Assessing Farm Gate Pricing And Income Of Cocoa Farmers:

A CASE STUDY OF COCOA FARMERS IN THE AGONA EAST DISTRICT

June 2019

SEND GHANA

INKOTA netzwerk e.V.

UTZ joining forces with Rainforest Alliance

Assessing Farm Gate Pricing And Income Of Cocoa Farmers:

A Case Study Of Cocoa Farmers In The Agona East District

June 2019

SEND GHANA

INKOTA netzwerk e.V.

UTZ joining forces with Rainforest Alliance

Table of Contents

List of Tables

List of Figures

Acknowledgments

We acknowledge contributions from the cocoa farmers in the Agona East District who participated in the data collection. We thank the Ghana COCOBOD for their comments towards the improvement of the draft report which was presented at a validation seminar on 12 February 2019.

Our sincerest appreciation goes to Prof. Kwabena Asomanin Anaman (Research Lead) and his team for undertaken the survey and writing the report.

Finally, this research would not have been possible without the funding support from our project partners, INKOTA netzwerk and Rainforest Alliance. We greatly appreciate cherish their partnership.

Executive Summary

The objectives of this study were to analyse farmers' perceptions of factors influencing the determination and setting of cocoa farm gate prices, (also referred to as cocoa producer prices), to ascertain the impact of Ghana COCOBOD's mass spraying and fertilizers distribution programmes on the economic welfare of cocoa farmers including related issue dealing with the likelihood of exclusion of certain groups of farmers from these two programmes, to investigate the effect on economic welfare of cocoa farmers under the unchanged cocoa producer prices situation over the last couple of years, and to establish the factors influencing income diversification activities of cocoa farmers, especially through off-farm income sources, in Ghana, using Agona East District as a case study.

The methodology of the study involved a desktop component that reviewed the literature on the processes involved in the determination and setting of cocoa producer prices in Ghana; then a farmer-survey component that analysed farmers' perceptions of the determination and setting of cocoa farmgate prices and related issues that affect their economic welfare. For the case study, in the Agona East district, in addition to the personal confidential interviews of 90 randomly-selected cocoa farmers, we had two focus-group meetings with stakeholders, in-depth interviews with two purchasing clerks, one chief cocoa farmer, three sub-chiefs, one Agona East District Assembly representative, and the Paramount Chief and President of the Agona Nsaba Traditional Council, one of the 179 traditional councils in Ghana.

The desktop literature review outlined the international trade supply and demand factors responsible for the setting of world cocoa prices. Further, various processes and structures that determine local cocoa producer prices and domestic marketing arrangements in Ghana were discussed. The desktop review indicated relatively low involvement of cocoa farmers in the determination and setting of cocoa producer prices in Ghana. Decision making processes, which lead to the setting of local cocoa producer prices at the beginning of the production year in October in Ghana, had relatively little involvement of cocoa farmers. Further, the representation of cocoa farmers in the industry price setting committee was generally low.

The results of the farmer-survey analysis confirmed little role of farmers in the determination and setting of local cocoa producer prices. Rather the most important factors that farmers perceived to determine local cocoa producer prices were the largely unknown and unclear processes carried out by the government of Ghana and the Ghana Cocoa Board in setting local producer prices. These two agents – the Government of Ghana and the Ghana Cocoa Board – were considered the most influential agents in the setting of local producer prices. These two agents were also perceived to be more influential in setting local producer prices than overseas cocoa buying companies and firms. The

respondents ranked foreign agencies as the fourth most influential actors in the setting of local cocoa producer prices.

The third most important factor in the determination and setting of local cocoa producer prices as indicated by survey respondents was the perceived weighing scale adjustment fraud, perpetrated by purchasing clerks of local Ghanaian buying agencies, at the point of sale of dried cocoa beans, at the buying centres and depots. The normal channel of purchase of dried cocoa beans in the Ghanaian cocoa industry is for the farmer to transport his/her dried cocoa beans in bags or sacks to the local buying centre or depot. These dried beans are weighed on a scale by a purchasing clerk of a licensed buying agency approved by the Ghana Cocoa Board. It was ascertained from the study that there was widespread perception that purchasing clerks manipulated the scale to reduce the price paid to farmers. This fraud, involving the adjustment to the weighing scale, could reduce income obtained by a farmer from selling a bag of 64 kilogrammes (kg) dried cocoa beans by about four to 10 percent.

