre-liberalization era and 1989-2004 post liberalization period.

1.2. Problem Statement

In Ghana, the policy of food self-sufficiency, especially in rice, was first implemented by the government in the 1970's. The policy was successful up to 1982 with the highest self-sufficiency rate of 99.2% in 1976 (Bozza, 1994). After this period of success, the paradigm shift in economic policies championed by the International Monetary Fund (IMF) and World Bank resulted in measures like the withdrawal of subsidies, which culminated in the reversal of this positive trend.

Prior to the trade liberalization, a number of consumer commodities, particularly rice, enjoyed a substantial protection from international prices. Restrictions generally took the form of higher tariffs on imports, quantitative controls and administrative regulations.

The inception of the trade liberalization saw the abolishing of the import licensing and quantitative restrictions. The tariff structure has also been greatly reduced and simplified. Consequently, the local market in Ghana has been inundated with cheap imported rice. The cedi price of the imported rice is generally low and affordable. There is therefore increasing demand for the imported rice.

Ironically, under World Trade Organization rules, Ghana could protect its domestic rice industry with tariffs of up to 99 percent. However, agreement with the World Bank limits rice import tariffs to maximum of 20 percent (Ministry of Trade and Industry, 2005). Import restrictions and domestic price support mechanisms used to maintain the price of domestically produced rice was abolished. The reduction and simplification of tariff structure became the mainstay with respect to imports, resulting in the precipitous fall in the level of protection. This exposure culminated in increased imports with consequent reduction in the demand for locally produced rice. It also affected the pricing of the domestic rice thereby acting as a potential disincentive for domestic rice supply in Ghana.

It costs the government of Ghana US$130 million a year to import rice which takes a heavy toll on the nation's foreign exchange. Up to 40 percent of Ghana's imported rice comes from United States of America; much of this is subsidized both at the point of cultivation and at the point of export. The heavy subsidies on cultivation of rice made international cost of production much lower (Curtis, 2002).

On the other hand, the input subsidies of 40 to 80 percent enjoyed by Ghanaian domestic producers were abolished in 1989. For instance, the fertilizer price increased in excess of 40 percent per annum between 1986 and 1992 and 89 percent from 1993 to 1995 following the withdrawal of subsidies. Thus, between 1988 and 1992, land productivity generally declined as reduced use of farm inputs due to their high cost after liberalization and a policy of input-subsidy removal was implemented (Asuming-Brempong, 1994). Even though the cost of fertilizer alone may not be significant

depending on the rice production system in question, generally the cost of farm inputs rose with the removal of the input subsidies. This policy therefore resulted in a substantial increase in the domestic cost of rice production in Ghana. Currently, the domestic rice industry is facing the challenge of low prices of imported rice. This, coupled with the high cost of production makes the locally produced rice uncompetitive on the market. The maintenance of substantial subsidies for foreign rice producers and the restrictive policies against imported products from Ghana into foreign markets also make the local rice industry uncompetitive to the imported ones.

Rice production is also intricately linked with land, water and the environment. Thus, a careful management of the natural functioning of rice ecosystems is critically important for protecting the environment while raising productivity to meet the growing consumer demand for rice. The growing environmental concerns globally over the land, soil and water cannot be over emphasized. Non judicious use of farm chemicals to attain high yields and in response to heightened disease and pest pressure results in widespread environmental pollution. In the case of Ghana, the use of farm chemicals in rice production has been marginal and more common in the irrigated systems than the other systems of rice production. More so, the removal of input-subsidies and the resultant increase in the cost of these chemicals have further reduced their patronage. However, extensive land cultivation without appropriate sustainability measures would result in soil infertility and land degradation.

With the above analysis certain critical questions attract attention:

1. What is the effect of rice import trade liberalization on the supply of locally produced rice in Ghana?
2. Has the import trade liberalization affected the price of rice produced in Ghana?
3. What is the effect of rice import trade liberalization on the demand of rice in Ghana?
4. What is the effect of import trade liberalization on the utilization of arable land for rice production in Ghana?

These are some of the economic issues that arise from the policy of rice import liberalization vis-à-vis local rice production in Ghana which needs to be investigated.

1.3. Objectives of the Study

The main objective of the study is to assess the effect of the rice trade liberalization and its related policies on the domestic rice industry in Ghana.

The specific objectives of the study are as follows:

1. To examine the effect of trade liberalization on the producer price of the locally produced rice.
2. To assess the effect of trade liberalization on the production of rice in Ghana.
3. To assess the effect of trade liberalization on demand for rice in Ghana.
4. To determine the effect of trade liberalization on the utilization of domestic resources, especially land for rice cultivation.

1.4. Justification for the Study

Ghana is mainly an agricultural country since agricultural activities constitute the main use to which Ghana's land resources are put and agriculture is the major occupation of 47 percent of the economically active age group (Seini, 2002). It is therefore economically prudent to ensure that, the country's agricultural industry is not only sustained but also managed in a way to achieve growth in order to provide the needed support to the economy.

Justifiable concerns have been expressed regarding the effects of Structural Adjustment Programmes; involving market liberalization, fiscal austerity and real currency devaluation on food prices in low and middle income countries, especially those of Africa by researchers like Cornia *et al* (1987). The major source of this concern is the recognition of the fact that, macroeconomic policies directly and indirectly influence levels and volatility of absolute and relative agricultural prices. In the absence of hedging mechanisms, such increased price variability can have detrimental impact on both the consumer and producers of agricultural commodities (Binswanger and Rosenzweig, 1986).

Since price is a function of trade policy and an important panacea for agricultural development, there is the need to rethink and re-examine trade policy especially of agricultural commodities in poor and developing countries. Of particular concern should be the very effects of trade liberalization on the marketing systems in developing countries, and how trade liberalization affects domestic rice production. Alderman and

Shively (1996) found in a study in Ghana that, following the inception of the economic recovery programme (ERP) in 1983, the average wholesale food prices declined.

There is no doubt that rice is currently one of the major staple foods in Ghana, contributing nearly 15% to the Agricultural GDP. Rice is therefore becoming increasingly important in the consideration of food security, household income and poverty reduction. Rice production in Ghana is dominated by smallholder operators who tend to be basically subsistence farmers.

Researchers like Asuming – Brempong (1990, 1994 and 1998), Alderman and Shively (1996), Weissman (1990) and Tabatabai (1988) provide considerable information on the effects of the structural adjustment programme on agriculture and food in particular. Asuming-Brempong has carried out a series of studies on the rice sub-sector in Ghana. He has examined the comparative advantage and rice policy in Ghana and has also studied the effect of the exchange-rate liberalization and input-subsidy removal on the competitiveness of cereals in Ghana. This study, however, differ from the previous ones in the following respects. It intends to examine the effect of the trade liberalization on the production, the demand and the producer price of locally produced rice in particular. It also intends to examine the effect of the trade liberalization on the utilization of domestic resources, especially land.

A study by Asuming–Brempong (1998) revealed that domestic rice production is not competitive despite Ghana's comparative advantage in rice production over other sub-Saharan countries. The agronomic conditions prevailing in certain parts of the country

may however, be a contributory factor to this assertion. According to him, trade liberalization has affected the competitiveness of production. Even though the studies pointed to the view that, rice production is not competitive, this does not mean that rice production must be brought to a halt. It is a fact that some farmers depend on rice production as their main livelihood. Thus the relevance of a study of the effect of trade liberalization cannot be over emphasized.

The importation of cheaper foreign food products like rice into Ghana is a disturbing phenomenon since it worsens the performance of the country's local rice industry. This study, seeks to assess the implications of the rice trade liberalization on the domestic rice production. It is believed that such a study would bring into focus the effects of trade liberalization on the local rice industry and offer the basis for looking at ways to mitigate the deleterious effects of the trade liberalization policy on the local rice industry.

Donor agencies such as CIDA, USAID, IFAD, and AfDB that have invested huge sums of money into increasing agricultural production in Ghana will also be interested in knowing the performance and constraints of the agricultural industry in order to offer relevant assistance. The findings of this study shall be relevant for this purpose.
Lastly, the recommendations that will emanate from the study will offer suggestions on ways through which the domestic rice production and marketing can be improved in the face of the import liberalization.

1.5. Organization of the Study

The study is organized into six chapters. Chapters two and three, respectively, are devoted to theoretical and conceptual framework from related studies and historical overview of rice policy in Ghana. Chapter four examines the methodologies employed in the study. Chapter five applies the relevant methodologies to the primary data collected from the field and the secondary data from the PPMED of MOFA, GSS, SRID and Ministry of Trade and Industry. The empirical results obtained are also discussed in this chapter. Summary of findings, conclusion and recommendations of the study are presented in chapter six.

CHAPTER TWO

THEORETICAL AND CONCEPTUAL FRAMEWORK OF THE STUDY

2.1. Introduction

A tremendous amount of research has been done on the effect of trade liberalization on agricultural production, which has a bearing on this study. This section reviews these studies to obtain some facts that will provide the context within which the study can be understood, and help to take a theoretical position to inform the study. Furthermore, the review is intended to bring out other areas related to this topic which needs further exploration. Other studies related to the effects of trade liberalization on the production, the supply and the producer price of locally produced rice, will be examined.

2.2. Effect of Trade Liberalization on Producer Price

Price changes in the agricultural market can be linked to the adjustment policies through three main routes. These are the fiscal contraction, currency devaluation as well as the liberalization of domestic and international trade. The interplay of the effects of these policies results in the variation of the producer price of the local rice.

Changes in the fiscal conditions such as reduction of subsidies and the increment of taxes have a direct bearing on food prices in general. Therefore, the producer price of rice is affected by fiscal conditions to a large extent. Without loosing sight of this fact, this study intends to be more concerned with the trade liberalization aspect of the economic reforms.

Some empirical studies have been done on the effects of trade liberalization on domestic prices in some sectors of the economy in some developing countries such as Cote d'Ivoire and Mexico. However, a systematic attempt to quantify the beneficial effect of trade liberalization on domestic prices in developing countries is often hindered by lack of required data and by the difficulty of singling out the effect of trade policy reforms. An empirical study of the effect of trade liberalization on the domestic pricing behaviour of the Korean manufacturing sector, using an oligopolistic model of price determination in an open economy, was done by Yang and Hwang (2001). This study found a negative and consequently a restraining effect of import competition on domestic prices in the Korean manufacturing sector. The paper also concluded that, import competition not only affects profit rates in developing countries but price as well. This finding is also collaborated by Tybout (1992); DeRosal and Goldstein (1981); and Puguel (1980)

Younger (1992) carried out an econometric analysis of the link between food price movements and exchange rate movements which reported that, devaluations in Ghana indeed raised food prices. However, the cumulative elasticity of price changes to an exchange rate shock was only in the order of 5 - 10 percent. In particular, the impact of 100 percent devaluation was only an 8 percent increase in food prices, all occurring within the first two months.

