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Influence of agricultural trade liberalization policies on production and poverty reduction among Ghanaian rural smallholder cocoa and rice farmers

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This study assessed the influence of Agricultural trade liberalization policies on production and poverty reduction among rural smallholder cocoa and rice farmers in Ghana. Both cross-sectional and secondary data were used in this study. Two hundred respondents were sampled from six districts due to their intense cultivation of cocoa and rice, across the six agro-ecological zones in the country using the simple random sampling technique and structured questionnaire was administered to them. Data analyses involved the use of multiple and logistic or logit regression models. The study indicated that government's investment in the agricultural sector, the total land area cultivated of both cocoa and rice significantly influenced positively the gross outputs of both crops. The total imports of rice significantly influenced negatively the gross output of rice. For cocoa, export tariffs on agricultural commodities and total export quantity of cocoa negatively influenced gross output of cocoa but were not statistically significant. Again, the total export quantities of rice and increase in import tariffs on agricultural commodities showed a higher likelihood of enhancing increase in rice production. The study also found that agricultural trade liberalization policies have generally contributed to the increase in income levels of the farmers. It was concluded that Agricultural trade liberalization policies adopted by Ghana in the early 1980s generally had more positive effect on the production of cocoa than rice over the years but have generally contributed to the increase in income levels of the farmers hence it contributed to poverty reduction.

Key words: Ghana, logistic and multiple regressions, poverty reduction, smallholder farmers.

INTRODUCTION

It has been established that over 70% of people in developing countries such as Ghana live in the rural areas and find their livelihood in agriculture. Out of 35% of Ghanaians classified as poor, 75% live in the rural areas. Poverty in rural Ghana is estimated to contribute approximately 90% of national poverty. There are variations in the poverty rate between regions; some have a substantially higher rate than indicated by this average figure (GSS, 2007). In 2005/2006 in particular, poverty was highest by far among food crop farmers. Moreover, their contribution to the national incidence of poverty is much in excess of their population share (GSS, 2007).

The most important cash crop in Ghana remains cocoa. The crop's contribution to Agricultural GDP in 2009 was 11.5% and continues to grow at a rate of 5.2% (MOFA, 2010). Ghana is the second largest world supplier of cocoa after Cote d'Ivoire but majorities of the producers are smallholder farmers. The crop is currently vulnerable to the vagaries of the international market, especially to volatility in export prices. Another important staple over the last decade is rice. Rice production has a long history in Ghana (Kranjac-Berisavljevic et al., 2003). Small rice producers usually did not grow rice for self-consumption

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but as a cash crop in order to earn money for other purposes. However, over the last decade, consumption patterns have changed considerably, converting rice into a major food staple in urban, and to some extent also, in rural areas. According to the Food and Agriculture Organization (FAO), per capita consumption of rice almost doubled from 11 kg per year in 1999 to 21.6 kg in 2003. According to a Baseline Survey conducted for the same year, 2003, the average per capita consumption of urban consumers amounted to 38 kg per year and 9.2 kg for rural consumers (JICA, 2007).

In most developing countries such as Ghana, small-scale farmers generally constitute the largest group in the largest economic sector of agriculture. They produce about 80% of the total agricultural production using rather rudimentary technology on family-operated farms. These small scale farmers tend to be among the low income and the poorest sector of the population and yet not many public expenditure and development programs are designed to improve their lot (Chamberlin, 2007).

In recent times, globalization with particular reference to agricultural trade liberalization has been identified as one of the ways to reduce poverty among smallholder farmers in developing countries including Ghana since agriculture is a major employment sector in these countries and most of the farmers are smallholders. Trade liberalization is increasingly advocated as a critical policy for poor countries to promote economic growth and to reduce poverty. This view underpins the work of leading multilateral institutions, including the World Bank, International Monetary Fund (IMF) and World Trade Organization (WTO), as well as many Northern governments including DFID. The case for trade liberalization in developing countries is based on economic arguments that trade liberalization promotes growth, which leads to poverty reduction. This view is largely based on aggregate income and consumption measures of poverty.

In recent years (late 1980s), the government of Ghana adopted policies with the intention to open the economy by promoting trade with the rest of the world. The effects of import liberalization on the viability of agriculture, particularly that practiced by small farmers of food crops, have become an important field of study in recent years. This is due to the increasing concerns of farmers and their organizations, civil society organizations involved in development, and policy makers in governments of the developing world (Khor and Tetteh, 2006).

Such concerns emerged because of the experience of many developing countries which undertook structural adjustment programmes, in which trade liberalization as well as the withdrawal of the state from an active role in support of farmers, were prominent components of the loan conditionalities of international financial institutions. The concerns increased due to the commitments that developing countries undertook to eliminate quantitative restrictions in agricultural products and to reduce their agricultural tariffs under the Uruguay Round. Among the trade policies implemented were the reduction of the trade barriers, such as, tariffs and quotas that affected the importation of several products and the exportation of non-traditional agricultural exports (Khor and Tetteh, 2006).