From the viewpoint of cocoa farmers, the important factors that reduced the gross price of dried cocoa beans paid to farmers at the buying centres and depots, during the time of sales of cocoa beans, included excessive deduction for the hiring of bags and sacks from the buying centres and depots for the dried cocoa beans, excessive deduction for apparently under-dried cocoa beans, unapproved charges levied on cocoa farmers for activities such as transfer of dried cocoa beans from the buying centres and depots to the offices of the licensed buying agencies, and inadequate quality verification of the scale used for weighing the dried cocoa beans. Despite officials of Ghana Cocoa Board insisting that bags and sacks obtained from buying centres were given to farmers free of charge, we ascertained from the study that those who obtained bags and sacks from buying agencies paid a direct fee through deduction of one kilogram of dried cocoa beans.

Using statistical analysis, we established that age, sex, educational attainment, and the farmer owning his/her own bags and sacks used to pack the dried cocoa beans to be transported to the buying centre, influenced the farmer's perceived level of fraud related to adjustments to the weighing scale at the point of sale of dried cocoa beans. Women farmers, who tended to be less educated and had less power bargaining, indicated less weighing scale fraud perceptions compared to their male counterparts possibly due to the easiness in cheating women farmers. The more educated a farmer the higher the perception of weighing scale fraud at the point of sale of the cocoa beans. Farmers who owned their own bags and sacks for packing dried beans to be transported to buying centres perceived higher likelihood of fraud through the hiring of bags from purchasing clerks, and hence preferred to use their own bags and sacks.

Participation in the Ghana Cocoa Board's fertilizers input distribution and mass spraying exercise programmes over the previous 12 months was also analysed. Participation in both the fertilizer distribution and mass cocoa spraying exercises was shown to increase the yields and gross incomes of farmers. Contrary to some perceptions in the industry, these two programmes undertaken by the Ghana COCOBOD are

not subsidized programmes, but are financed directly through a compulsory levy on all cocoa farmers in Ghana, and other stakeholders such as licensed buyers and haulers, based on a deduction of the gross free-on-board (fob) price of dried cocoa beans before the derivation of the local cocoa producer price. The fob prices are the world market spot prices less the transportation costs from the shipping country (producing country) to the port of the country demanding the exportable good.

The expenditures on these two programmes are included in the cocoa industry costs which are deducted from the total gross cocoa revenues of the industry before the derivation of the *net* fob price. The net fob price is then shared among various stakeholders of the cocoa industry such as cocoa farmers, licensed buying agencies, haulers and transport companies, the exporter (Cocoa Marketing Company, a subsidiary of the Ghana Cocoa Board), and the regulator, Ghana Cocoa Board/Government of Ghana. During the 2017/2018 production year, cocoa farmers received 75.60% of the net fob price compared to 6.29% for the Ghana Cocoa Board for its industry-regulatory operations. The remaining 18.11% were distributed to the other stakeholders.

We established that Muslim cocoa farmers in the survey area were more likely to be excluded from the mass cocoa spraying programme than other farmers. This likelihood of exclusion from this programme was also directly linked to the sex of the farmer with female farmers more likely to be excluded than male farmers. For the fertilizers input distribution programme, there was increased likelihood of exclusion of female farmers from this programme. These results suggested that female cocoa farmers were more likely subsidizing male cocoa farmers for both the cocoa spraying and the fertilizers distribution programmes, while Muslim cocoa farmers were also more likely subsidizing non-Muslim farmers for the mass cocoa spraying programme.