Shively (1996) also studied food price variability and the economic reform in Ghana using an Autoregressive Conditionally Heteroskedastic (ARCH) regression model to measure the changes in maize price volatility in Ghana. The statistical evidence which emanated from this study contradicted the hypothesis of increasing price variability of

maize in the post reform era in Ghana. However, there is the need to take into account the fact that, the price variability of rice would be more affected by changes in import costs compared to maize or other staples due to the level of rice importation in Ghana. Thus, the inference drawn from this study cannot be extended to that of rice. The impact of the trade liberalization on the producer price of rice is therefore expected to be greater taking into account the level of rice importation in relation to maize.

Tengku and Ariffin, (1998, 2004) and Weerahewa (2004) carried out studies using price linkage equations to ascertain the potential impacts of trade liberalization on domestic producer prices. The authors evaluated price linkages for the oil palm and paddy rice industry in Malaysia and Sri Lanka respectively. The impact of trade liberalization on producer prices was measured using time series data. The results supported the hypothesis that trade liberalization caused a significant reduction in the price of paddy rice in Malaysia.

The liberalization of the domestic and international trade which formed one of the main pillars of the economic reforms in Ghana played a significant role in the domestic food price variation. In the pre-liberalization era, most developing countries created high protective barriers to international imports, using tariffs, quantitative import restrictions and exchange rate controls. The protective measures were often reinforced by domestic market interventions in the form of selective credits policy, licensing and price controls.

The substitution of quantitative restrictions by tariff, liberalizing imports in general led to a reduction in the level of protection offered to the domestic market (Cavazos, 1977).

According to Mellor (1966) and Kirkpatrick and Maharaji (1992), exposure to increased imports reduces agricultural prices, thereby decreasing incentives to increase production.

Batavia and Malliaris (1996) also found in a study that, in developed countries price support and subsidies have induced farmers to overproduce. This has resulted in the corresponding governments offering excess output to the world markets thus lowering world prices of agricultural products. United States subsidies on cotton, for example, have stimulated overproduction, leading to a slump in cotton prices on the world market. As a consequence, cotton exporting countries in sub Saharan Africa lost an estimated $301 million in export earnings in 2001/02 season alone (Watkins, 2002). Therefore the inference can be made that, the removal of import licensing and the lowering of tariffs will translate one –for – one into lower domestic prices. It is therefore expected that, the producer price of the local rice will be negatively affected by any policy that result in the removal or reduction of tariffs or import restrictions such as trade liberalization.

Eastman and Stykolt (1962) studied protected oligopolies and reported findings contrary to that of Cavazos. Their argument for trade liberalization maintains that protection tends to lead to too many firms producing at low output levels. According to Eastman and Stykolt, liberalization will consequently encourage rationalization, by forcing inefficient firms out of business. Rodrik (1988b) however notes that, this industry-rationalization argument is based on the assumptions of economies of scale and freedom of entry and exit. Thus, with the lowering of protection, the market price is reduced, some firms are forced out, and the remaining firms have to move down their average

cost curve to produce at a sufficient scale of output for reduced level of average cost to match the lower domestic price.

Lopez and Lopez (2001) in their empirical illustration of the impact of imports on price-cost margins explained the price-cost margin as a measure of the net returns of a firm. The price-cost margin takes into account the price of the domestically produced goods and their variable cost of production. The net effect of imports on price-cost margins is given by the sum of three effects. The resultant may be negative or positive depending on the industry under consideration and the impact of each of the three effects. One of the effects comes from the direct impact of imports on price and is always negative. Another effect is the impact of the change in the domestic cost of production due to the domestic quantity adjustment of the product in question. Field and Pagoulatos (1996, 1998); Nolle, (1991); and Stahlammer, (1991, 1992) in their studies found a positive association between increase in imports and the domestic price-cost margins. These findings supported the view that, trade liberalization has resulted in the increase in the domestic price-cost margins. Roa (1998) also corroborated the findings of Field and Pagoulatos and reported in a study that, a liberalized trade in agriculture will raise prices, increase output and raise input use efficiency.

Some empirical evidence therefore suggests that the economic reforms in general and the trade liberalization in particular have resulted in producer price increases but others suggest the contrary.

2.3. Effect of Trade Liberalization on Production and Supply

Studies on the effect of trade liberalization on the production and supply of locally produced commodities have yielded varied results. Some studies have constructed scenarios in which liberalization might slow or increase growth while others have found no influence of trade liberalization on the growth of domestic agricultural output. Underpinning the trade liberalization process is the economic principle of comparative advantage. Thus, liberalizing countries believe that they will flourish by taking advantage of their assets to produce goods and services efficiently and trade those goods produced more efficiently by other countries. Proponents of this theory believe that, liberalized trade increases competitive pressures on domestic companies and as a result create a more efficient production practices and increased price competition which benefits consumers.

Empirical studies in developing countries, including some Asian countries, in which production response models were econometrically estimated to assess the effect of trade liberalization on domestic food production, have treated rice as a homogeneous crop in most cases (Chen and Ito, 1992; Brorsen *et al*, 1987; Parikh *et al*, 1986; Tyres and Anderson, 1986; Roningen and Dixit, 1989). In spite of the fact that, both the locally produced rice as well as the imported rice on the Ghanaian market are of different varieties and grades, this study intends to treat it as a homogenous crop.

Papageorgiu *et al* (1990) in a study on liberalizing foreign trade regimes in developing countries reported that, the performance at the macroeconomic level has been disappointing and even far below the average for the liberalizing economies after

liberalization period. Most developing countries acceding to the Trade Policies Reform had to remove import restrictions and price supports. Fatimah *et al* (1983) corroborating this argument found in a study in Malaysia that, both the fertilizer subsidy and price support significantly contributed to profit and output. The price support scheme was able to increase rice output by 34.2 percent and contributed 71.5 percent change in the level of income. It is evident from the above argument that, the removal of all these subsidies and price support would see many producers being displaced from the rice industry.

Balassa (1989) argues that both export rivalry and import competitions are necessary ingredients to raise domestic productivity because of the nature of a competitive market. Balassa believes that imposing quantitative restrictions to protect domestic producers from import competition leads to a general misallocation of resources and thus lower productivity growth. Import competition will initiate local producers to be aware of competition and take measures to increase productivity and efficiency. Tiepoh, (2000) holds a different view from Balassa. According to Tiepoh trade liberalization has a negative effect on local food production since smallholder farmers will not be able to compete with foreign importers. This may discourage rural subsistence farming if the flow of cheaper food products is so strong to the extent that it penetrates rural households. The ultimate effect will be to destroy the basis of domestic food production.

Schultz (1960) found in a study that surplus food imported and sold on the open domestic market led to a price fall and the corresponding cutback in the domestic production will reduce total supplies available for consumption below the level of the total of pre-surplus supplies and the amount of the imported surplus.

Chand (2003) studied the impact of trade liberalization and related reforms on India's agricultural sector and reported that almost all other crops with the exception of fruits and vegetables, showed moderate to high decline in growth rate during the reform period. For instance, the production performance of cereals, measured by the growth rates, showed a decline from 2.97 before the reform to 2.30 in the post reform period

Fisher (1963) theoretically indicates that the effect of importing cheap substitutes of domestic food depends on the price elasticity of supply. He stated that, the higher the elasticity the weaker the effect. Studies in Sub-Saharan Africa confirm that the effect of output price changes on aggregate production levels tends to be insubstantial in many countries, but the response of individual crop production to changes in relative prices is highly significant. For instance, Bond (1983) carried out a statistical analysis on nine Sub-Saharan African countries and estimated average short-run and long-run price elasticities for aggregate agricultural supply to be 0.18 and 0.21 respectively. The estimates for the short-run and long-run price elasticities for Ghana were found to be 0.20 and 0.34 respectively. Fones-Sundell (1987) also estimated the supply elasticity of rice to be 0.27 in Mali. Although individual crop supply elasticities vary between African countries and between crops; generally, elasticities of 0.5 or more were found in studies by Bond (1983) and Fones-Sundell (1987).

A change in the relative prices among variable inputs would result in a new least cost combination of the variable factors used to produce a given output. A relatively cheaper input is substituted for a more expensive input. The degree of change will depend on the rate at which resources substitute for each other. The substitution effect tends to reduce

the amount of the input that becomes relatively more expensive and substitute the cheaper input. The trade liberalization policy accompanied by the removal of input subsidy, led to an increase in the price of agricultural inputs especially fertilizer. Since farmers have reduced the use of fertilizer due to their high cost, it is expected that farmers would be using more extensive methods of production, which may not be environmentally sustainable.

Bogahawaate (1983) and Gunawardena and Oczkowski (1992) found that the increase in production of paddy rice due to increase in guaranteed price results in 47 percent growth in the long run paddy purchases. The continuation of the guaranteed price scheme appears to play a positive role in providing incentives to producers. Survival of the domestic paddy rice producers may be at stake since a large share of the profit obtained from paddy production comes from price support and fertilizer subsidy. The above argument clearly implies that the developed countries may not be necessarily efficient in their production but the over production is as a result of input subsidy and price support. The removal of these protections and the permission of increased import competition would see many producers being displaced from the industry and reduction in paddy output (Fatima *et al*, 1983 and Tan, 1987).

2.4. Effect of Trade Liberalization on Demand

A background study by Eagleton in April 2001 on the International Rice Market reported that, the demand for rice in West Africa has grown at an average annual rate of 6 percent since 1970s. Over the same period, the quota of rice in cereals consumed has increased 15 to 25 percent. The primary factors contributing to this dramatic shift are

population growth and substitution away from traditional coarse grains associated with rapid urbanization. The USDA Foreign Agricultural Service is sourced as naming Ghana as the twelfth largest rice export market of the USA in 1999. The study indicated a significant growing demand for rice in the post-liberalization era in Ghana. Over the period from 1985 to 1998 the USA exports to Ghana increased from 19000 tonnes to 61000 tonnes (USDA Foreign Agricultural Service, 2000).

2.5. Summary

This review looked at various studies which have a bearing on this study and discussed them. Empirical evidence from the review on the effect of the economic reforms in general and the trade liberalization in particular was mixed. Some studies found a negative effect on the producer price, the production and supply of local commodities while others reported positive effects of trade liberalization on same.

2.6. Hypotheses

The study therefore hypothesizes the following:

1. Trade liberalization has no significant impact on the producer price of rice in Ghana.
2. Trade liberalization does not have any effect on domestic production of rice in Ghana.
3. Trade liberalization (i.e. removal of input subsidy resulting in high cost of input) has no effect on the utilization of arable land for rice production in Ghana.