In many developing countries like Ghana, the liberalization of imports has resulted in intense competition from imports that have threatened to displace some of the products of small farmers from their own domestic market. The competition emanating from imports has not been fair, in many cases. This is because imports coming from developed countries are usually heavily subsidized, and thus their prices are artificially cheapened. On the other hand, the farmers of developing countries are usually not subsidized. Moreover, the assistance that their governments provided have, in many countries, been withdrawn or substantially reduced, due to the structural adjustment policies. The displacement of developing countries' farmers and their products due to trade liberalization has thus become the subject of global concerns (Khor and Tetteh, 2006). Not surprisingly, the impact of trade reforms on the welfare of the poor has become an important subject of interest to researchers and policy makers alike. However, there has been limited empirical research on how these reforms affect poverty at the household level (Winters, 2002; Winters et al., 2004). This situation is not different in Ghana and in the six districts selected for the study in particular. The six districts selected namely: Nzema East Municipal, Offinso South Municipal, Wenchi Municipal, Kwahu West district, Central Tongu district and Builsa district cut across all the six main agro-ecological zones which span the entire country. Cocoa and rice are the main crops cultivated in these districts alongside the production of other crops with majority of the farmers being relatively poor. For this reason, the objectives of this study are:

1. To assess the influence of trade policies adopted by Ghana under the WTO'S Agreement on Agriculture; under the World Bank/IMF imposed Structural Adjustment Programmes on the productions of (cocoa and rice) and poverty reduction through increase in income among smallholder farmers who produce these crops.
2. To assess if these policies are enhancing or increasing production among the farmers.

For the purposes of this study, all the hypotheses are stated in null form and are as follows:

H_{-1}: Trade liberalization policies have no influence on the production or outputs of (cocoa and rice) and poverty reduction.
H_{-2}: Trade liberalization policies do not enhance or increase production among the farmers.

MATERIALS AND METHODS

The Nzema East Municipal, Offinso South Municipal,

Wenchi Municipal, Kwahu West District, Central Tongu District and Builsa District which cut across all the six main agro-ecological zones of the republic of Ghana formed the study areas. Ghana is located in West Africa, on West Africa's Gulf of Guinea only a few degrees north of the Equator. With a total area of 238,538 sq km, the country is bounded by Côte d'Ivoire to the west, Burkina Faso to the north, Togo to the east, and the Atlantic Ocean to the south. Ghana's population according to the 2010 population and housing census stands at 24,658,823, an increase by 30.4% from 18,912,079 in 2000 to 24,658,823 in 2010 (GSS, 2010).

The Nzema East Municipal covers an area of about 2194 km^2. It is bounded on the west by Jomoro, north by Wassa Amenfi East, and the east by Wassa Amenfi West and Ahanta West District. On the south, it is bounded by the Gulf of Guinea. The average temperature in the district is about 29.4 with variation in the monthly mean ranging between 4 to 5°C throughout the year. The vegetation of the Municipal is made up of the moist semi-deciduous rain forest mainly in the northern part, followed by secondary forest southwards. The soils are acidic and low in nutrient due to high leaching. Leaching is the result of the high rainfall in the district. The current population of the Municipality (according to the 2010 population census) is 60,828 (males 29,947 and females 30,881) constituting 2.6% of the Western Regional population (GSS, 2010).

Offinso South Municipal located in the extreme north-western part of the Ashanti Region of the republic of Ghana. It lies between longitude 1' 65W and 1' 45E and latitudes 6' 45N and 7' 25 S. The district covers an area of 1255 km^2. The highest rainfall of about 170 cm is recorded in the south and declines northwards to about 150cm. The Municipal experiences two rainfall seasons, the major rains start from April to July and the minor from September to mid November and lasts until July. The soils of Offinso Municipal are developed from parent materials of varied rock types of different geological origins. The parent materials are granite, voltain rocks and Lower Birimian rocks. The 2010 Population and Housing Census yielded the district a population head count of 76,895.

The Wenchi Municipality is located in the Western part of Brong Ahafo Region. It is situated at the northeast of Sunyani (regional capital). It lies within latitudes 7 .30° and 8.05° North and longitudes 2.15° West and 1.55. The rainy season occurs between April and October with a short dry spell in August. The average annual rainfall is about 1,140 - 1,270 mm. The area falls under the Lower Birimian, which consists of such metamorphosed sediments as phyillite and schist. There are also granite and granodiorite in the southeast and western parts of the municipality. The 2010 population figure of Wenchi Municipal was 89,739 (GSS, 2010).

The Kwahu West Municipal is one of the newly created districts in the Eastern Region of Ghana and lies between latitudes 6°30' North, and 7° North and longitudes 0°30' West and 1° West of the equator, covering an area of about 414 km^2. The 2010 National Population and Housing Census put the district's population at 93,584 with an intercensal growth rate of about 4%.