An analysis of cocoa farmers' income diversification was also undertaken. Off-farm income activities by cocoa farmers yielded an average annual income of about 1,165 Ghana cedis compared to the average annual gross income from cocoa farming of 3,493 Ghana cedis, and 982 Ghana cedis for non-cocoa agricultural and forestry ventures. Off-farm income constituted about one third of total gross cocoa income and therefore was an important risk management strategy for cocoa farmers providing an additional source of livelihood income. We also analysed factors influencing the degree of income diversification of cocoa farmers based on three key measures of diversification. These three measures are (1) the number of income-generating activities undertaken by the cocoa farmer, (2) the proportion of the total gross income of a cocoa farmer that comes from off-farm sources, and (3) a formal income diversification index known as the Simpson diversification index.

Overall, our analysis suggested that increasing formal educational attainment of the farmer increased his/her income diversification activities. Farmers who owned and directly managed their cocoa farms tended to undertake less income diversification activities and rather focussed more on the management of their cocoa farms. Further, currently married respondents had relatively lesser degree of diversification activities,

largely due to their increased role in home-based work duties, which are not formally classified as income-generating activities. Remittances were not considered to be a major regular source of income.

Finally, local cocoa producer prices were maintained at the same level of 7,600 Ghana cedis per tonne or 475 Ghana cedis per bag of 64 kg of dried cocoa beans for the 2018/2019 production year which started on 5 October 2018. Producer prices have remained unchanged for three continuous years, 2016/2017, 2017/2018 and 2018/2019. The lack of any increase in cocoa producer prices since October 2016 would suggest that by the end of the 2018/2019 production year, the real cocoa producer price would have been reduced by about 38%. The findings of this study confirmed that total aggregate production in the Ghanaian cocoa industry had consistently declined whenever there had been two or more years of decline in the real cocoa producer price.

1.0
Introduction

1.1 Cocoa Production and Importance in Ghana

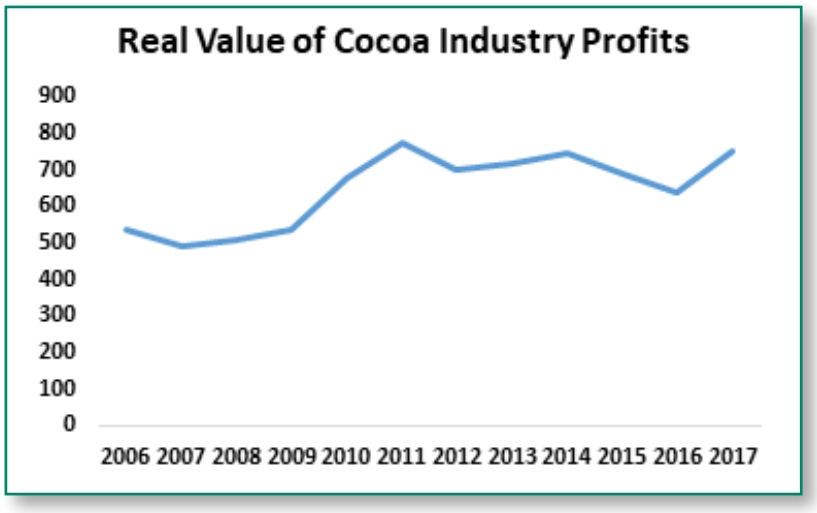
Ghana is currently the second largest producer of cocoa in the world, accounting for about 20% of the share of world cocoa output and is second to La Cote d'Ivoire which produces about 40% of total world production[1]. It is estimated that Ghana's cocoa industry employs about two million people in the 10 cocoa producing regions of the country. According to the Bank of Ghana, in 2016, cocoa earned the country US$2.7 billion accounting for about one-quarter of the total export earnings of US$11 billion making it the second largest export earner after gold. Currently, about 6% of the total export revenues from cocoa production are reserved as tax revenues for the government compared to about 20% from 1950 to 1980[2]. The cocoa industry also accounted on average for about 2.5% of the size of the gross domestic product (GDP) of Ghana over the 12-year period from 2007 to 2017[3] (see data in Appendix 1).