CHAPTER THREE

HISTORICAL OVERVIEW OF RICE POLICY IN GHANA

3.1. Introduction

The evolution of rice policy in Ghana can be traced back to the pre-independence period when the colonial government established the first rice mill at Esiama (in the then West Region) in 1926. This followed a major policy statement by the administration in 1924 for a need to develop an organized rice industry in the Gold Coast (now called Ghana after independence). Government rice policies in independent Ghana are discussed below under rice production and trade policies.

3.2. Rice Production Policy

The first major agricultural policy reform occurred after independence in 1957 when the government of Dr. Kwame Nkrumah scrapped the second phase of a ten-year development plan (Five –Year Development Plan, 1959-64) inherited from the Colonial Administration in favour of the new government's seven – year development plan (1963-1970). The goal of the Nkrumah government was to develop Ghana on a socialist model; and the two basic pillars for this model were industrialization and modernization of agriculture. In this development plan, rice received a specific recognition among the cereals to be developed and its production increased.

The overall increase in cereal production within the plan period was expected to be 52 percent. Moreover, rice production from the public sector was to increase by 100 percent. In order to realize the goal of modernizing agriculture and increase rice production, the government encouraged large scale farming (by both the state and

individuals) and irrigated rice production, particularly in Northern Ghana where condition are relatively favourable. A large number of tractors and other agricultural machinery were imported between 1962 and 1964 by the government through the United Ghana Farmers Council Cooperatives (UGFCC). The government established the State Farms Cooperation (SFC) in 1962 as part of the program to modernize agriculture. Three state farms were set up at Damongo (Northern Region), Adidome, and Afife for rice cultivation.

In anticipation of a rapid increase in rice production, the UGFCC imported and installed 15 modern rice mills in the potential rice growing areas. However, due to delays in construction, only a few of the mills could be operational before the UGFCC was dissolved in 1966 following a change in government.

A second agricultural policy change occurred when the government of the National Liberation Council (NLC) shelved Nkrumah's Seven-Year Development Plan and instead launched a Three-Year Development Plan (1968-1970). The main thrust was on correcting the disequilibrium in the system through import liberalization, devaluation of the cedi, and deflationary monetary and fiscal policies. Direct involvement of the state in industry and agriculture was discouraged. An effort was made to harness the potentials of the private sector for economic development. The rice industry featured prominently under the agricultural sector of the plan. Seed multiplication programs were started for food grains (including rice), and the Agricultural Development Bank was established to provide credit for farmers. In 1969, a civilian government led by Dr. K.A. Busia was elected into power. They followed the agricultural policies of the NLC government, and

rice production was again given a booster. For example, in 1970 the government signed an agreement with the Federal Republic of Germany to supply 1,500 tons of fertilizer free of charge annually for the development of agriculture in the Northern and Upper Regions, with the greater proportion of it used in rice production (Ghana Rice Policy cited in Osafo, 1983). Government rice policy aimed at making rice available to consumers at moderate prices without discouraging the expansion of local production.

In 1972, a military government under the National Redemption Council (NRC) came into power. They launched Operation Feed Yourself (OFY) programme to increase food production, and initially supported small-scale farmers who produced the bulk of Ghana's food requirements. Rice is one of the major cereal crops which featured in the program. However, government support later shifted toward development of privately-owned, large–scale and mechanized commercial farms which used intensive methods, apparently because they hoped that rice production increases could occur faster under these farms. The NRC government also drew up a development program, a Five-Year Development Plan 1975/76-1979/80, in which rice production was targeted to increase by some 80 percent within the period.

Due to the implementation of these policies, rice output in Ghana during the seventies reached its peak of 89,000mt in 1975/76 when for the first time in Ghana's rice history, government declared self-sufficiency in rice. This was as a result of probably the massive importation of production and processing equipment in the 1960s and emphasis on rice production during the Operation Feed Yourself (OFY) programme of the early

1970s when the government provided institutional, financial and technical support to the rice industry.

A third agricultural policy reform was initiated with the launching of the Economic Recovery Programme (ERP) in 1983, and the associated Structural Adjustment programme under the Provisional National Defence Council (PNDC). The PNDC assumed office in 1981 and undertook many policy reforms aimed at arresting the steady deterioration of Ghana's economy. The Rehabilitation Phase of the Economic Recovery Programme (1983-86) included a programme for the agricultural sector: Ghana Agricultural Policy- Action Plans and Strategies (1984-86). Highlights of the plan which included self- sufficiency in the production of cereals, maintenance of adequate levels of buffer stocks of grains, particularly rice, was to ensure availability of food during the lean season (March-July), price stability, and provision of maximum food security against unforeseen crop failure and other natural hazards. The government's strategy was to emphasize on rice production during the three year period (1984-86) and increase output by increasing yields in selected high potential areas, including irrigated project areas, while encouraging production in other areas. The total rice area cultivated for the period was expected to increase from 67,210ha in 1984 to 101,865ha in 1986, an increase of some 52 percent.

The second phase of the adjustment process (the Stabilization Phase, 1986-88) emphasized increased productivity and internal price stability in the agricultural sector. Specific policy goals included attaining self- sufficiency in cereals especially rice.

The objective was to increase area under rice cultivation from 67,210 to 101,865 ha. However, this was not achieved; in 1986 the total area under rice cultivation was 76,100 ha. Despite the non achievement of the area expansion objective, Ghana was self-sufficient in rice production in 1986, which was partly due to good rainfall, influx of returnees from Nigeria who went into farming and subsidized production inputs.

Under the third phase of the adjustment process (Liberalization and Growth Phase), which started in 1989, the major goals included deregulation of commodity and service markets to reduce domestic price distortions, as well as liberalization of export and import markets.

The goals pursued under the third phase caused a major shift in rice production and marketing policies:

- All direct subsidies and taxes on imported inputs were withdrawn.
- Distribution of all inputs (seed, fertilizer and agro-chemicals) was to be privately handled.
- All price controls, including that of rice, were eliminated.
- All imports including rice imports were liberalized, though relatively heavy tariffs were imposed at different times to protect local production.
- Marketing of both locally produced and imported rice were liberalized.

The annual paddy rice production of 63,000mt in 1988 dropped to 40,200mt in 1989 probably as a result of the implementation of the Economic Recovery Programme (ERP). The price support system was abolished during this period and free market operation was introduced. Subsides on production inputs were removed making fertilizer more expensive which led to the reduction in its utilization. Before then, fertilizer subsidies have been in the range of 40 to 80 percent. Slow growth in the early 1990s raised concerns about policies to privatize and liberalize agricultural production and marketing. Clearly, there had been problems. For example, the removal of fertilizer subsidies led to a sharp increase in fertilizer prices and a decline in its use. The price of fertilizer more than doubled when subsidies were removed in the 1990s. Since then the price of fertilizer continued to increase substantially from 1990 to 2005 (See Table 3.1). Annual fertilizer imports which reached a peak of 102,940mt in 1980 during the pre-liberalization period and dropped to 19,840mt in 1996 in the post –liberalization and also increased to 79,262mt in 2001 as shown in Table 3.2. Fertilizer were not imported in some years (1981, 1983, 1991 and 2002) because of lack of import capacity in the case of the early 1980s, and because stocks we adequate to meet consumption in the case of 1991 and 2002 (Seni, 2002).

Currently, the policy is to ensure food security and promote import substitution. Since 2002, the thrust of this policy was to reduce rice imports by 30 percent over the medium term, in order to save some $100 million annually and by increasing domestic production level to about 370,000 metric tonnes. Specific measures to reach this level of production include increased mechanization, increased cultivation of inland valleys and effective and efficient utilization of existing irrigated systems (FASDEP, 2002).

Table 3.1: Fertilizer prices and subsidy levels in Ghana (1970-2005)

Year	NPK(¢ /50kg)	Sulphate of Ammonia (¢ /50kg)	Average level of subsidy
1970	2.80	2.00	50
1971	2.80	2.00	54
1972	2.80	2.00	65
1973	2.80	2.00	72
1974	2.80	2.00	45
1975	2.80	2.00	86
1976	2.80	2.00	82
1977	6.50	5.00	62
1978	7.50	6.00	0
1979	10.00	8.5	80
1980	15.00	12.00	65
1981	30.00	25.00	45
1982	30.00	25.00	45
1983	58.00	45.00	45
1984	440.0	295.0	0
1985	440.0	295.0	60
1986	700.0	490.0	56
1987	1,380	820.0	42
1988	2,300	1,600	30
1989	3,350	2,350	0
1990	4,500	3,100	0
1991	4,500	3,100	0
1992	7,800	6,400	0
1993	11,800	7,800	0
1994	17,200	13,100	0
1995	22,500	16,000	0
1996	31,000	25,000	0
1997	34,000	22,000	0
1998	35,000	22,000	0
1999	49,000	34,000	0
2000	79,000	53,000	0
2001	105,000	90,900	0
2002	123,500	101,700	0
2003	149,500	110,000	0
2004	188,600	143,000	0
2005	202,000	158,000	0

Source: SRID of Ministry of Food and Agriculture, Accra, 2006.

Table 3.2: Fertilizer imports to Ghana in Metric tonnes (1970- 2004).

YEAR	NPK	UREA	AS	MOP	KNO_3	SSP &TSP	OTHERS	TOTAL
1970	9000	3	6267	30				15300
1971	8834	3	5943	33		471	82	15306
1972	8732	33	3052	33				20229
1973	19626	8	7100	30	18			51456
1974	8310	10	4150	10		1000		40440
1975	19980	3	2258	5		1925		42221
1976	41426		2557			582		85409
1977	23650		2900	70	10	7480	4650	50200
1978	25621		13739				3545	64981
1979	39650		19000					98300
1980	42480		17980	500		400	1480	102940
1981	0		0					0
1982	32500	0	14000	0	0	0	4000	79000
1983	0		0					0
1984	24550	200	13600					62900
1985	24562		5437					54561
1986	11600		8500	1000		400		31700
1987	23420		14650					38070
1988	19025		20550					39575
1989	28500	6015	25711				5013	65239
1990	21,250	20,100	2,500	0		500	600	44950
1991	0	0	0	0		0		0
1992	17,500	0	11,500	400		0		29400
1993	10,000	0	7,600	2,000		560		20160
1994	13,040	0	8,500	2,500		20		24060
1995	9,300	4,250	9,000	3,400		200	1990	28,140
1996	8,700	920	5,320	4,500			400	19,840
1997	37,080	1,850	10,700	5,450		0	1083	56,163
1998	21,858	500	13,265	3,095		500	3097	42,315
1999	3,602		4,800	8,066		3,500	2,025	21,993
2000	14,902	141	23,165	4,510		600		43,318
2001	49,287	2,500	22,628	4,147				79262
2002	0	0	0	0		0	0	0
2003	18,890	500	25,715					45105
2004	18,223	250	7,688			1,850		28011

Source: SRID of Ministry of Food and Agriculture, Ghana, 2005

3.3. Rice Trade Policies

Government intervention in rice marketing in the 1980s involved the setting of quotas on rice imports and the establishment of official prices for imported and domestically produced rice. The government through the Food Distribution Corporation controlled the price of imported rice at official distribution centres in the pre-liberalization (late 1970s to 1986). Table 3.3 shows the summary of rice trade policy.

