



FERTILIZER USE AMONG COCOA FARMERS IN GHANA: THE CASE OF SEFWI WIAWSO DISTRICT

Isaac Nunoo^{1*}, Benedicta Nsiah Frimpong² and Frederick Kwabena Frimpong³

^{1,3}Kwame Nkrumah University of Science and Technology, Department of Agriculture Economics, Agribusiness and Extension

²Council for Scientific and Industrial Research- Crops Research Institute

*Corresponding author: nunooisaac85@yahoo.com

Abstract

This study analyses factors that influence fertilizer use among cocoa farmers in the Sefwi Wiawso District in the Western Region, Ghana. Primary data were obtained from 200 cocoa farmers in the district. Descriptive statistics and ordinary least square regression analysis were used to analyse data collected. The results revealed that majority of the cocoa farmers were males and are getting old. Also farm size and price of fertilizer were significant factors affecting fertilizer use among cocoa farmers in the Sefwi Wiawso District in the Western Region. Moreover 74.5 percent farmers do not use fertilizer whereas 25.5 percent use fertilizer on their cocoa farms. The study recommends that Ghana government should further subsidise the price of fertilizer to make fertilizer more affordable to small holder cocoa farmers and also adopt strategies that hedge against price risk. In addition, illiterate farmers should be encouraged to undergo adult literacy programmes. Rural development policies should think about the importance of improving small-scale farmers' access to credit market. Furthermore, the extension unit of the Ghana Cocoa board and Ministry of Agriculture should be strengthened to educate cocoa farmers more on fertilizer usage.

Keywords: Cocoa, Fertilizer, Ghana, Ordinary least square, Ghana Cocoa board

Introduction

It is estimated that over 14 million workers produce cocoa, of which 10.5 million are in Africa. Small-scale farmers grow 95 percent of the world's cocoa. Cocoa has been the backbone of Ghana's economy for a century and plays a major role in employment, foreign exchange earnings, government revenue, education, and infrastructural development amongst others (Amoah, 2008). In Ghana, it is estimated that there are about 265,000 cocoa farm owners and roughly 800,000 people involved in cocoa growing and these figures exclude those working in other areas of the industry such as the processing firms, Licensed Buying Companies, chocolate vendors and others (Asamoah and Baah, 2003). Cocoa contributes about 70-100 percent of smallholder cocoa farmer's annual household income in Ghana. Despite its contribution from export earnings and employment the average yield per hectare is 450 kg (MMYE, 2008) this yield rate is low compared to countries like Malaysia and Indonesia where average yield exceed 1000 Kg/hectare (Les Afriques, 2009). According to Nkamleu *et al.*, (2007) these low yields per hectare partly reflect the low quantity of inputs farmers apply to their tree stock investments. The researcher further stated that most important of these inputs, beside labour, are fertilizers for soil fertility. Studies on demonstration plots by Cocoa Research Institute of Ghana (CRIG) indicate that, low soil fertility is among the major causes of decline in yield of cocoa and has been confirmed through fertilizer use trials. The soil nutrients of farm lands are being mined annually via cocoa harvest. Opeyemi *et al.*, (2005) reported that the effective use of fertilizer on cocoa would help not only to improve yield but also has the advantages of profitability, product quality and environmental protection. This implies that fertilizer usage is a primary factor to be considered in maximizing cocoa production. According to Ghana Cocoa Board (2002) fertilizer application increased yields from 250 kg per hectare to 1,500 kg per hectare after the 4th year of fertilizer application. This gives indication that fertilizer application is inevitable in agricultural production as adequate use of fertilizer increases agricultural output.

Application of fertilizer is inevitable for the replacement of soil nutrients that are being mined through cocoa pod harvest annually. This therefore implies fertilizer usage should be considered as a key factor in maximizing cocoa production; this study was therefore conducted to assess fertilizer usage for cocoa production in the study area. There is also the need to investigate factors which could hamper optimum use of fertilizer among cocoa farmers in the Sefwi Wiawso District.

Methodology

The study was carried out in the Sefwi Wiawso district in the Western Region of Ghana. The reason for selecting this cocoa growing region is that, it's among the highest cocoa producing region in the country. The Sefwi Wiawso district is located in the North-eastern part of the Western Region covering an area of about 2,634 square kilometers. It shares boundaries with the Brong-Ahafo in the north, Juaboso and Bia Districts in the West and by Aowin and Suaman districts in the south. It is also bordered by Bibiani-Ahwiaso-Bekwai to the coast and Wassa Amenfi West to the south-east. The Sefwi Wiawso District falls within latitudes 6° 00' and 6° 30' North and Longitudes 2° 15' and 2° 45' West (SWDA, 2012). Some of the common foodcrops grown in the area are; cocoa, cassava, plantain, yam, cocoyam, maize and banana.