The average annual growth rate of the cocoa industry between 2007 and 2017 was 3.7% compared to the growth rates of 4.2%, 9.8% and 7.7% for the agricultural, industry and services sectors respectively (refer to Appendix 2). In 2015 and 2016, the cocoa industry registered negative growth rates of -8% and 7% respectively. These negative growth rates were partly due to the decline of real local cocoa producer prices in 2012, 2013 and 2014. Other factors that could explain the negative growth rates included relatively lower rainfall amounts in Ghana due to weather shocks such as the El Nino phenomenon and reduced levels of COCOBOD's programmes in 2014 and 2015. The recovery in the growth of the industry in 2017 also partly reflected farmers' response to the increases in real cocoa prices in 2015 and 2016[4]. The high growth rate for 2017 reflected the sharp increases in producer price from GhC5,520 per tonne in the 2014/2015 production year to GhC7,600 per tonne in the 2016/2017 production year. However, the producer price has remained unchanged since October 2016 when new price was announced in October 2016.

A recent important challenge facing the cocoa industry in Ghana is the fluctuating and general decline of total industry net income, as measured by the value added to GDP[5]. In 2017, the cocoa industry was nominally worth about GhC3,357 million. The real value of net income of the Ghanaian cocoa industry fluctuated over the 12-year period from 2006 to 2017 as illustrated in Figure 1. After a peak value in 2011, the real value of the income of the sector trended downwards except for a recovery in 2017. The decline of net income of the industry obviously affects the welfare of farmers. Given that the local producer price is an important factor in the determination of the total net income of the sector, issues related to farmgate price determination and setting processes are directly important to the welfare of farmers.

1 World Cocoa Organization, 2018
2 The current decline in tax revenues from cocoa to government is due to the diversification in revenue sources such as royalties and dividends from production of oil from newly-discovered fields.
3 Ghana Statistical Service, 2018
4 refer to Table 1 for more details of real cocoa producer prices
5 The value added to GDP is computed by the Ghana Statistical Service as the total value of cocoa produced less the total costs of variable inputs used in production. Thus the value added to aggregate cocoa production represents the net returns to labour and management of all cocoa farmers. The total value of cocoa produced is the total production multiplied by the average local producer price. Appendices 1 and 2 provide the nominal and real sizes of the cocoa industry over the 2006 to 2012 period. Appendix 3 provides the comparison of the real value of the cocoa industry as compared to other industries and sectors of the economy of Ghana.

Figure 1: Real value of cocoa industry profits in Ghana as measured by value added to GDP in constant 2006 million Ghana cedis from 2006 to 2017.



An important factor that has affected the welfare of cocoa farmers in major producing countries such as Ghana is world cocoa price instability. Local cocoa producer prices in reality are dependent on world cocoa prices. In more recent years, especially over the last two years, world cocoa prices have exhibited marked instability, with prices reaching an average monthly high of US$3,098.66 in May 2016 and dropping to about US$1,917.68 per tonne in December 2017. This led to the reduction of producer prices by one third La Cote d'Ivoire for the 2017/2018 production year. Ghana maintained local cocoa producer prices at the same level for the 2017/2018 production year of GhC7,600 per tonne. After a brief recovery which saw average monthly world prices reaching US$2,659.94 in May 2018, these prices slumped gradually till they reached around US$2,231.17 per tonne as at 21 December 2018, and US$2,227.33 as at 14 March 2019.[6]

An important link to the payment of adequate local producer prices in Ghana is the exchange rate. Foreign exchange revenues derived from cocoa exports are largely surrendered to the Bank of Ghana (Central Bank of Ghana). The Bank of Ghana then gives Ghana Cocoa Board (COCOBOD) the equivalent Ghana cedis from which local cocoa prices are determined. At the end of September 2018, the inter-bank exchange rate was 4.75 Ghana cedis per one US dollar, which was about the rate required to maintain the current local cocoa price of 7,600 Ghana cedis per bag for the 2018/2019 production year given the free-on-board (fob) forward contract prices of 2,100 dollars per tonne. However, instead of using 4.75 Ghana cedis per one US dollar, the Ghana COCOBOD used 4.4 Ghana cedis per one US dollar to determine the setting of local producer prices for the 2018/2019 production year, partly explaining the unchanged level of local cocoa producer prices for the 2018/2019 production year.