Table 3.3: Rice Trade Policy in Ghana.

Year	Trade Regime	Specific Policy Interventions
1960-1970	Highly Restrictive Trade Regime	• Government policy intervention in the rice industry includes the use of floor and ceiling prices, input and credit subsides. • Restrictions were generally characterized by a plethora of trade control instruments; higher tariffs, quantitative controls and administrative regulations on imports. Since then rice imports have been subjected to various controls and regulations, culminating in a total ban on rice imports in 1975 under the NRC government, when Ghana declared self-sufficiency in rice, and again in 1986 under the PNDC government.
1980s	Price Regime	• The pricing regime that existed for rice includes; official and open market price for both local and imported rice.

Source: PPMED of Ministry of Food and Agriculture

Table 3.3: Rice Trade Policy in Ghana (continued).

Year	Trade Regime	Specific Policy Interventions
1990s	Reduction and Simplification of tariff structure	For example, in 1981 the official price for imported rice was ¢4.00/kg, while the open market price for both local and imported rice is ¢29.90/kg. This was 7 times higher than the official retail price. • In 1984 official retail price for imported rice was ¢11.40/kg, and that for local rice was ¢50.00/kg. The open market price for both imported and local rice was ¢171.61/kg. In 1985/86 the official price for the local rice was ¢64.00/kg while the imported rice was ¢36.00/kg. The open market price was ¢96.00/kg.
1990s	Reduction and Simplification of tariff structure	• Ghana has progressively eliminated its import quotas and import licensing regime in 1989. Rice imports were made less restrictive, though relatively heavy import tariffs (43%). The country has now resulted in using a reducing tariff rate (32.5%). Thus protection for local producers fell precipitously

Source: PPMED of Ministry of Food and Agriculture

CHAPTER FOUR

METHODOLOGY

4.1.1. The Analytical Model

In this study an analytical model was developed to capture the changes in the policy framework. A partial equilibrium model, treating Ghana as a net importer of rice, was developed. The producer side was represented by a supply function, marketing function by an equation to link rice prices and the consumer side by a demand system for rice. The supply function, marketing function and the demand system are considered stochastic and they were econometrically estimated.

4.1.2. Model for Estimation of Domestic Producer Price

In estimating the potential impacts on domestic prices resulting from liberalization, a price equation was estimated. The two main variables that influence domestic producer prices are import price and import penetration ratio. In this study, the model used to estimate the degree of the effect of liberalization on domestic producer price is derived from the Law of one price (LOP). The model is similar to that used in the following studies (for DeRosal and Goldstein (1981); Mundlak and Larson (1992); Pugel (1980) Tengku and Ariffin (1998, 2003); and Weerahewa (2004)). The domestic producer price of milled rice is expressed as a product of border or international price of imported rice, import penetration ratio and trade liberalization. In developing countries like Ghana, it is reasonable to consider import penetration ratios as a measure of import trade liberalization. While average tariff rates may capture the effect of tariff reduction,

import penetration would probably capture the effect of both tariff reduction and non tariff barriers.

The model is specified as follows:

$$P_t = f(BP_t, IPRt, DUMLIB_t) \quad \text{.....(4.1)}$$

The border price of rice is the price in dollars per metric tonne at the border of a country. For imports, it include the cost of the goods plus the insurance and freight required to get them to the border (called CIF price) all converted into domestic currency at the official exchange rate. Therefore the international or border price per metric tonne is given by the total value of rice imports divided by the imported quantity. On the other hand, import penetration ratio (IPR) was calculated by dividing the value of imports by the sum of the value of domestic output and imports (Bednaizik, 1993; Forouton (1991, 1996)). The value of domestic output is given by the product of producer price per metric tonne of milled rice and quantity produced annually per metric tonne. Producer price is the average national price or unit value received by producers in the domestic market for a specific agricultural commodity produced. This means that this value reflects what the average producers received for their product, not necessarily what was paid by the consumer.

Converting equation (4.1) to logarithmic form, the intended relationship can be written as;

$$\ln P_t = \alpha_0 + \alpha_1 \ln BP_t + \alpha_2 \ln IPR_t + \alpha_3 DUMLIB_t + \varepsilon_t \quad \text{.....(4.2)}$$

Where $\ln P_t$ denotes the natural logarithm of the annual real domestic producer price of the domestic milled rice for each year *t* in cedis per metric tonnes; $\ln BP_t$ and $\ln IPR_t$ denote the natural logarithm of the real international price of imported rice in cedis per metric tones and the natural logarithm of the import penetration ratio respectively. $DUMLIB_t$ also represents the net effect of the liberalization; this is expected to capture the net effect of the trade reform other than those directly included in the equation. The net effect of liberalization through the use of dummy variables, $DUMLIB_t$ takes 0 for pre- liberalization (1970-1988) and 1 for post- liberalization (1989- 2004); and ε_t denotes the disturbance term. The α's are parameters (elasticities) to be estimated and the *t* subscripts refer to the time period. The producer price of domestic rice and international or border price of imported rice were deflated by consumer price index (CPI) using 1997 as the base year.

4.1.3. Estimation of Locally Produced Rice

In evaluating the effects of liberalization on domestic rice production, a supply response model was used for the estimation. The variables that can influence production of agricultural commodities are varied and many, depending on the type of commodity and the uniqueness of the production process. However, the core variables are usually own-price and the price of competing commodities. In many cases the level of technology, the cost of production as well as the weather played important roles. The period considered for this study is from 1970 to 2004. Supply functions were estimated for three different time periods: the entire period (1970-2004), sixteen years before (pre) liberalization era (1973-1988), and sixteen years after (post) liberalization period (1989-

2004) which was characterized by removal of government support. The supply function is based on findings of Chen and Ito (1992) and Song and Carter (1996) who separated their data set into two periods. However, Chen and Ito (1992) formulated different equations for each period and then combined the two equations into one, using a switching procedure. This study however used one equation for the entire period, then separated the entire period into two periods (sixteen years before and after the introduction of trade liberalization) in order to compare the effect of liberalization. Three regressions were run. The first regression was run using all the entire sample size from 1970 to 2004 and a second regression was run for pre- liberalization and post-liberalization periods. Equations (4.3), (4.4) and (4.5) are used for the estimation of the entire period, the pre and the post–liberalization periods respectively. Rice production function would be obtained through an econometric estimation specified as follows:

$$\ln DRP_t = b_0 + b_1 \ln PR_{t-1} + b_2 \ln AR_t + b_3 \ln RF_t + b_4 SI_t + b_5 DUMLIB1_t + \varepsilon_t \quad \ldots\ldots 4.3$$

$$\ln DRP_t = b_0 + b_1 \ln PR_{t-1} + b_2 \ln AR_t + b_3 \ln RF_t + \varepsilon_t \quad \ldots\ldots 4.4$$

$$\ln DRP_t = b_0 + b_1 \ln PR_{t-1} + b_2 \ln AR_t + b_3 \ln RF_t + \varepsilon_t \quad \ldots\ldots 4.5$$

Where $\ln DRP_t$ is the natural logarithm of annual domestic rice production in metric tonnes and $\ln PR_{t-1}$ is the natural logarithm of lagged farmgate price of paddy rice in cedis per metric tonnes. The farmgate price for rice represents the average producer price that producers received for the individual commodity. This means that the value reflects what the average farmer received for his product, but not what paid for by the consumer. $\ln AR_t$ is the natural logarithm of area planted with rice in hectares and $\ln RF_t$

is the natural logarithm of annual rainfall in millimetres for the northern region. This annual rainfall was considered for the study because according to PPMED, (1995; 1996), Akanko, *et al* (2000) and SRID, (2003) revealed that 55%, 63%, 61% and 57.4% of the bulk of rice production comes from the northern Region of Ghana respectively. $DUMLIB_t$ is the effect of trade liberalization and was measured through the use of dummy variables, where $DUMLIB_t$ takes 0 for 1970-1988, and 1 for 1989- 2004 and SI_t denote the input subsidies and dummy variable was used to represent the periods in which subsidy was offered to farmers; SI_t takes 1 for 1970 to 1988 for period in which subsidies was offered and 0 for 1978, 1984 and 1989 to 2004 for periods in which the subsidy was withdraw.

4.1.4. Estimation of Rice Demand Function

A quantitative analysis of the impact of the trade liberalization on the demand is based on the demand theory. It is assumed that the representative consumer maximizes utility, given a fixed income. The demand schedule for rice is derived by maximizing the consumer's utility and per capita demand for rice which is a function of average income (is per capita Gross Domestic Product, GDP), retail price of rice, and retail price of maize as a related commodity for rice. According to Dapaah (1991), cereals contribute about half the calories need in Ghana. Maize, just like rice, is also consumed nationwide and constitutes a principal diet of the majority of Ghanaians. Maize was therefore considered as related commodity for rice. The rice demand function is based on the findings of Haessel (1976); Ahmad (1990); and Kako *et al* (1997). Price data for rice and maize were unavailable for the period of 1970-79 so estimation was done using the

time series data of the period 1980 – 2004 by OLS. The rice demand equation is estimated as follows:

$$\ln Q_t = \alpha_0 + \alpha_1 \ln PR_t + \alpha_2 \ln PM_t + \alpha_3 \ln Y_t + \alpha_4 DUMLIB2_t + e_t \quad \text{.....4.6}$$

where $\ln Q_t$ is the natural logarithm of amount of per capita consumption of rice, at time *t*, $\ln PR_t$ is the natural logarithm of real retail price of rice in cedis per metric tonne in year *t*, $\ln Y_t$ is the natural logarithm of the real average per capita income, $\ln PM_t$ is the natural logarithm of real retail price of maize in cedis per metric tonne, $DUMLIB2_t$ is the dummy variable introduced to capture the period of the trade liberalization; $DUMLIB2_t$ takes 0 for 1980-1988 and 1 for 1989-2004 and e_t is the error term. The $_t$ subscript refers to the time period. During the period under consideration, a lot of the data on the retail price of locally produced rice was not available. Consequently, the retail price of imported rice was used as the probable estimate for locally produced rice for such periods where there were challenges with data in this study. Specifically, $\ln Q_t = \ln (S_t + M_t)/N$, where S_t and M_t are domestic production and net imports of rice, respectively and N is the population. Average per capita income was obtained by dividing Gross Domestic Product (GDP) in year *t* by population in that year. Prices (rice and maize) and average per capita income were deflated by consumer price index (CPI) and GDP deflator of the 1997 base year respectively.