The Central Tongu district, which was curved out of the former Tongu district Council in 1989 by Legislative Instrument (LI.15) lies within latitudes 5047°N to 60°N and longitude 005° E to 0045. The climate of the district is tropical, greatly influenced by the South – West Monsoons from the south Atlantic and the dry harmattan winds from the Sahara. There are two rainy seasons, the major one from mid – April to early July and the minor from September to November. The average annual rainfall varies from 900 to 1100 mm with more than 50% of it falling in the major season. The vegetation is dense along the Volta River and along the stream basins. This is basically due to the presence of more fertile soils and better subsoil moisture. The population of the district as recorded in the 2010 Ghana Population and Housing Census is 149,188 compared with 90,000 in 1984.

The Builsa district lies between longitudes 1° 05' West and 1° 35' West and latitudes 10° 20' and 10° 50' North. It is bounded on the North and East by the Kassena-Nankana district; on the west by the Sissala district and on the South by the West Mamprusi district and part of Kassena-Nankana district. Temperatures are high and the dry season is characterized by dry harmattan winds and wide diurnal temperature ranges. There is only one rainy season, which builds up gradually from little rains in April to a maximum in August/September and then, declines sharply coming to a complete halt in mid-October when the dry season sets in. The 2010 total population consists of 50.64% (47,099 females) and 49.4% (45,892 males). The people are predominantly small holders growing a range of rain-fed food crops. Agriculture is the main economic activity in these districts with major crops like cocoa and rice grown, among other crops like maize, sorghum, millet, cowpea, groundnut, Bambara, soybean, vegetables, oil palm, cashew, cassava, cocoyam and plantain grown both for subsistence and for cash (http://www.ghanadistricts.com/districts/?news&r=7&_=128**,** accessed 25/5/2013).

A structured questionnaire was developed for the collection of data. Purposively sampling was used to select one district from each of the six agro-ecological zones due to their intensive involvement in the cultivation of cocoa and rice. Each district was considered as a cluster. In addition, simple random sampling technique was used to select 200 respondents for the survey to ensure an even selection of the respondents giving each respondent an equal chance of being selected. This was done according to the proportions of the populations in these zones. Secondary data were sourced from registered data sources such as economic surveys and research databases such as Food and Agriculture Organization (FAO) statistic database, World Bank Country status report, World Food Program (WFP) database and World Trade Organization (WTO) database,

United Nations Conference on Trade and Development statistic database (UNCTAD) and official documents of the Ministry of Food and Agriculture (MOFA) of Ghana. The period for which secondary data were collected was between 1980 and 2010. The Statistical Package for the Social Sciences (SPSS) was used to analyze the data. The data collected were analyzed using the multiple regression and the logistic or logit models. Descriptive statistics such as, tabular description and summary statistics like percentages and frequencies were also used to summarize the data.

The schematic representation of the multiple regression model is as stated subsequently without regard to the signs of the coefficients:

$$Y_{it} = \beta_{i_{it}} + \beta_1 IMP_{it} + \beta_2 GIA_{it} + \beta_3 IT_{it} + \beta_4 TLAC_{it} + \beta_5 TEX_{it} + \beta_6 EXT_{it} + \varepsilon_{it} \quad (1)$$

Where:

Y_{it} is the production of the selected crops (cocoa and rice),

i is the sector in question,

t refers to the time period from which the data were obtained (1980 to 2010),

$\beta_{\circ}$, is a constant known as the intercept,

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the coefficients of regression parameters that were estimated and used to describe the direction and strengths of the relationship between Ghana's gross output of the selected crops under consideration; thus (Cocoa and rice) and the explanatory variables and ε_{it}, represent the stochastic disturbance term that capture the effect of all the other factors that were not included in the model, but have an effect on the production factors.

In this model, the dependent variable is that of the total production or output of cocoa and rice in metric tons. $IMP, GIA, IT, TLAC, TEX, and\ EXT$ represent the total quantity of imports of (cocoa and rice) in tons in year t, Governments' investment in the agriculture sector in millions of US Dollars in year t, import tariffs on agricultural commodities in percentage (%) in year t, total land under cultivation of (cocoa and rice) in hectares (Ha) in year t, total export quantity of (cocoa and rice) in tons in year t and export tariffs on agricultural produce in percentage of total government revenue in year t respectively.

For the logistic regression, the regressand in this objective was a binary variable that take only two values (1, 0), say, 1 if production increased and 0 if production decreased.