Since the local producer price of 7,600 Ghana cedis per tonne of cocoa has been kept for the 2018/2019 production year starting in October 2018, then after two years of double digit inflation averaging

6 International Cocoa Organization average daily price for 21 December 2018 and 14 March 2019

around 12% per year, the real local cocoa producer price had fallen by about one-quarter (25%) with respect to base price in October 2016. The effect of real local cocoa producer prices on the welfare of farmers is an important policy concern given that many smallholder farmers live below or just above the poverty line. The relative poor income status of cocoa farmers is not only due to their limited participation in local producer price determination, but also due to their rather weak lobbying efforts in determining the level of local cocoa prices that they receive. The living income gap of cocoa farmers in Ghana observed by Tyszler *et al*. (2017) could be related to farmers' limited participation in the determination of local producer prices. The lack of any increase in local cocoa producer prices over the last three years could have further worsened the living income gap of cocoa farmers.

The limited participation of farmers in the setting of producer prices, coupled with their inadequate access to detailed information on international market trends, raises questions about the level of transparency in the determination of local producer prices of cocoa. Further, Ghanaian cocoa farmers have little influence on the determination of the prices of inputs paid either through private market channels or through the programmes enacted by COCOBOD where inputs are supplied to cocoa farmers. The costs of these inputs supplied by COCOBOD are deducted from the gross producer price to arrive at the actual or net producer price paid to farmers.

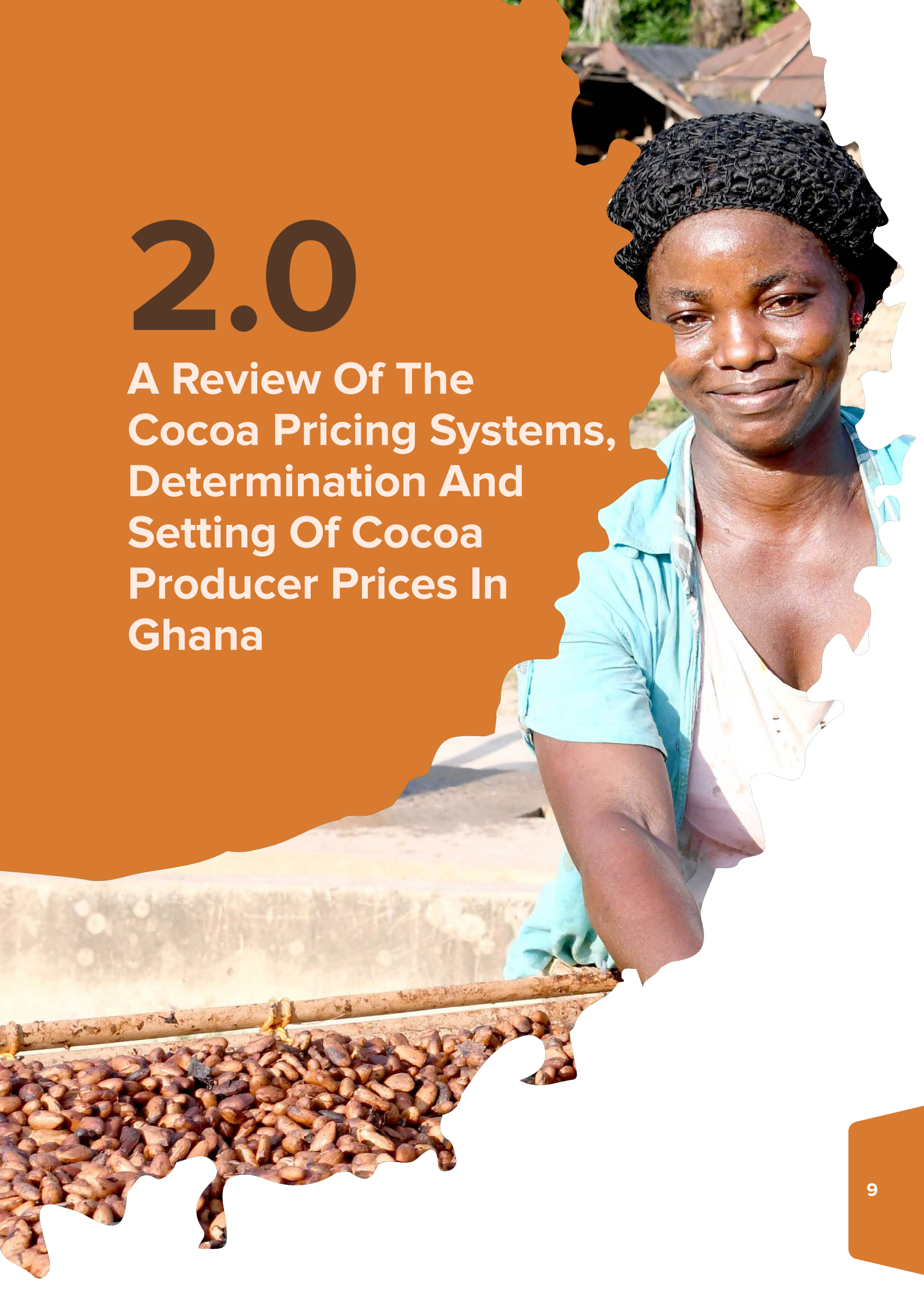
Given the background material presented, the objectives of this study were to analyse farmers' perceptions of factors influencing the determination and setting of cocoa farm gate prices (cocoa producer prices), the impact of COCOBOD's mass spraying and fertilizers distribution programmes on the economic welfare of cocoa farmers, the effect of the unchanged nominal cocoa producer prices on the economic welfare of cocoa farmers, and factors influencing cocoa farmers' income diversification activities in Ghana, using Agona East District as a case study.