4.1.5. Land Utilization Model

The effect of trade liberalization on the utilization of arable land in the production of paddy rice was estimated by the use of an area harvested model based on the rational

expectations model. The area planted with paddy rice was estimated by OLS using a time series data. In Ghana, a greater proportion of paddy rice is produced on rainfed fields.

Lin *et al* (2000) states that the "theory underpinning area harvested model assumes that producers wish to maximize expected utility of wealth. Since both price and yield are stochastic and output will be a function of the joint probability distribution of gross revenue. This model is also based on the studies by Chen and Ito (1992), Kako *et al* (1997), Narayana and Shah (1984). Rice field area is expressed as a function of the expected gross rice revenue or income, lagged area planted with rice and dummy variables for trade liberalization periods. Annual data for the period 1970-2004 was used to estimate the rice field area function. Based on this, the generic paddy rice area equation for this section is specified as follows:

$$\ln PF_t = b_0 + b_1 \ln RI_t^* + b_2 DUMLIB3_t + b_3 \ln PF_{t-1} + V_t \quad \ldots\ldots 4.7$$

The cobweb theory stated that the current expected gross income is based only on most recent past value.

$$RI_t^* = RI_{t-1} \quad \ldots\ldots 4.8$$

Where RI_t^* is the expected gross income for the period, t and RI_{t-1} is the observed income in period t-1. Now substituting RI_{t-1} for RI_t^* in the rice field area equation (4.7). The model is dynamic since lagged area planted with rice is included as an explanatory variable. The paddy field area model now becomes:

$$\ln PF_t = b_0 + b_1 \ln RI_{t-1} + b_2 DUMLIB3_t + b_3 \ln PF_{t-1} + b_4 T_t + V_t \quad \text{.....4.9}$$

Where the $\ln PF_t$ is the natural logarithm of the field planted with rice (hectare) in year t; $\ln RI_{t-1}$ is natural logarithm of lagged gross rice revenue or income in cedis per metric tonne in year t; $DUMLIB3_t$ is the dummy variable representing the trade liberalization periods since 1989 when the liberalization policy was introduced; $DUMLIB3_t$ takes 0 for 1970- 1988 and 1 for 1989 - 2004; $\ln PFt_{-1}$ is lagged area under rice cultivation and V_t is the error term. Gross rice revenue was given by multiplying the quantity of rice produced in year *t* by the price in that year. By definition, rice area is specified as a function of gross revenues or income rather than prices as is often utilized in area response analysis. As noted by Rosegrant and Kasryno (1992) and Sanderson *et al* (1980), the use of revenue is theoretically preferable to price as an exogenous variable because price and quantity are not stationary.

4.2.0. Description of Variables, Source of Data and Sampling

4.2.1. Source of Data

Both primary and secondary data were obtained for the purpose of the analysis in determining the effects of trade liberalization on the domestic rice industry in Ghana. The secondary data consisted of the border price, producer price, production levels, import levels, and the gross domestic product (GDP), which are provided in appendix B. These data were obtained from Ghana Statistical Service (GSS), Statistics Research and Information Directorate (SRID), Ministry Trade and Industry as well as the Policy Planning, Monitoring and Evaluation Directorate (PPMD) of the Ministry of Food and

Agriculture (MOFA), and the Bank of Ghana (BOG). The time series data covers thirty five years, spanning the period from 1970 to 2004. Data was also obtained from previous economic studies of rice in Ghana conducted by individuals and organizations such as WARDA, the World Bank, as well as from FAO statistics.

4.2.2. Description of Variables and the Expected Impact

A detailed list of the variables, their descriptions, some selected statistics, and expected impacts are shown in Table 4.1 below.

Table 4.1 Variable list, descriptions and some selected statistics and expected impacts

Explanatory Variables	Description	Mean	Standard Deviation	Expected Sign
ln P_t	Natural logarithm of real producer price in cedis/ Metric tonne	21.2409	3.57782	+
lnBP_t	Natural logarithm of real Border international price in Cedis/metric tonne	20.7772	4.5034	+
lnIPR_t	Natural logarithm of import Penetration ratio	-1.0036	0.8728	-
lnDRP_t	Natural logarithm of Domestic rice production in metric tonnes	11.4862	0.72079	-
lnP_{t-1}	Natural logarithm of lagged Farmgate price in cedis/tonne	9.7112	3.24842	+
lnAR_t	Natural logarithm of Area Planted with rice in hectare	11.2003	0.37981	+
lnRF_t	Natural logarithm of Annual rainfall in millimetres	7.0253	0.35897	+
lnPF_t	Natural logarithm of Rice Field area in of hectare	11.1953	0.38214	+
lnRI_t	Natural logarithm of gross rice revenue in cedis	20.6680	3.76575	+

Table 4.1 Continued

Variables	Description	Mean	Standard Deviation	Expected Sign
$\ln Q_t$	Natural logarithm of annual per capita rice demand	2.6778	0.69586	+
$\ln PR_t$	Natural logarithm of real price of rice in cedis / metric tonne	12.0485	2.89448	-
$\ln PM_t$	Natural logarithm of real price of maize in cedis/metric tonne	10.6590	3.05799	+
$\ln Y_t$	Natural logarithm of real average per capita income in cedis	8.9629	0.17553	+
S_t	Producer subsidy for domestic Production	0.4857	0.50709	+
$DUMLIB_t$	Dummy variable for inception of trade liberalization for price equation	0.4706	0.50664	-
$DUMLIB1_t$	Dummy variable for the introduction of liberalization for quantity produced equation	0.4571	0.50543	+
$DUMLIB3_t$	Dummy variable for the introduction of liberalization for paddy field area equation	0.4571	0.50543	+
$DUMLIB2_t$	Dummy variable for the introduction of liberalization for demand equation	0.6400	0.48990	+

4.2.3. Sampling Procedure

The stratified sampling procedure was employed to choose rice farmers from the Northern Region of Ghana for interview. The five rice producing districts selected for the survey in the northern region were the Tamale, Yendi, Tonlon-Kumbugu, Gushiegu-Karaga and the Savelugu- Nantong districts. For each district, two rice producing communities were selected. These communities are Tugu, Wamale, Yendi, Mion, Zanjibalig- bibu, Ginganni-villi, Kpatinga, Gaa, Nantong and Tampion.

A sample size of 10 farmers was drawn from each of the communities in the study area. This gives a sample size of 20 farmers per district, and a total of 100 respondents in the survey. The five districts were selected to give a fair representation of the rice farming in the Northern Regions. Sampling of the actual respondents in each category was however done randomly.

4.2.4. Data Collection Procedure

The major instrument for collecting the primary data was semi- structured questionnaire administered to rice farmers through personal interviews (a copy of the questionnaire in appendix A).

Secondary data such as prices, production levels, import levels, area under cultivation and other relevant indicators over the period of 1970 to 2004 was obtained from Ghana Statistical Service (GSS), Statistics, Research and Information Directorate (SRID), Ministry Trade and Industry and Policy Planning, Monitoring and Evaluation Directorate (PPMD) of Ministry of Food and Agriculture (MOFA), Bank of Ghana (BOG).

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1. Trade Liberalization Effects on Producer Price of Rice

Before proceeding to the regression results, one point needs to be kept in mind. Since all variables are in the natural logarithms, the estimated coefficients may thus be interpreted as elasticities.

Regression results reported in Table 5.1 presents estimation of domestic producer price in terms of variables, which comprises the border price or international price of rice, import penetration ratio and net effect of trade liberalization (represented by a dummy variable).

Table 5.1 Regression Results for Trade Liberalization Effect on Producer Price

Independent variable	coefficient	t-statistics	significance level
Dependent variable is the natural logarithm of domestic producer price (P_t)			
$lnBP_t$	0.963	39.781	0.000
$lnIPR_t$	-1.139	-10.648	0.000
$DUMLIB_t$	-0.592	-2.796	0.009
Constant	0.368	0.514	0.479
Adj. R^2	0.988		
F-statistics	929.977		0.000
SER	0.38704		
N	35		

Notes: BP = border price of rice in cedis; IPR = import penetration ratio, DUMLIB = trade liberalization and N is the sample size (1970-2004).

The Durbin-Watson (D-W) statistic, d is 1.782. The upper (d_L) and the lower (d_U) limits of the level of significance of the D-W statistic (from the critical table) at 5 percent is 1.27 and 1.65 respectively. Since the empirical value is greater than the lower and upper limits, the result suggests absence of serial correlation. The coefficient of determination adjusted for degrees of freedom is 99 percent, which indicates that the variation in domestic producer price of rice was explained by changes in the explanatory variables as shown in Table 5.1. The F-statistic was statistically significant meaning all the explanatory variables were related to the producer price. The standard error of regression (SER) in the equation predicting domestic producer price was considerably lower than the standard deviation of the sample mean of domestic producer price (Table 4.1), implying that the estimated model is a better predictor of producer price than the sample mean of producer price.

The estimated coefficient for the import penetration ratio (IPR) was -1.139. It carries the negative sign as expected and is highly significant. Its magnitude is quite high, indicating that a 10 percent increase in IPR leads on average to a reduction of domestic producer price by 11.4 percent. This clearly demonstrates a substantial restraining effect of import competition on domestic producer price. The coefficient of the border price was statistically significant at 1%.

The coefficient of the DUMLIB was found to be negative, and statistically significant at 1%. This implies that the net effect of liberalization other than those directly captured in

the model had substantially reduced the domestic producer price of rice. The deduction can therefore be made that, the trade liberalization has resulted in the fall of the producer price of local rice in Ghana.

The results also suggest that, there was a negative, and hence retraining, effect of trade liberalization or import competition on domestic prices in the Ghanaian rice industry. Thus, it is clear that import competition not only affect profit rates in developing countries [see the World Bank studies reported by Tybout (1992)] but price behaviour as well. Comparing result of this study with similar studies done on the manufacturing sector by [Pugel (1980), and DeRosal and Goldstein (1981)], the restraining effect on domestic price in Ghanaian rice industry appear to be substantially larger than that of the domestic prices in United States. This is as a result of most developing countries, including Ghana, have their domestic markets been heavily protected by various import restrictions, hence it not surprising to find a larger effect of trade policy change on domestic producer price.