It is assumed that we have a regression model:

$$Y_i^* = \beta_{\circ} + \sum_{j=1}^{k} \beta_j X_{ij} + \mu_i \quad (2)$$

where Y_i^* is not observed. It is commonly called a latent variable. What we observe is a dummy variable y_i defined by:

$$y_i = \begin{cases} 1 \forall Y_i^* > 0 \\ 0\ otherwise \end{cases} \quad (3)$$

It is common practice to assume that the outcome variable, denoted as Y, is a dichotomous variable having either a success or failure as the outcome:

$$\log_e \left[\frac{p(Y=1|X_1,\dots X_p)}{1-p(Y=1|X_1,\dots X_p)}\right] = \log_e \left[\frac{\pi}{1-\pi}\right] = \alpha + \beta_1 X_1 + \cdots + \beta_p X_p = \alpha + \sum_{j-1}^{p} \beta_j X_j \quad (4)$$

For logistic regression analysis, the model parameter estimates $(\alpha, \beta_1, \beta_2, \dots \beta_p)$ should be obtained and it should be determined how well the model fits the data (Agresti, 2007). The complete model contained all the explanatory variables and interactions believed to influence increase in production.

Since we fit a logistic regression model, we assume that the relationships between the independent variables and the logits are equal for all logits. The regression coefficients are the coefficients $\alpha, \beta_1, \beta_2, \dots \beta_p$ of the equation:

$$Logit[\pi(x)] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p \quad (5)$$

Fitting equation (5), we have the following model for cocoa:

$$Logit[\pi(x)] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \quad (6)$$

Where α is a constant known as the intercept,

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6\ and\ \beta_7$ are the coefficients of regression parameters that were estimated and described the direction and strengths of the relationship between Ghana's increased or decreased in gross output of Cocoa and the explanatory variables; and $X_1, X_2, X_3, X_4, X_5, X_6\ and\ X_7$ represent the explanatory variables, provision of extension services, provision of input services, provision of storage facilities, provision of inputs at subsidized prices, export quantity, size of land cultivated and current import tariff on agricultural commodities respectively.

Again fitting equation (5), we have the following model for rice:

$$Logit[\pi(x)] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \quad (7)$$

Where α is a constant known as the intercept; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7 \text{ and } \beta_8$ are the coefficients of regression parameters that were estimated; and $X_1, X_2, X_3, X_4, X_5, X_6, X_7 \text{ and } X_8$ represent the explanatory variables; provision of extension services, provision of input services, provision of storage facilities, provision of market services, export quantity, size of land cultivated, current import tariff on agricultural commodities and imports of rice respectively.

RESULTS AND DISCUSSION

Empirical results of the influence of trade liberalization policies on cocoa and rice production

The relationship between the production or output value of (cocoa and rice) and the other predictor policy variables influencing output was accessed using the six predictor explanatory policy variables of interest in the regression model and regressed. The explanatory variables include: Ghana's total imports of (cocoa and rice) (IMP), Ghana government's investment in the agricultural sector (GIA), import tariffs on agricultural commodities (IT), total land area cultivated of (cocoa and rice) (TLAC), total export quantity of (cocoa and rice) (TEX) and export tariffs on agricultural commodities (EXT). The results from the regression analysis are presented in Table 1.
The fitted regression for the above relationship for cocoa is:

Y = -956.950 + 175.221 IMP + 6.111 GIA + 5.511 IT + 0.172 TLAC -0.348 TEX – 1.726 EXT

(335.307) (86.094) (1.065) (8.991) (0.071) (0.219) (2.437)

R^2 = 0.884 F = 30.456 DW = 1.343

And the fitted regression for rice is:

Y = -454.329 − 0.095IMP+ 2.623GIA −0.412 *IT* + 1.618 *TLAC* + 2.732 *TEX* + 0.713 *EXT*

(149.807) (0.053) (0.499) (4.389) (0.366) (4.510) (1.204)

R^2 = 0.913 F = 42.023 DW = 1.350.

From the regression result, β_1 = 175.22 which suggest there is positive correlation between Ghana's total import of cocoa and gross output of cocoa. As imports rise by 1000 tons, cocoa output will rise by 175000 metric tons (Mt). This variable was statistically significant at the 10% confidence level but this is contrary to fact. For rice, Ghana's total imports of rice have a negative sign with a value of β_1 = -0.095 as expected. The negative sign of this coefficient indicates that the total imports of rice to Ghana and gross output production of rice have an inverse relationship. This means that as Ghana's total rice import quantity increases by 1000 tons, the output value of rice production decreases by 95 Mt. This was statistically significant at the 10% level of confidence. This can be explained by the fact that, as more rice is imported into the country, domestic rice production is under threat of collapsing and this is in accordance with fact. The results also conform to those of Khor and Tetteh (2006) who explained that there are huge imports of rice from countries such as the United States and other countries where a significant number of the farmers' cost were subsidized and therefore production cost was relatively low 'dump' their products on the Ghanaian market hence displacing local rice producers.