This study used primary data exclusively collected from 200 cocoa farmers in Sefwi Wiawso District. The survey used a two-stage stratified sampling design with geographical proximity as the stratification variable, the villages as the primary sampling unit and the households as the secondary sampling unit. A total of five (5) villages were randomly selected of which 40 farmers were randomly selected per village making a total sample of 200 farmers. Primary data were used in the analysis and these consisted of socio-economic data and production data. Structured questionnaires were administered to respondents and complemented by focus group discussions and informal interview to ensure the consistency and accuracy of data collected.

Data Analysis

The data collected were analyzed with the use of descriptive statistics as well as regression analysis. Descriptive statistics was used to describe the socio-economic characteristics of the respondents and the status of fertilizer usage for cocoa production in the study area.

Regression model was used to assess the determinants of the usage of fertilizer for cocoa production in the study area. Here Ordinary Least Square (OLS) Regression model was used and explicitly, the model is stated below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where:

Y = Quantity of fertilizer used (Kilogram)

B_0 = Constant term

X_1 = Farm size (Hectares)

X_2 = Fertilizer availability (Available =1, Not available=0)

X_3 = Rate of fertilizer application (number of times)

X_4 = Price of fertilizer application (GH¢)

e = Error term

Result and Discussion

Socio-economic characteristics of the respondents

Table 1 show the sex composition of the cocoa farmers which revealed that 84.5 percent of the respondents are males with 15.5 percent being females. This indicates that cocoa production is a male dominated occupation as most of the activities associated with its production require physical energy and is labour intensive which makes it not suitable for females.

Table 1: Demographic characteristics

| Variables | Frequency | Percentage | Mean |
|--------------------------|------------|------------|------|
| Sex | | | |
| Females | 31 | 15.5 | |
| Males | 169 | 84.5 | |
| Total | 200 | 100 | |
| Marital Status | | | |
| Single | 25 | 12.5 | |
| Married | 175 | 87.5 | |
| Total | 200 | 100 | |
| Age | | | |
| 20-40 | 79 | 39.5 | |
| 41-50 | 48 | 24.0 | |
| 51-60 | 45 | 22.5 | |
| 61-70 | 28 | 14.0 | |
| Total | 200 | 100 | |
| Educational Level | | | |
| No formal education | 62 | 31.0 | |
| Primary education | 121 | 60.5 | |
| Secondary education | 15 | 7.5 | |
| Tertiary education | 2 | 1 | |
| Total | 200 | | |

| | | | |
|----------------------|------------|------------|---|
| | | 100 | |
| Cocoa Variety | | | |
| Amazon | 30 | 15 | |
| Amelonado | 149 | 74.5 | |
| Amazon+Amelonado | 21 | 10.5 | |
| Total | 200 | 100 | |
| Household size | | | 7 |
| Farm size | | | 2 |

Source: Field Survey, 2012

Moreover as the study showed that the males in cocoa farming were more than the females in the study area, it is likely to be linked with the involvement of the women in the cultivation of other alternative crops and trading in food crops, since the soils are favorable to most food crops. A study by Baah *et al.* (2011) on cocoa farmers in the Eastern Region of Ghana also showed that 78 percent were males while 22 percent were females, this confirms the study done in the Sefwi Wiawso indicating that the cocoa farming is a male dominated occupation. The average age for the cocoa farmers was 46 years. This indicates that the farmers are in their prime ages and were actively involved in cocoa production investment. Finding by Clay (2004) indicated that roughly seventy percent of total global cocoa productions are smallholder farmers with land size ranging from 0.5 to 7 ha. The results from the data revealed that cocoa farmers in the Sefwi Wiawso have an average farm size of 2 hectares, of which most of the farmlands are family lands which have been inherited from parents or grandparents. Ghana Cocoa Board (2002) indicated that cocoa farm sizes in Ghana are relatively small, ranging from 0.4 to 4.0 ha. A study by Danso-Abbeam *et al.* (2012) in the Bibiani-Anhwiaso-Bekwai District of Ghana showed that a high proportion of the respondents (70.33 percent) had farm size between 1-5 hectares of cocoa farm confirming results from the study in the Sefwi Wiawso District.

The data collected revealed that more than 91.5 percent of the respondents were not educated beyond the primary school level, out of which 60.5 percent were not formally educated at all. A minority of 7.5 percent had secondary education. According to the Ministry of Food and Agriculture (2011) education of the respondents plays a significant role in the acquisition and use of information, hence technology adoption. This low level of formal educational background may likely affect their knowledge of innovations and attitudes to

information which are necessary for farm work. A mean family size of 7 members was obtained among the sample respondents. This implies that family size of cocoa farmers in the district could be one of the necessary conditions for engaging in cocoa production; as large family size could ease the labour constraint.