The import penetration ratio coefficient (-1.139) and trade liberalization dummy (-0.592) are statistically significant, showing that both an increase in import penetration ratio, as well as the trade liberalization had a marked effect on domestic producer price of rice. To this end, the hypothesis of trade liberalization not having an impact on the producer price of the locally produced rice was consequently not accepted because the results show that the trade liberalization had decreased the domestic producer price of rice.

5.2. Estimated Effects of Trade Liberalization on Production of Local of Rice.

The result of the effect of trade liberalization on the production of locally produced rice is shown in Table 5.2. The F-statistic for the whole sample period and post - liberalization periods were all statistically significant. This implies that, all the explanatory variables were related to the production of the locally produced rice. An exception was the F-statistic of the pre-liberalization period which was statistically insignificant. The standard errors of regression (SER) were considerably lower than the standard deviations of the sample mean of locally produced rice (Table 4.1). This means that, the estimated models are a better predictor of local rice production. The adjusted R^2 for the whole period under study was 82 percent while that for the pre and post liberalization periods were 63 and 71 percent respectively. This indicates that, over 60 percent of the variation in the production of the locally produced rice was explained by the changes in the explanatory variables for the whole period under study, pre-liberalization and the post-liberalization period. The D-W statistics in all equations indicate no serious problems of autocorrelation and thus autoregressive correction was unnecessary.

For the whole sample period (1970-2004) equation, the area planted with rice variables was statistically significant at 1% level, as presented in Table 5.2. However, the parameter estimates for annual rainfall and trade liberalization were not different from zero at the 5% significance level. Even though the periods of liberalization had a positive influence on rice production, this effect was found to be negligible. The elasticity of supply with respect to farm price or farmgate price was 0.078 percent. The

estimation result shows that rice production is positively related to the farm price of paddy rice and statistically significant at 10%. The sign of the coefficient of the input subsidy was positive as expected but was not statistically different from zero at the 5% significance level. This suggests that, the input subsidy offered by the government reduced the cost of production which resulted in increased rice production. The effect of the input subsidy was very small. This may, in part, be due to the unavailable data on exact amount of input fertilizer used in rice production. The use of dummy variable rather than the actual amount of fertilizer to calculate subsidy to the rice farmers could also introduce some biases. The elasticity of supply with respect to area planted with rice is 1.025. Area planted with rice was positively related to rice production. This means that, rice production has been increasing due to area expansion, even though the growth rate of rice production has slowed down over time.

In the pre-liberalization era, as shown in table 5.2, all the variables explained 63 percent of the total variation in the local rice production. The coefficient of the farmgate price or farm price of paddy rice in this era was statistically significant at 5 percent.

Table 5.2 Regression Results for the Effect of Liberalization on Rice Production in Ghana

Explanatory Variables	Whole sample period	Pre-liberalization period	Post- liberalization period
	Dependent variable is the quantity produced locally (DRP_t)		
$lnPR_{t-1}$	0.078 (2.361)**	0.132 (3.483)*	0.104 (1.042)
$lnAR_t$	1.025 (3.430)*	0.394 (1.180)	1.697 (2.804) **
$lnRF_t$	0.176 (0.964)	0.588 (2.591)**	0.341 (1.648)
(SI_t)	0.065 (0.255)		
$DUMLIB1_t$	0.146 (0.524)		
Constant	-2.0879	1.474	11.200
Adj. R^2	0.82	0.63	0.71
D-W	1.607	1.814	1.105
F-Statistic	31.959*	9.513*	13.172*
SER	0.30588	0.28059	0.23220
N	35 (1970-2004)	16 (1973-1988)	16 (1989-2004)

Note: Dependent variable is quantity of rice produced locally, DRP_t (metric tonnes), PR_{t-1} is farm price lagged one year, AR_t is area planted with rice (hectare), RF_t is annual rainfall (mm), $DUMLIB1_t$ is a dummy for the period of trade liberalization and SI_t is input subsidy. The numbers in parenthesis are t- ratios. A * indicates the coefficient is statistically significant at the 1% level, ** indicates statistical significant at 5% and *** indicates statistical significant at 10% level. D-W represents Durbin-Watson Statistics and N is the sample size.

The elasticity of production of rice (DRP_t) with respect to farm prices or farmgate prices received by farmers (PR_{t-1}) was 0.132. This indicates that, an increase in the farmgate price or farm price resulted in a corresponding increase in the local rice production against the backdrop of lower cost of farm inputs in this period. The argument can therefore be made that; the input subsidies offered to farmers by the government in the 1970s and the 1980s was a major contributory factor to the increase in the domestic rice production.

In the Pre-liberalization era, analysis of the effect of the area under rice cultivation on production yielded insignificant results. Rice production was found to be positively related to the area under cultivation in the Pre-liberalization period. This finding suggests that land usage within that period was small and insignificant.

The trend of fertilizer importation as shown in Table 3.2 depicts high levels of fertilizer importation during the 1970s and the 1980s. Considering the quantity of fertilizer imported during this era, the assumption can be made that, the subsidy offered by the governments helped the farmers to procure more fertilizer to undertake rice cultivation more intensively.

The coefficient of annual rainfall (RF_t) was 0.132 and statistically significant at 10 percent. This variable had the positive sign as expected. This suggests that the annual rainfall increased local production of paddy rice in the pre-liberalization period compared to the whole sampled period and post –liberalization period.

For the post liberalization equation, the coefficient of the farm price of paddy rice was statistically insignificant. This might be due to the fact that, the minimum guaranteed price of rice was removed in the post liberalization era resulting in the decline of the profit margins of farmers. The coefficient of annual rainfall was 0.341 but statistically insignificant. It however had the expected positive sign.

Area under rice production was found to be statistically significant at 5% level. The elasticity of production with respect to area planted with rice was 1.697 percent. This implies that, the area under rice production has increased in the post liberalization era. The reason for this might be partly due to the withdrawal of the subsidies on farm inputs which led to a sharp rise in the price of fertilizer. This culminated in the use of extensive method of production by farmers in order to achieve maximum yield.

From the results above, it can be deduced that, the level of rice production is positively related to the area under rice production. This implies that, the increase in the level of rice production, especially in the post-liberalization period, was mainly due to the expansion of the area under rice production, but the growth rate of rice production has slowed down over time. The mean annual production growth rate of rice in Ghana has generally declined in the post-liberalization era. The post-liberalization era, especially after 1993, saw a sharp decline in the annual growth rate of rice production reaching the all-time low of negative 2.1% as shown in Table 5.3. The inference can therefore be made that, the trade liberalization has had a significant negative impact on the growth rate of domestic rice production in Ghana.

Table 5.3: Mean Annual Production Growth Rates of Rice in Ghana from 1970 to 2005.

Period	Production of rice (metric tons)	Growth rates
1970-72	104.4	
1973-75	124.2	3.20
1976-78	117.0	
1979-81	141.3	3.50
1982-84	84.4	
1985-87	139.0	10.80
1988-90	156.4	
1991-93	264.6	11.50
1994-96	360.0	
1997-99	413.0	2.45
2000-02	495.4	
2003-05	433.0	-2.10

Source: Computed from data from the Ministry of Food and Agriculture, MoFA

Since all variables are in natural logarithms, the estimated coefficients may thus be interpreted as elasticities. Thus, the supply elasticity of paddy rice with respect to farm price or farmgate price is 0.08 for the whole sampled period. This value is consistent with the lower bound estimate.

The supply elasticities were calculated for three different time periods: the entire period (1970-2004), the pre-liberalization period (1973-1988), and the post liberalization period (1989- 2004). The supply elasticities (i.e., entire period, pre-liberalization and post liberalization) in the study are smaller than other studies have found. Bond (1983) estimated short-run and long-run price elasticities for aggregate agricultural supply for Ghana to be 0.20 and 0.34 respectively. The discrepancies in the supply elasticities for this study and that of Bond can be attributed to variations in the periods under study and challenges associated with the data available.

The price elasticity of supply of the local rice for the sixteen year period before the inception of the trade liberalization was found to be 0.132. That for the sixteen year period after the trade liberalization was 0.104. Considering the theoretical argument of Fisher (1963) which states that, the higher the price elasticity of supply the weaker the effect of importing cheap substitutes of domestic foods; the inference can be made that the effect of the importation of cheap rice is stronger in the post-liberalization era which has a lower price elasticity of supply of 0.104. Thus, the hypothesis that trade liberalization does not have effect on the domestic rice production in Ghana was therefore rejected.

5.3. Estimated Domestic Demand for Rice

Results on the estimation of rice demand are shown in Table 5.4. The estimate however, did not isolate the imported rice from the locally produced rice but dealt with the demand for rice in general. The D-W statistic in the equation indicates no serious autocorrelation so an autoregressive correction was unnecessary. The F-statistic was

statically significant, implying that all the explanatory variables are related to domestic demand of rice. The Adjusted R^2 was 94 percent indicating that total variation in per capita demand of rice was explained by changes in the explanatory variables.

Table 5.4 Regression Results of Rice Demand

Explanatory Variables	coefficient	t-statistics	significant
Dependent variable is the natural logarithm of per capita demand of rice (lnQ_t)			
$lnPR_t$	-0.228	-3.618	0.002
lnY_t	1.462	4.316	0.000
$lnPM_t$	0.216	3.387	0.003
$DUMLIB2_t$	0.851	8.589	0.000
Constant	-10.527		
Adj.R^2	0.937		
SER	0.17452		
F- Statistic	90.394		0.000
D-W	2.085		
N	25		

Note: $lnPR_t$ is the natural logarithm of real retail price of rice, lnY_t is the natural logarithm of real average per capita income, $lnPM_t$ is the natural logarithm of real retail price of maize, and $DUMLIB2_t$ is dummy variable is introduce to capture the period of the trade liberalization (1989-2004). D-W represents Durbin-Watson Statistics and N is the sample size (1980-2004) while SER is standard error of the regression.

From the domestic demand equation, the coefficient of the real average per capita income was positive and was statistically significant at 1 percent. The elasticity of per

capita demand of rice with respect to income was 1.5 percent. This means that the income elasticity of (1.5) was about six times higher than the price elasticity (0.23). In this case, income acted as an important factor in explaining rice consumption compared to price. This is one of the reasons why the demand of rice is higher in the urban areas compared to the rural areas. The demand for rice was negatively related to its own price. It was however, positively related to the price of maize as expected, which implies that maize is a substitute for rice.

The coefficient of the price of rice was negative as expected and statistically significant at 1 percent. This indicates that, 10 percent decrease in the price of rice increased the rice per capita consumption by 2.28 percent. The absolute value of own-price elasticity reported in table 5.4 was below the values reported from earlier study by Haessel (1976) (own-price elasticity reported by Haessel was 1.256). The price elasticity estimated was fairly larger in absolute value. This may, in part, be due to the poor quality of the data resulting in biased estimates. The use of wholesale prices rather than retail prices is also a contributory factor to the biases.