The specific objectives of the study were as follows: (a) identify the key players in the cocoa industry particularly those involved in the determination and setting of cocoa producer prices based on a desktop review, and also the analysis of perceptions of these processes by the surveyed farmers, (b) ascertain the impact of COCOBOD's mass spraying and fertilizers distribution programmes on the economic welfare of cocoa farmers including the related issue dealing with the likelihood of exclusion of certain groups of farmers from these two programmes, (c) investigate the effect on economic welfare of cocoa farmers under current condition of unchanged cocoa producer prices over the last couple of years, and (d) establish the factors influencing income diversification activities of cocoa farmers, especially through off-farm income sources, as a means of assuring relatively stable household incomes.

The rest of this report is organized as follows: in the next section we discuss Ghana's cocoa industry, with a focus on cocoa pricing and marketing systems, and cocoa price determination in Ghana. The methodology is discussed in the subsequent section. This is followed by the presentation and discussion of the results of the analysis of the survey, conclusions and policy recommendations. The list of cited references and appendices follow at the end of the report.

2.0

A Review Of The Cocoa Pricing Systems, Determination And Setting Of Cocoa Producer Prices In Ghana



2.1 Cocoa Sector Pricing Reforms in Ghana

During the first half of century of cocoa production and exports in Ghana (1890 to 1940), cocoa prices were generally unstable resulting in relatively low prices for cocoa farmers. This instability in local cocoa producer prices and its related agitation by nationalists forced the British Colonial government to establish the Cocoa Marketing Board (CMB) in 1947. The CMB was originally responsible for price setting in the whole of the West African cocoa production region. The CMB announced the official producer price before the start of the season and gave its cocoa buying agents a fixed stipend to cover the costs of procuring and transporting every tonne of cocoa beans from the production centres to the ports. Under this system, the CMB saved all excess monies it generated from the sales of cocoa beans during periods of high cocoa prices for periods when prices fall[7].

The CMB was later changed to the Ghana Cocoa Board (COCOBOD) in the 1990s. The COCOBOD was a major source of taxation for the government of Ghana for a long period of time until the late 1980s. In the 1950s and 1960s, Ghana was responsible for over one third of the world's production. The large production from Ghana, which was then the largest world producer of cocoa, partly led to the world price depression of the early 1960s, which in turn affected local producer prices. International cocoa prices reached a record low of 211 United States (US) dollars per tonne in July 1965, seven months before the first Ghanaian military coup in February 1966. World cocoa prices reached an all time high of 4,361.58 US dollars per tonne in July 1977, (International Cocoa Organisation, 4 October 2018), during the period that coincided with the extreme droughts associated with the El Nino weather phenomenon which sharply reduced the supply of cocoa coming from West Africa, which was severely hit by the El Nino weather shock.