The elasticity of government investment in the agricultural sector for both cocoa and rice are β_2 = 6.111 and β_2 = 2.623 respectively and they carry an expected positive sign. The variables are also significant at the 5% confidence level. This is in accordance with facts. As total investment in the agricultural sector increases by one million USD, Ghana's output of cocoa and rice will also increase by 6000 Mt and 2620 Mt respectively. These are in accordance with facts. This result is consistent with the findings of Ofosu-Asare (2011) in a study of trade liberalization, globalization and the cocoa industry in Ghana, who observed that government investment in the cocoa sector through implementation of programs such as the Cocoa Diseases and Pest Control (CODAPEC) program through Cocoa Board (COCOBOD) in 2001 where cocoa farms were sprayed free of charge to control insects pests and diseases actually enhanced farmers output and improved the quality of cocoa beans produced. Ofosu-Asare (2011) also observed that another program by the government was the introduction of cocoa Hi-tech implemented in 2003. This encouraged cocoa farmers to plant improved materials and to apply fertilizers which subsequently enhanced farmers output.

The results also confirm the findings of Wiredu et al. (2010) in a study of the impact of improved varieties on yield of rice producing households in Ghana, who observed that government investment in programs that promote high-yielding rice varieties and other complementary technologies enhanced the gross output of rice production.

β_3 = 5.511 depicts a positive relationship between Ghana's import tariffs on agricultural products and cocoa output. As Ghana's import tariffs rise by 1%, cocoa output will increase by 5500 Mt. This was however not statistically significant at 5% confidence level. This is also in line with the theory of: β_3 = -0.1412 which means import tariffs on agricultural products is inversely proportional to the gross output of rice. This however was not statistically significant at the 5% confidence level. This

Table 1. Results of regression analysis of the influence of agricultural trade policy variables on cocoa and rice production.

Cocoa				Rice			
Variable	**Coefficient**	**t-statistic**	**Prob.**	**Variable**	**Coefficient**	**t-statistic**	**Prob.**
Constant	-956.95	-2.854	0.009***	Constant	-454.329	-3.033	0.006***
IMP (000t)	175.221	2.035	0.053*	IMP (000t)	-0.095	-1.804	0.084*
GIA (USD Million)	6.111	5.738	0.000***	GIA (USD Million)	2.623	5.257	0.000***
IT (%)	5.511	0.613	0.546	IT (%)	-0.412	-0.094	0.926
TLAC (000Ha)	0.172	2.436	0.023**	TLAC (000Ha)	1.618	4.426	0.000***
TEX (000t)	-0.348	-1.591	0.125	TEX (000t)	2.732	0.606	0.550
EXT (% total revenue)	-1.726	-0.708	0.485	EXT (% total revenue)	0.713	0.592	0.560
R^2	0.884			R^2	0.913		
Adjusted R^2	0.855			Adjusted R^2	0.891		
Total Panel Observation	30			Total Panel Observation	30		
F-Statistic	30.456			F-Statistic	42.023		
Durbin Watson	1.343			Durbin Watson	1.350		

Source: Multiple Regression Analysis. ***, **, and * = 1%, 5% and 10% significance level respectively.

means that as Ghana's import tariffs on agricultural products rise by 1%, rice production will decrease by 410 Mt but this is not in accordance with the study's fact. The possible explanation to this may be that since Ghana is not self-sufficient in rice production, a further increase in the import tariff will adversely affect the quantity of rice imported into the country and this will erode the purchasing power of the poor farmer who needs to consume this product to get the required calories to farm. If these calories are not sufficient, production will be affected due to lack or limited energy to farm. Arulpragasam et al. (1997) said that additional tariff on imported rice would particularly increase the price of local and imported rice and decrease real incomes for both rural and urban households.

β_4 = 0.172 and β_4 = 1.618 depict a positive relationship between the total land cultivated of (cocoa and rice) and gross cocoa and rice outputs during the period under study and these are also in accordance with the study's fact. As the total land cultivated of cocoa and rice increase by 1000 ha, cocoa and rice outputs also increased by 170 Mt and 4430 Mt respectively. These were statistically significant at the 5% confidence level.

This result is in line with that of Vigneri (2007) who observed that cocoa farmers increased their output by expanding their farms' sizes. They did that to take advantage of the support provided by government like the mass spraying against diseases and insect pests, payment of bonuses and annual producer price increases. For rice, this result was also consistent with the findings of NRDS (2009) who indicated that the annual production fluctuations of rice are largely due to the area (ha) put under rice cultivation, rather than yield variations (t/ha).

The effect of total quantity exported of cocoa looked insignificant in this study because its coefficient was negative with a value of β_5 = -0.348. This indicated that total quantity exported of cocoa and output had an inverse relationship. This is also contrary to the theory of β_5 = 2.732, which means that Ghana's total export of rice is directly proportional to the gross output of rice. This was however not statistically significant at the 5% confidence level. This means that as Ghana's total export of rice rises by 1000 tons, gross output production of rice also increases by 2730 Mt. This is backed by the theory.

β_6 = -1.726 showed that there was an inverse relationship between Ghana's export tariff on agricultural product and output value of cocoa. As Ghana's export tariff decreased by 1%, output of cocoa increased by 1730 Mt. This was however statistically insignificant but in accordance with facts. For rice, β_6 = 0.713 which also suggests a positive relationship between Ghana's export tariffs on agricultural commodities and total output of rice. This means that as Ghana's export tariffs on agricultural products increased by 1%, total rice production also increases by 710 Mt. This was however not significant at the 5% level and contrary to the study's fact.