The coefficient of the dummy variable was 0.851 and statistically significant at 1 percent. The dummy variable represented the period from the inception of the trade liberalization. This result indicates that, rice consumption *ceteris paribus,* has increased in the era of the trade liberalization (since the 1990s). Even though this finding can be explained to some extent by the changes in the consumption patterns of consumers due to urbanization and other factors, one cannot loose sight of the contribution made by the effect of the trade liberalization on the demand of rice in Ghana.

5.4. Effect of Trade Liberalization on Land Utilization

Results on land utilization for rice production consist of a regression analysis of the area under rice cultivation and other explanatory variables as well as results from a survey conducted in the Northern Region of Ghana. Regression results reported in Table 5.5 indicate that the standard error of regression (SER) was much lower than the standard deviation of the sample mean of area under rice cultivation (Table 4.1). This indicates that the estimated model is a better predictor of the area under rice production. The coefficient of determination adjusted for degrees of freedom was 81 percent, thus indicates that the variation in area under rice cultivation was explained by changes in the explanatory variables. The Durbin – Watson (D-W) statistics, d was 1.774. The upper (d_L) and the lower (d_U) limits of the level of significance of the D-W statistic (from the critical table) at 5 percent was 1.22 and 1.73 respectively. Since the empirical value is greater than the lower and upper limits, the result suggests absence of serial correlation. The F-statistic of the model was statistically significant, meaning the explanatory variables were related to the area under rice cultivation.

The coefficient on lagged area under rice cultivation (0.471) was significant at 1 percent level and positive. This finding suggests a response to exogenous shock of over a year is required for rice farmers to fully adjust their planting decisions. The estimation result shows that, the parameter estimate of the DUMLIB2 representing the introductions of the liberalization policy were statistically significant at 5%. However, the parameter estimates of gross rice revenue or income was not different from zero at the 5% significance level.

Table 5.5 Regression Results for Rice Land Utilization

Explanatory Variables	coefficient	t-value	significance
Dependent variable is the area planted with rice ($InPF_t$)			
Gross Rice Revenue ($lnRI_t$)	0.017	1.340	0.190
Dummy ($DUMLIB2_t$)	0.271	3.040	0.005
Lagged area under-Cultivation	0.471	3.258	0.003
Intercept	5.461	3.752	0.001
Adjusted R^2	0.82		
D-W	1.774		
F-Statistic	52.717		0.000
SER	0.16201		
N	35		

Note: Dependent variable is rice planted with rice (hectare), DUMLIB2t is a dummy variable for the period of trade liberalization and T is time trend and its takes 1 for 1970 through 35 for 2004. D-W represents Durbin-Watson Statistics and N is the sample size (1970-2004) while SER is standard error of the regression.

The coefficient of the DUMLIB2 (0.299) was positive, implying that, there had been an expansion in the area used for rice production during the trade liberalization periods. It means that, rice field areas have been increasing at 29.9 percent per annum over the estimation period. It can therefore be assumed that future area under rice production would increase at the same rate under the prevailing conditions. However, area

expansion as a means of increase in rice production cannot be environmentally sustainable since arable land is fixed.

Table 5.6: Average Rice Field (hectares) under Cultivation per Farmer

Name of the community	1980s	1990s	2004	2005
Zanjibaliga-bibu	0.87	1.92	2.29	2.77
Gingarnni-villi	1.03	2.65	3.02	3.34
Wamale	0.93	2.61	2.94	3.18
Tugu	1.13	2.23	2.75	2.94
Kpatinga	0.99	2.86	3.46	3.58
Gaa	0.81	2.47	3.04	3.18
Nantong	0.73	2.19	3.18	3.26
Tampion	0.73	2.77	2.81	3.06
Yendi	1.01	2.98	3.58	3.83
Mion	0.85	2.59	3.02	3.42

Source: Survey data

As part of this study, a survey was conducted among rice farmers in the northern region of Ghana. A total of 100 rice farmers were interviewed. Most of the respondents who constitute 52.7 percent have been rice farmers for about 25 years.

Table 5.6 shows the average hectares of land under rice cultivation per farmer in each community in the study area. It is indicative from the study that, there has been an

increase in the area under rice cultivation over the period under review. The average annual area under rice cultivation per farmer showed a rise over the period from the 1980s to 2005. In 1980s the average hectares of land under rice production per farmer, ranged from 0.73 to 1.13 hectares. This increased to 2.77 to 3.83 hectares in 2005. This is consistent with the earlier finding of the study which indicated an increase in the area of land under rice cultivation in the post-liberalization era.

Table 5.7 Reasons for Area Expansion

Reason	Frequency	Percentage
Larger family size	36	36
Low productivity	33	33
High cost of farm input	31	31
Total	100	100

Source: Survey Data

Out of the 100 rice farmers interviewed, 36 percent of them attributed the area expansion to increasing family size. Large family sizes provided more farm hands and also more mouths to feed. 33 percent of the respondents also attributed the increase in the area under rice cultivation to low productivity of the soil which resulted in the need to expand the area under cultivation to achieve their regular yield. 31 percent of the respondents also found it economically prudent to increase the area under cultivation in order to achieve their regular margins of income in the face of high cost of farm inputs and low producer prices. This option was easier because of the availability of land and cheaper source of labour (as shown in Table 5.7).

Statistical analysis which took into account the area under rice production sixteen years before (1973-88) and after (1989-2004) the commencement of the trade liberalization yielded the following results: The mean area under rice cultivation over the sixteen year period before the liberalization era was 56,4375ha while that for the period after was 104,3750ha. This implies that, there was a two-fold rise in the area of land under rice cultivation in the post-liberalization era. From the above discussion, it is clear that time and the dummy variable which represents the trade liberalization had a positive impact on the rice field area, which implies the area under rice cultivation has increased over time. In this same era, the percentage change in the five-year average fertilizer import was in the negative, as shown in Table 5.8.

Table 5.8: Five –Year Average of Fertilizer Imports 1970-2004

Period	Five-year Average Metric ton	Percentage change
1970-1974	28546	164
1975-1979	68222	194
1980-1984	30822	-16
1985-1989	38969	33
1990-1994	23714	-47
1995-1999	33690	-22
2000-2004	42970	-28

Data Source: MOFA (SRID)

Thus, the argument can be made that, the decline in the use of fertilizer and other agrochemicals in the post-liberalization period resulted in the increase in the area under rice cultivation, in order to maintain the levels of production and income. The intensification of land use in the absence of adequate soil fertility measures is a contributory factor to the degradation of land resources, deforestation, loss of biodiversity, builds up of pest populations, depletion of natural soil fertility and soil erosion. These changes will ultimately affect the regenerative capacity and functioning of the ecosystems.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The main objective of this study was to assess the implications of rice trade liberalization and related policies on the domestic rice industry in Ghana. The study focused on the effect of trade liberalization on the domestic production, the producer price, the demand and the utilization of resources especially land for rice production in Ghana. Econometric analysis of the data using multiple regressions for each of the objectives of the study was done. A survey among rice farmers of some rice growing communities in the Northern Region of Ghana was carried out which sort to collect data on the area under rice cultivation over the period under review.

The study found a significant effect of the trade liberalization on the domestic producer price of rice. On the whole, the study concluded that the trade liberalization led to a fall in the domestic producer price of the local rice in Ghana. Thus, the hypothesis that the trade liberalization did not have an impact on the producer price of the locally produced rice was rejected.

The study also showed a significant negative impact of the trade liberalization on the annual growth rate of rice production in Ghana. Thus, the hypothesis that the trade liberalization did not have a negative impact on the domestic rice production was rejected. The price elasticity of supply for the pre and post-liberalization periods were found to be 0.132 and 0.104 respectively. Based on the theoretical argument by Fisher (1963) which states that, the higher the price elasticity of supply the weaker the effect of

the importing cheap substitutes of domestic foods, the study made the inference that the effect of the importation of cheap rice has been stronger in the post liberalization era compared to the pre-liberalization period.

The result indicated that, rice consumption *ceteris paribus* has increased in the era of the trade liberalization. In this same period, the level of rice importation has reached tremendous levels with the domestic rice production seeing only a modest level of increase. Thus, the inference can be made that, generally the demand of rice has increased especially in the post-liberalization era. However, this may not be due to the effect of the trade liberalization alone but other factors like the change in the consumption patterns of consumers, urbanization and economic growth. Furthermore, the level of rice importation has resulted in stiffer competition for the locally produced rice, bearing in mind, the finding of the study that income act as an important factor in explaining rice consumption compared to price. Therefore, the importation of relatively cheaper rice offers a comparative market advantage over the local rice.

There was a two-fold rise in the area of land under rice cultivation and a negative percentage change in the five-year average fertilizer import in the post-liberalization era. This implied, farmers had increased rice production per unit area in the pre-liberalization era due to the subsidy on farm inputs especially fertilizer. However, in the post-liberalization era, the increase in rice production could mainly be attributed to expansion of the area under rice cultivation. Thus, the study revealed an increase in the utilization of arable land for rice production after the trade liberalization in Ghana. However, there

is the need to take cognizance of the fact that suitable arable land is fixed. Thus this finding holds when the availability of suitable arable land is assumed.

The study therefore concludes that, the trade liberalization has impacted negatively on the domestic rice industry in Ghana.

6.2. Recommendations

Ghana has the potential to achieve self-sufficiency in rice production. The advantages of such an achievement would be a reduction of the strain which is put on the nations foreign reserves by the huge importation of rice. The study therefore makes the following recommendations:

1. It is recommended that the ministry of food and agriculture institute effective irrigation schemes whiles enhancing the efficiency of the existing schemes in order to improve the productivity of the domestic rice industry. In addition to this, there is the need to introduce improved and higher yielding rice varieties to domestic rice farmers. This recommendation is based on the fact that a greater proportion of the domestic rice production is done on rainfed upland field which makes the farmers more vulnerable to the weather. Instituting these measures would also result in higher yields and consequently improve the efficiency of the local rice farmers to enable them compete on the market.

2. The demand for rice in general, has increased in the post-liberalization era. However, the locally produced rice continues to face challenges on the market due factors like poor processing, packaging and advertisement. Thus, there is the need for government to enhance the capacity of the local rice farmers through education on processing and packaging. In addition to this, there is the need to embark on a vigorous advertisement of the local rice in order to enhance its appeal on the market.

3. The study revealed an increase in the arable land under rice cultivation in the post-liberalization era. Since suitable arable land is fixed, it is recommended that government through the Ministry of Agriculture ensures that, sustainable and environmentally friendly farming methods are used by local rice farmers in order to maintain the fertility of the lands and also protect the environment. There is also the need to promote safe and judicious use of agro-chemicals in addition to the above measures.