For much of the 1970s and 1980s, the relatively high level of government taxation of the cocoa industry was thought to be responsible for the relatively low production in Ghana at that time. This reduced production forced the country to embark on an internal marketing liberalization of the cocoa industry from the mid-1980s. This marketing liberalization was not comprehensive as the State maintained its role as the regulator and as major internal marketer through the Produce Buying Company (PBC). The cocoa marketing reform allowed for the participation of about 35 additional private buying companies to compete with the then state-owned Produce Buying Agency (PBC), which was technically a subsidiary of the COCOBOD. However, the State through the COCOBOD maintained its monopoly in the external marketing or export of cocoa beans and cocoa products.

The pricing policy which took off with the reform in the mid-1980s operated under a principle of the net fob sharing among players and stakeholders in the cocoa sector (i.e. from the production to the export processes). In order to ensure

[7] Kotey, R.A., Okali, C. and Rourke, B.E. (editors; 1974). *Economics of Cocoa Production and Marketing*, Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana, 547 pp.

equitable sharing of the net cocoa fob price among the industry players, the Government of Ghana established the Producer Price Review Committee (PPRC) to determine the appropriate levels of the distribution of the net cocoa fob price. Vigneri and Kollavalli (2018) suggested that in the first seven years of the reform (1986/87 to 1992/93), the PPRC made estimations of the costs involved in the production and marketing of cocoa beans. On arriving at these estimations, the PPRC allocated returns to the sector players in such a way that, the cocoa farmers were expected to receive at certain minimum percentage of the total expected revenues to be accrued from the sale of cocoa beans[8]. According to officials of the Ghana COCOBOD, the PPRC concept formally took off during the 1992/93 production year. Hence the period between 1986/87 to 1992/93 could be considered a transition period where a quasi committee or body was probably handling the determination of cocoa producer prices.

From 1992/93 onwards, the share of the net fob price going to the government was reduced with the share of the net fob price for cocoa farmers increased. From 2004/2005 production year, the share of the net fob price going to cocoa farmers was increased to a minimum of 70%. The share of the net fob price going to government taxation dropped from 25% to 15% from 2004/2005 and further to about 5% in 2012. This reform in the allocation of the net fob price which favoured cocoa farmers was expected to lead to increased production of cocoa. This pricing reform together with the government programme of mass spraying of cocoa farms starting in 2002 led to the steady increase in cocoa production in Ghana till the national output reached one million tonnes in 2011. The one million tonnes output was also achieved partly due to smuggling of cocoa from Ghana's neighbour, La Cote d'Ivoire, which was then in turmoil due to a civil war.

McMillan (2001) suggested that the situation that occurred before the price reform discouraged cocoa farmers from investments due to the low producer prices which did not compensate for the costs of maintaining cocoa farms including fair returns on the labour and management of farmers. On the other hand, Kherallah *et al.* (2000) indicated that the relatively large taxation on the cocoa sector over the years helped producer countries such as Ghana to build an extensive social and physical infrastructure. With the large support from development partners in the form of loans and grants from 2001 to 2012, and the discovery and development of offshore oil and gas reserves in Ghana since 2011, the need for higher taxation from the cocoa sector ceased.

[8] Vigneri and Kollavalli, 2018

2.2 Marketing and Pricing Systems

Unprocessed cocoa beans are exported mainly from developing countries to overseas companies and buyers through international dealers who inspect the beans to ensure they are up to standard. Buyers may either be producers of cocoa products or dealers who sell the cocoa beans to final users. International cocoa transaction in Ghana is done by principally using the forward sales and spot sales methods. The forward sales is a system of marketing where cocoa prices and quantities to be sold are pre-determined ahead of the production season and delivered to the buyer after the season at the already determined price. In the forward pricing system, the agreed prices include the cost of storing the cocoa ahead of the delivery date. This system of pricing is based on the future price mechanism which is set at the commodity exchanges in London and New York.