The results of the F-tests on the significance of the equations were far larger than the tabulated F at the significance level of 5%. Therefore the models are significant in general. The Durbin-Watson values of 1.343 and 1.350 show inconclusive evidence of autocorrelation respectively. The coefficients of determination: R^2 = 0.855 and 0.913 respectively, which are the proportion of the sample variation in the dependent variables explained by the independent variables, serves as goodness- of fit measure, therefore, the linear combination of independent variables explained about 85.5% and 91.3% of the variability of the dependent variables respectively. The fit of the regressions are good as well.

Agricultural trade policy variable influencing increase in production of cocoa and rice

From Table 2, it can be observed that the probability of

Table 2. Results of logistic regression of analysis of agricultural trade policy variables influencing or enhancing increase in production of cocoa and rice.

Cocoa						Rice					
Variable	**Coefficient**	**Standard error**	**EXP(B)**	**t-statistic**	**Prob.**	**Variable**	**Coefficient**	**Standard error**	**EXP(B)**	**t-statistic**	**Prob.**
Constant	-0.488	1.540	0.614	0.100	0.752	Constant	0.410	1.565	1.506	0.068	0.794
Provision of extension	-0.908	0.706	0.403	1.654	0.198	Provision of extension	-0.712	0.619	0.491	1.321	0.250
Provision of input service	0.170	0.877	1.185	0.038	0.846	Provision of input service	-0.130	0.781	0.878	0.027	0.868
Provision of storage facilities	0.384	0.855	1.468	0.201	0.654	Provision of storage facilities	-0.741	0.582	0.477	1.621	0.203
Provision of subsidized inputs	1.696	1.388	5.450	1.493	0.222	Provision of market services	-0.606	0.878	0.546	0.475	0.491
Export quantity	1.097	0.647	2.996	2.873	0.090*	Export quantity	1.259	1.137	3.521	1.225	0.268
Size of land cultivated	-2.670	0.622	0.069	18.449	0.000***	Size of land cultivated	-1.166	0.555	0.312	4.412	0.036**
Current import tariff	19.506	1.657E4	2.960E8	0.000	0.999	Current import tariff	21.210	1.380E4	1.627E9	0.000	0.999
						Imports of similar produce	-19.860	1.380E4	0.000	0.000	0.999
Number of observations	100					Number of observations	100				
% of correct predictions	84%					% of correct predictions	77%				
Nagelkerke R^2	0.568					Nagelkerke R^2	0.435				
Model Chi-square	54.638					Model Chi-square	38.672				
d.f	7					d.f	8				
Number of increased production	59					Number of increased production	39				
Number of non-increased production	41					Number of non-increased production	61				

Source: Logistic Regression Analysis. ***, **, and * = 1%, 5% and 10% significance level respectively.

increase in production of cocoa and rice were likely to be lowered by 0.403 and 0.491 times respectively for each unit lower in extension services provision. These were however not statistically significant ($p>0.05$). This means that increases in cocoa and rice production are less likely achieved with lower provision of extension services. Provision of extension services by government and other stakeholders should therefore be made priority in order to enhance increase in production of cocoa and rice.

For an additional unit provision in input services to the farmers, production was likely to increase by a factor of 1.185 times for cocoa. For rice, the odds of increase in production were lowered by lower input service. This implies that the likelihood of increase in production is lower for each unit decrease in input provision. Production is likely to be lowered by a factor of 0.878 times with each unit lower in provision of input service. These were however not statistically significant ($p>0.05$) in both cases. Farmers must therefore be assisted by the government to acquire such inputs to boost their production of the crops.

The likelihood of increase in production of cocoa is enhanced by a factor of 1.468 times with an additional unit provision of storage facilities. For rice, the probability of increase in production of rice was likely to be lowered by a factor of 0.477 for a further unit decrease in the provision of storage facilities to farmers. These were however not significant ($p>0.05$). Therefore, to enhance increase in production, farmers must be supplied with storage facilities across the country to help them increase production.

The probability of increase in production is

enhanced by a factor of 5.450 times with each additional unit provision of input subsidies to cocoa farmers. However, this was not statistically significant ($p>0.05$). Rice farmers on the other hand do not enjoy provision of inputs at subsidized prices. This result is in accordance with a study on drivers of cocoa production growth in Ghana by Vigneri (2007) who also observed that the adoption of substantially higher fertilizer rates, provision of storage facilities in conjunction with a systematic spraying of cocoa farms has played a key role in showing the potential of market incentives (in the form of higher producer prices on the one hand, and a combination of subsidized inputs and better farming practices promoted by the government on the other) in making possible what is considered a miracle growth episode in the cocoa sector. The government must therefore focus its attention to providing farmers with input subsidies and the mass spraying program for cocoa farmers must continue and expanded to cover the whole country.