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APPENDIX A. THE SAMPLED QUESTIONNAIRE FOR THE SURVEY

EFFECT OF TRADE LIBERALIZATION AND RELATED POLICIES ON RICE INDUSTRY IN GHANA.

QUESTIONNAIRE FOR RICE FARMERS

A. PROFILE OF INTERVIEWEE:

1. Name of the farmer.....

2. Name of community/village.....

3. District.....

4. Gender i. Male ☐ ii. Female ☐

B. PRODUCTION ACTIVITIES

5. Do you cultivate rice? Yes ☐ No ☐

If yes, proceed to Q6.

6. How long have you been a rice farmer? .....

.....

7. In the 1980s, how many acres of land did you use on the average for rice production?

(a.) Up to 3 acres (b.) 4 – 6 acres (c.) 7 – 9 acres (d.) 10 – 12 acres (e.) 13 – 15 acres

(f.) more than 15 acres .

8. In the 1990s, did you cultivate the same number of acres? If No, proceed to Q9

9. How many acres of land did you cultivate on the average in 1990s?

(a.) Up to 3 acres (b.) 4 – 6 acres (c.) 7 – 9 acres (d.) 10 – 12 acres (e.) 13 – 15 acres

(f.) more than 15 acres .

10. Did you cultivate the same number of acres in 2004 and 2005? ☐ Yes ☐ No

11. If no, how many acres did you cultivate in the 2004 and 2005?

a.) Up to 3 acres (b.) 4 – 6 acres (c.) 7 – 9 acres (d.) 10 – 12 acres (e.) 13 – 15 acres (f.) more than 15 acres.

12. Why did you expand the area under rice cultivation over the period years?

i. large family size

ii. High cost of farm inputs.

iii. Low productivity of land.

iv. Other reasons

APPENDIX B.

CONSISTS OF DATA ON PRODUCTION LEVEL, BORDER PRICE, PRODUCER PRICES, AREA UNDER CULTIVATION AND IMPORT PENETRATION RATIO.

Appendix I: **Data on Production levels, Producer Price and Area under cultivation (1970-2004)**

Years	Annual quantity of milled rice produced (metric tonnes)	Area under rice production(metric tonnes)	Producer price of milled rice/ metric tonnes	Farmgate or farm price of paddy ice/ metric tonnes
1969	37,000.00	47,000.00	144.00	86
1970	29,000.00	52,000.00	196.92	97
1971	33,000.00	51,000.00	203.69	123
1972	42,000.00	48,000.00	273.85	123
1973	37,000.00	56,000.00	331.69	148
1974	44,000.00	58,000.00	363.69	179
1975	42,000.00	68,000.00	495.38	276
1976	40,000.00	65,000.00	1,010.46	495
1977	38,000.00	53,000.00	1,438.77	1,010
1978	37,000.00	51,000.00	2,011.69	1,352
1979	38,000.00	53,000.00	2,233.23	2,012
1980	39,000.00	36,000.00	4,611.69	2,233
1981	26,000.00	43,000.00	9,080.62	3,900
1982	22,000.00	44,000.00	14,883.69	4,570
1983	16,000.00	39,000.00	48,097.23	21,540
1984	46,000.00	68,000.00	54,627.69	22,000
1985	48,000.00	87,000.00	41,740.92	21,840
1986	42,000.00	76,000.00	48,977.23	29,020
1987	49,000.00	72,000.00	84,091.08	45,890
1988	63,000.00	52,000.00	153,771.69	62,960
1989	40,000.00	74,000.00	248,202.46	82,960
1990	49,000.00	88,000.00	149,992.62	96,000
1991	91,000.00	95,000.00	142,252.54	91,430
1992	79,000.00	80,000.00	157,167.46	97,960
1993	94,000.00	77,000.00	203,140.23	125,510
1994	97,000.00	81,000.00	264,126.92	140,590
1995	133,000.00	100,000.00	412,805.54	242,500
1996	130,000.00	105,000.00	603,798.31	412,806
1997	118,000.00	118,000.00	779,896.69	603,798
1998	169,000.00	130,000.00	812,853.54	779,897
1999	126,000.00	105,000.00	854,394.00	812,854
2000	149,000.00	115,000.00	551793.00	854,394
2001	178,000.00	138,000.00	1,904,000.00	551,793
2002	168,000.00	123,000.00	2,183,767.67	1,904,000
2003	143,000.00	119,000.00	2,562,415.67	2,183,768
2004	145,000.00	122,000.00	3,396,872.00	2,562,416

Source: Ministry of food and Agriculture, PPMED, 2004

Note: The quantity of Paddy rice was obtained by dividing the quantity of milled rice by 0.6

Appendix II: Data on Average per Capita Income

Year	GDP(in local currency)	GDP Deflator (with the based year of 1997)	Deflated GDP
1980	42,851,999,744.00	0.505057019	84,845,865,200.54
1981	72,626,003,968.00	0.887049867	81,873,642,803.49
1982	86,451,003,392.00	1.134453078	76,205,005,790.89
1983	184,037,998,592.00	2.530524619	72,727,211,274.44
1984	270,561,001,472.00	3.424114493	79,016,341,893.98
1985	343,047,995,392.00	4.131139623	83,039,554,862.46
1986	511,393,005,568.00	5.854064452	87,356,914,112.56
1987	746,000,023,552.00	8.148945562	91,545,589,286.79
1988	1,051,195,998,208.00	10.87092537	96,697,931,648.57
1989	1,417,214,033,920.00	13.94677942	101,615,863,504.00
1990	1,920,791,347,200.00	18.29351702	104,998,472,665.07
1991	2,427,529,461,760.00	21.95978694	110,544,308,476.95
1992	2,802,875,105,280.00	24.40831753	114,832,786,083.15
1993	3,872,099,926,016.00	32.1597165	120,402,178,480.98
1994	5,205,000,192,000.00	41.84909793	124,375,445,336.71
1995	7,751,699,791,872.00	59.86317723	129,490,283,510.46
1996	11,338,700,029,952.00	83.71131677	135,450,025,959.12
1997	14,113,399,898,112.00	100	141,133,998,981.12
1998	17,296,000,024,576.00	117.0484733	147,767,839,522.38
1999	20,579,660,857,344.00	133.3923899	154,279,122,463.03
2000	27,152,999,251,968.00	169.719548	159,987,459,143.95
2001	38,071,001,153,536.00	228.3708418	166,706,926,568.48
2002	48,862,001,627,136.00	280.47962	174,208,741,523.66
2003	66,157,700,000,000.00	280.47962	235,873,465,601.53
2004	79,803,690,000,000.00	280.47962	284,525,806,188.70

Source: Bank of Ghana, 2004

Note: The deflated GDP was then divided annual population to obtained average per capita income.

Appendix III: Data on Border Price of Rice C.I.F Tema (cedis) from 1970 to 2004 in Ghana.

Year	Quantity imported (mt)	Value of imports(cedis /mt)	Border price c.i.f. Tema (cedis/mt)
1970	53,000	10,149,500	191.5
1971	35,000	5,992,000	171.2
1972	24,000	6,062,400	252.6
1973	53,000	10,301,080	194.36
1974	39,000	18,200,910	466.69
1975		0	0
1976	2,067	722,582	349.58
1977	9,000	3,229,380	358.82
1978	45,400	19,156,984	421.96
1979	40,000	15,276,800	381.92
1980	26,000	18,223,550	700.91
1981	32,000	31,502,522	984.45
1982	31,000	28,195,389	909.53
1983	33,000	364,360,500	11,041.23
1984	50,000	731,261,164	14,625.22
1985	60,000	939,615,046	15,660.25
1986	55,000	1,335,397,111	24,279.95
1987	73,000	3,640,810,763	49,874.12
1988	69,000	5,333,735,363	77,300.51
1989	175,000	16,048,279,406	91,704.45
1990	218,700	19,630,892,709	89,761.74
1991	218,700	22,646,419,773	103,550.16
1992	216,142	28,665,129,042	132,621.74
1993	268,900	52,083,886,469	193,692.40
1994	281,100	68,729,757,837	244,502.87
1995	140,000	83,211,026,492	594,364.47
1996	204,000	116,519,741,679	571,175.20
1997	186,000	131,183,509,693	705,287.69
1998	249,000	248,785,751,891	999,139.57
1999	241,610	338,776,885,125	1,402,164.17
2000	187,256	462,318,880,446	2,468,913.58
2001	333,000	814,292,496,980	2,445,322.81
2002	325,000	918,393,396,633	2,825,825.84
2003	797,705	1,106,559,628,124	1,387,178.20
2004	711,344	1,691,338,710,635	2,377,666.38

Source: Ministry of Trade and Industry, Accra, 2004.

Note: The border price of rice is calculated by dividing the value of imports by the quantity of imports.

Appendix IV: Data on Retail Prices of Rice and Maize in cedis /tonne (1980-2004)

Year	Price of Rice (cedis /tonne)	Price of Maize (cedis /tonne)
1980	29,900	4,080.00
1981	423,200	8,280.00
1982	115,980	10,520.00
1983	171,610	24,400.00
1984	96,000	18,750.00
1985	96,000	19,110.00
1986	100,000	30,350.00
1987	96,000	55,050.00
1988	268,627	67,250.00
1989	323,679	62,393.33
1990	361,408	107,300.00
1991	363,680	103,737.00
1992	440,011	170,850.00
1993	483,392	126,640.00
1994	742,463	227,755.83
1995	1,323,941	439,520.00
1996	1,796,801	462,250.00
1997	1,759,938	657,115.00
1998	1,817,986	592,091.00
1999	1,323,413	541,834.79
2000	3,014,083	895,000.00
2001	4,432,758	1,500,000.00
2002	4,446,885	1,546,442.66
2003	4,844,625	1,822,333.84
2004	5,821,020	2,876,167.56

Source: Ghana Statistical Service, Accra, 2004

Appendix V: Annual Rainfall Data (mm) for Northern Region for the period of 1970-2004

Year	Annual Rainfall(Mm)
1970	967.5
1971	975.1
1972	994.02
1973	693.33
1974	658.40
1975	662.50
1976	1008.30
1977	1131.90
1978	1018.50
1979	1226.40
1980	1322.10
1981	1101.50
1982	1176.00
1983	759.00
1984	1025.80
1985	1034.70
1986	1082.50
1987	952.20
1988	1121.40
1989	1427.50
1990	1129.80
1991	1579.70
1992	695.40
1993	1000.90
1994	1159.00
1995	995.80
1996	1144.70
1997	1229.00
1998	937.00
1999	904.00
2000	870.50
2001	791.80
2002	827.70
2003	1269.20
2004	1058.60

Source: Tamale Synoptic Station, 2004