From table 1 it could also be observed that most of the respondent (74.5 percent) had sole variety of the Amazon on their farm while just 15 percent uses the Amelonado. However, 15 percent of the respondents have combined the use of both Amazon and Amelonado. This is an indication that most of the respondents are responding to the faster rate of adopting the new cocoa hybrid variety.

Table 2 showed that 74.5 percent of the respondents do not use fertilizer while only 25.5 percent indicated that they use fertilizer on their cocoa farms. This results is an indication that majority of the cocoa farmers are not using fertilizer on their cocoa farms. However, none of those that even use fertilizer did apply as recommended by CRIG but rather haphazardly. These results confirm studies by Baah *et al.*, (2011) in Eastern Region of Ghana and Olwande *et al.*, (2009) in Kenya that majority of cocoa farmer’s do not use fertilizer in their cocoa production as recommended. Although the results confirms studies by other researchers, it is also contrast to a study by Chude (1999) who claimed that fertilizer is an agricultural technology that is widely adopted by farmers.

The non-usage of fertilizer according to the respondent was as a result of the following factors: high price of fertilizer, unavailability of fertilizer and the natural regeneration of the soil fertility. The results indicated that although 28 percent did not indicate the reasons for not using fertilizer, 46.5 percent stated that fertilizer prices are high and therefore cannot afford it. 17.5 percent of the respondents’ farmers gave reason that fertilizer is not available for use when needed. Furthermore 8 percent of the cocoa farmers indicated that they don’t use fertilizer because they believe that the cocoa trees and leaves that fall on the soil would decay to improve the fertility of the soil

Table 2: Use of fertilizer for cocoa production

| Status | Frequency | Percentage |
|------------------------|-----------|------------|
| User of fertilizer | 51 | 25.5 |
| Non-user of fertilizer | 149 | 74.5 |
| Total | 200 | 100 |

Source: Field Survey, 2012

Determinants of the Quantity of Fertilizer Used For Cocoa Production

Table 3: Results of regression analysis

| Variable | β_s | Std. Error | t | Prob (P) |
|--------------------------------|-----------|------------|---------|----------|
| (Constant) | -3.144 | .141 | -22.332 | .000 |
| Price of fertilizer | .975 | .016 | 61.525 | .000*** |
| Farm size | .046 | .016 | 2.845 | .005*** |
| Fertilizer availability | -.027 | .025 | -1.074 | .285 |
| Rate of fertilizer application | .023 | .044 | .517 | .606 |
| R ² | 0.976 | | | |
| Adjusted R ² | 0.976 | | | |
| F value | 1.316E3 | | | |
| Standard error | 0.13428 | | | |
| D.W | 1.703 | | | |

Note: *, ** and *** represent 10%, 5% and 1% significant levels respectively.

Table 3 reports the results of the Ordinary linear regressions analysis for determinants of fertilizer use among cocoa farmers in Sefwi Wiawso District in the Western Region, Ghana. The analytical tests show that the R² of 0.976 is very high and indicates that about 97.6% of variability in the index of fertilizer use in the Sefwi Wiawso district is caused by the specify explanatory variables. The information criteria for the model are significant thus confirming the fitness of the models and implies that the indicated independent variables are important explanatory factors of the variations in the indices of fertilizer use among cocoa farmers in the Sefwi Wiawso District in the Western Region. The result reveals that the coefficients of farm size and price of fertilizer are significant (P<0.01). This is an indication that farm size and fertilizer price are critical in determining the quantity of fertilizer to use. The results correspond to studies done by Olayide *et al.*, (2009) and Amanze *et al.*, (2010) for farm size and distance from the point of sale. On the other hand the other two explanatory variables were not significant which comply with the a priori expectations. The result also reveals that the slope coefficient of availability of fertilizer is negative determinants of fertilizer use among cocoa farmers in Sefwi Wiawso. The results denote that unavailability of fertilizer decrease the fertilizer use in the study area.

Conclusion and Policy Recommendation

Using cross-sectional data collected at the farm level, this study investigates fertilizer usage in cocoa production. The results from the descriptive analysis of the socio economic characteristic of respondents reveals that most of the cocoa farmers in Sefwi Wiawso are old and as such there is an urgent need to encourage youth into cocoa production. The results further indicated that important factors directly related to use of fertilizer are farm size, availability of fertilizer, rate of application and price of fertilizer.