The probability of increase in rice production is lowered by a factor of 0.546 times with a unit decrease in the provision of market of services. This was however not statistically significant ($p>0.05$). Market provision is absolutely necessary to enhance and sustain increase in rice production. This is because the local farmers find it difficult to get market for their produce which has been taken over by rice imports from other countries. Market structures and channels should therefore be created in order to provide the farmers an avenue to sell their produce both locally and internationally. Cocoa farmers are provided ready markets for their produce; therefore they do not face marketing problems.

Production was likely to increase with higher export quantity for both crops. Production was likely to increase 2.996 and 3.521 times with each additional unit increase in total export volume of cocoa and rice respectively. This was statistically significant ($p<0.1$) at the 10% confidence level for cocoa but not statistically significant for rice. Vigneri (2007) also gave credence to the fact that the total export quantities of cocoa determined the amount of incomes farmers received hence farmers were motivated to increase production to earn more income and the same could apply to rice farmers.

The probabilities of increase in cocoa and rice productions are lower for low size of land cultivated. Productions were likely to be lowered by factors of 0.069 and 0.312 times with an additional unit decrease in size of land cultivated for cocoa and rice respectively. These were statistically significant ($p<0.05$). Farmers must therefore be encouraged to adopt new technologies in order to enhance production and increase in the production levels. Expansion in the size of land cultivated may be promoted in areas where land is available but farmers must also be encouraged to replant old farms and maintain good cultural practices in order to enhance increase in production.

The probabilities of increase in productions of both cocoa and rice were enhanced by factors of 2.960E8 and 1.627E9 with each additional unit increment in the current import tariffs of cocoa and rice respectively. This means that a further increment in the current import tariff will enhance increase in productions of both crops. Nonetheless, these were not statistically significant ($p>0.05$).

The odd of increase in rice production is lowered for imports of rice into the country. This means that the probability of increase in production of rice is likely to decrease to zero for each unit import of rice into the country. This was however statistically insignificant ($p>0.0.5$). This result was in accordance with that of Khor and Tetteh (2006) who explained that because Ghana's bound tariff for agricultural products is 99%, the country can increase its 20% tariff on rice to 25% or even much higher levels, and still be in compliance with its WTO obligations. The use of this flexibility is especially useful when a country faces import surges that adversely affect the domestic producers and this can result in increase in production of rice. Imports of cocoa had a negligible influence on increase in cocoa production since cocoa imports into Ghana is almost non-existent.

Agricultural trade liberalization policies and poverty reduction

Comparison of annual income and expenditure between cocoa and rice farmers

Income is widely used as a welfare measure because it is strongly correlated with the capacity to acquire many things that are associated with an improved standard of living, such as food, clothing, shelter, health care, education and recreation (Morris et. al., 1999). The income of farmers is the total income received by farmers at the end of a farming season. It did not include income received from other sources since farmers found it difficult computing such incomes because such incomes come to the farmers in bits and pieces occasionally. The income refers to the net income received by the various farmers of cocoa and rice sold at farm gate prices after the cost of production has been deducted. Comparatively, the annual average income earned by the cocoa farmers is more than rice farmers. Cocoa farmers earned an annual average income of about GHC2984, while rice farmers earned about GHC1809. These average annual incomes are however higher than the national annual average income of about GHC1217. Compared to rice farmers, cocoa farmers receive much support from the government, hence the higher average annual income.

Expenditure refers to the total amount spent on consumer goods and services in the last 12 months. It does not include cost of production items like seeds, fertilizers and so on. From Table 3 it can be observed that rice farmers with a lower annual average income also

Table 3. Comparison of annual average incomes and expenditures of cocoa and rice farmers.

Crop	Mean (±SD)	Minimum (GHC)	Maximum (GHC)
Cocoa farmers			
Income	2983.65 (±1339.34)	410.00	5535.00
Expenditure	5167.51 (±513.599)	3416.00	6457.00
Rice farmers			
Income	1808.80 (±1335.93)	450.00	6900.00
Expenditure	5761.45 (±441.45)	4838.00	7342.00

Source: Field Survey (2012); Estimated by author. USD 1.00 = GHC 2.00, as at May 2013.

have the higher average annual expenditure of about GHC5761 compared to cocoa farmers with a lower annual average expenditure of about GHC5168. This could be due to the relatively large average household sizes of about 7 persons among rice farmers compared to an average of about 6 persons among cocoa farmers in the present study.

Farmers' ability to afford basic social amenities

This study classified the basic needs of respondents as: providing three square meals a day, fish and meat products, ability to pay school fees for dependents, health bills, ability to afford new clothes for members of the household, fuel for cooking, ability to access information and access to entertainment facilities in line with the United Nations (UN) Millennium Development Goals (MDGs).

The distribution in Table 4 clearly shows that majority (81%) of cocoa farmers could afford three square meals a day compared to just about 28% of the rice farmers. When it came to the affordability of fish and meat products, majority (33%) of the cocoa farmers were in a better position to provide such products to their households compared to just about 12% of the rice farmers.

In terms of school fees, majority (27%) of cocoa farmers had the ability to pay fees for their children compared to just about 14% of rice farmers. This could be due to the arrangement made by government for cocoa farmers to buy their produce at the end of each farming season through purchasing clerks and also license buying companies thereby making money readily available to the farmers at the end of each season. Farmers who cultivate rice do not enjoy such arrangements and hence their relative low abilities to pay school fees for their children.

For health bills, a slightly higher percentage (27%) of the cocoa farmers have the ability to pay for healthcare delivery compared to 26% of rice farmers. This may be due to the new national health insurance policy introduced by the government which requires that a person registers once and pay a premium for healthcare and this premium amount is not so much. This has made healthcare more accessible to the people compared to the previous cash and carry system.

A higher percentage (21%) of the cocoa farmers could easily afford to buy new clothes for household members as against just about 13% of the rice farmers who could easily afford to buy new clothes for members of their households. Fuel wood is the common source of fuel for most rural households in Ghana. It is readily available to most farmers since they only need to get them from their farms. It is not surprising to see majority (86%) of the cocoa farmers having access to fuel as against 62% of rice farmers having access to fuel.

Information refers to access to productive information through extension agents or through television, radio and mobile phone. This was to assess if respondents had the ability to afford private extension services or buy a television or mobile phone to access productive information. Majority (55%) of the cocoa farmers had the ability to afford such services compared to just about 35% of the rice farmers.

Finally, when it came to entertainment a greater percentage (55%) of cocoa farmers could afford entertainment facilities compared to just about 35% of the rice farmers.

CONCLUSIONS AND RECOMMENDATIONS

This study has revealed that Government's investment in the agricultural sector, the total land area cultivated of both cocoa and rice significantly and positively influenced gross cocoa and rice outputs. Aside these, total imports of cocoa also significantly and positively influenced gross cocoa output even though theoretically, total imports of cocoa should have negatively influenced cocoa production. Import tariff on agricultural commodities also positively influenced gross output of cocoa but was not significant. For rice, total imports of rice significantly influenced negatively the gross output of rice.

When it came to agricultural trade policies which were likely to enhance or influence increase in production of the crops, the findings of the study showed that for cocoa, the provision of input services, provision of storage facilities, provision of inputs at subsidized prices, the total export quantity of cocoa and the current import tariff on

Table 4. Farmers' ability to afford basic social amenities.

Basic social amenity	Cocoa farmers				Rice farmers			
	Not able	Somewhat able	Very able	Total	Not able	Somewhat able	Very able	Total
Food	0% (0)	19% (19)	81% (81)	100% (100)	11% (11)	61% (61)	28% (28)	100% (100)
Fish and meat products	3% (3)	64% (64)	33% (33)	100% (100)	47% (47)	41% (41)	12% (12)	100% (100)
School fees	10% (10)	63% (63)	27% (27)	100% (100)	60% (60)	26% (26)	14% (14)	100% (100)
Health bills	11% (11)	62% (62)	27% (27)	100% (100)	30% (30)	44% (44)	26% (26)	100% (100)
Clothing (New)	7% (7)	72% (72)	21% (21)	100% (100)	51% (51)	36% (36)	13% (13)	100% (100)
Fuel for cooking	0% (0)	14% (14)	86% (86)	100% (100)	1% (1)	37% (37)	62% (62)	100% (100)
Information service	4% (4)	41% (41)	55% (55)	100% (100)	13% (13)	52% (52)	35% (35)	100% (100)
Entertainment	5% (5)	40% (40)	55% (55)	100% (100)	14% (14)	51% (51)	35% (35)	100% (100)

Source: Field Survey (2012); Percentage (Frequency); Estimated by author.

agricultural commodities were likely to positively enhance increase in production of cocoa but only the total export quantity was significant in the present study. The total export quantities of rice and import tariffs on agricultural commodities had higher probabilities of enhancing increase in rice production.

Finally, the findings of this study suggest that trade liberalization policies generally have contributed positively to the income levels of both cocoa and rice farmers since the average annual incomes earned by these farmers are higher than the national annual average income but due to the relative large household sizes kept by some of the farmers especially the rice farmers and relative less government support enjoyed, these income levels could not sustain their basic needs and therefore plunge them into poverty.

Governments should therefore increase its investment in the agricultural sector through mechanization and machinery provision, provision of agricultural input services, provision of financial services to the farmers to further boost production. Another critical area which should be since the total land cultivated of the crops positively impacted on gross output. Also the applied import tariff rate should be increased marginally without violating WTO rules and regulations to limit the imported quantities of rice to enhance local production.

It is recommended that trade liberalization should be carried out fully in the cocoa sector but gradually in the rice sector to protect local producers. Government must put in place strategies and special programs to enhance rice production. It is also recommended that farmers must be educated through public programs to keep relatively small household sizes which they can maintain without difficulty so that they do not end up in abject poverty.

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