Based on the results from the study, it could be concluded that those variables such as price of fertilizer, and farm size have effect on fertilizer use. Policy makers should therefore consider the following recommendations: Policies that promote use of fertilizers should be complemented by strategies that hedge against price risk. Farmers should be encouraged to improve their level of education. Illiterate farmers could be encouraged to undergo adult literacy programs. This is quite essential in as much as the level of education affect technology adoption and the same is that of the use of fertilizer for cocoa production. Improving small scale cocoa farmer's access to credit market would be a policy in the right direction.

References

- Amanze, B., Eze, C., Eze, V., 2010. Factors Influencing the Use of Fertilizer in Arable Crop Production among Smallholder Farmers in Owerri Agricultural Zone of Imo State. *Academia Arena*; 2(6):, Pp. 90-96.
- Amoah, F.M., 2008. "Public Sector Policy on Sustainable Cocoa Economy".Cocoa Research Institute of Ghana.Ghana Public Sector Policy. 17 Oct. 2009 <http://www.roundtablecocoa.org/documents/RSCE2%20Abidjan%20%20Dr%20A%20moah%20-%20Representative%20public%20sector%20Ghana.pdf> accessed on 19 Nov. 2011.
- Asamoah, M., Baah, F., 2003. Improving Research-Farmer Linkages: The role of CRIG. A paper submitted at the 4 Th International Seminar on Cocoa-Pests and Diseases (INCOPED), Accra, Ghana, 19 th -21St October 2003.
- Baah, F., Anchirinah, V., Amon-Armah, F., 2011. Soil fertility management practices of cocoa farmers in the Eastern Region of Ghana. *Agriculture Agric. and Biol. J. North Ame.*issn Print: 2151-7517, ISSN Online: 2151-7525, doi:10.5251/abjna.2011.2.1.173.181.

- Chude, V.O., 1999. Perspectives of fertilizer Use in the 21st Century. In: O Babalola, U Omoti, AI Isenmilla (Eds.): Management of Soil Resources of Nigeria for Sustainable Agricultural Production in the 21st Century. Proceedings of the 25th Annual Conference of the Soil Science Society of Nigeria.
- Clay, J., 2004. *World agriculture and the environment*. Island Press, Washington.
- Danso-Abbeam, G., Aidoo, R., Agyemang, K.O., and Ohene-Yankyera, K., 2012 Technical efficiency in Ghana's cocoa industry: Evidence from Bibiani-Anhwiaso-Bekwai District. *Journal of Development and Agricultural Economics* Vol. 4(10), pp. 287-294.
- Ghana Cocoa Board 2002. Report of the Committee on Application of 'High Technology' Method on Cocoa Production in Ghana. Accra: Ghana Cocoa Board.
- Gockowski, J., Sonwa, D., 2008. Biodiversity and Smallholder Cocoa Production Systems in West Africa, STCP Working Paper Series Issue 6, Available online at www.treecrops.org (Accessed on November 19, 2011). *J. Agric. and Resource Econ.*, vol. 2(1): 145-166.
- Les, A., 2009. "Le financement de l'agriculture en Afrique subsaharienne: une approche globale est nécessaire", No. 140.
- Ministry of food and Agriculture, 2011. Directorate of Agricultural Extension Services: Agric. Ext. Approaches Being Implemented in Ghana. <http://mofa.gov.gh/site/wp-content/uploads/2011/03/Extensionapproaches-in-Ghana-.pdf>. Accessed on 25th March, 2012.
- Ministry of Manpower Youth and Employment (MMYE) Ghana, 2008. Labour Survey in Ghana—2007/2008. Executive Summary, National Programme for the Elimination of the Worst Forms of Child Labour in Cocoa (NPECLC).
- Nkamleu, G., Keho, Y., Gockowski, J., and David, S., 2007. "Investing in agrochemicals in the cocoa sector of Côte d'Ivoire: hypotheses, evidence and policy implications", *African Journal of Agriculture and Resource Economics*, vol. 2(1): 145-166.
- Olayide, O.E., Arega, D., and Ikpi, A., 2009. Determinants of fertilizer use in Northern Nigeria. *Pakistan J. soc. Sci.* 6(2): 91-98.
- Olwande, J., Geophrey, S., Mary, M., 2009. Agricultural Technology Adoption: A Panel Analysis of Smallholder Farmers' Fertilizer use in Kenya. Contributed paper prepared for presentation at the African Economic Research Consortium Conference on Agriculture for Development.

Opeyemi, A.A., Fidelis, O.A., Ademola, B., Phillips, O., 2005. Quality Management Practices in Cocoa Production in South-Western Nigeria. Conference on International Research on Food Security, Natural Resource Management and Rural Development.

Sefwi Wiawso District Assembly (SWDA), 2012. [http:// www.ghanadistricts.com /districts/?news&r=5&_=139](http://www.ghanadistricts.com/districts/?news&r=5&_=139). Accessed on 19th Nov. 2010.