Within the context of the producing countries of cocoa, there are three main forms of local marketing of cocoa. These are (1) free marketing system, (2) famer-run price stabilization funds, and (3) marketing boards. The free marketing system allows for the involvement of private agents in the marketing of the product at all stages. These private agents may either be traders, cooperatives or international exporting companies. The government makes no interventions to pricing as the market forces of demand and supply are allowed to determine the prices. The government however, ensures quality of beans, controls taxation and supervises the entire system to promote farmers' interests. Under this system, cocoa producers earn a higher percentage of the fob prices but are also highly affected when international price fall as they receive much lower payments. This system is currently practiced by Brazil, Malaysia, Nigeria and Indonesia. Ghana used to practice the free marketing system between the 1920 and 1946 until the advent of the Ghana Cocoa Marketing Board now the Ghana COCOBOD in 1947[9].

The second system is the producer-run stabilization fund which is practiced by countries such as Papua New Guinea. Under this system, the internal producer prices for cocoa are partly determined by the government, through its various agencies using some of the cocoa proceeds to build a stabilization fund to support farmer prices in times of world cocoa prices. The government does not actively involve itself in the actual marketing of the cocoa produce to overseas markets as the marketing system is generally run by a farmer-based organization with the approval of the government. The internal marketing costs can be excessive if the management of the system is not closely monitored by the government or its agencies. There is a tendency for "free riding" and rent-seeking activities creep in, especially if the majority of the farmers forming the producer-based organization are not well educated or powerful as the relatively few members who are more educated and/or wealthy.

The third marketing system is the

[9] Kotey, R.A., Okali, C. and Rourke, B.E. (editors; 1974). *Economics of Cocoa Production and Marketing*, Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana, 547 pp.

marketing board system. This is also known as the hybrid system as it contains practices used in the free marketing and the stabilization fund systems[10]. Under the marketing board system, all farmers receive uniform price for their beans irrespective of their location. In this system, a state-owned marketing company maintains monopoly over various stages of cocoa. The producer price is determined by the marketing company in consultation with government authorities and relevant stakeholders. Usually, the price is set to cover the entire production year depending on the prevailing economic conditions. This system has been practiced in Ghana since 1947.

Some studies indicated that cocoa marketing boards which were set up to cushion farmers from price volatility have rather turned into corrupt institutions which work to tax farmers through their price setting schemes. This is mainly done by maintaining overvalued exchange rates. However, other studies have shown that cocoa marketing boards such as those in Ghana have ensured that the best quality cocoa in international markets are produced under this system.[11][12].

While internal country-based dynamics directly affect the marketing and pricing of cocoa, external dynamics also affect cocoa prices. These external dynamics include the determination of the fob prices of cocoa. The fob price, as defined earlier, is the world cocoa spot price minus the costs of transporting cocoa, which include insurance and related fees, from the port of origin (for example, Takoradi in Ghana) to the overseas markets (for example, Amsterdam in the Netherlands). Since cocoa beans are often sent through ships to overseas buyers, factors affecting the costs of shipping directly affect the fob prices. These factors include shocks such as closure of certain shipping lanes and routes through international conflicts which inevitably raise transportation costs higher. Because cocoa is traded in foreign currency, often in the US dollar, events in foreign exchange markets also affect the world prices in the currency of the producing countries, and the actual prices received by farmers.

2.3 Cocoa Marketing in Ghana

Ghana used to practice the free marketing system between 1890 and 1946 until the advent of the Ghana Cocoa Marketing Board in 1947, later renamed Ghana Cocoa Board (COCOBOD). Prior to the establishment of COCOBOD, Cadbury and Fry Company was the major firm marketing Ghana's cocoa beans during the 1930s. Although this company faced some competition from other companies, it controlled the greater proportion of the internal trade. However, due to

[9] Kotey, R.A., Okali, C. and Rourke, B.E. (editors; 1974). Economics of Cocoa Production and Marketing, Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana, 547 pp.

[10] Varangis, P. and Schreiber, G. (2001). "Cocoa Market Reforms in West Africa", in Akiyama, T., Baffes, J., Larson, D., and Varangis, P. (eds.), Commodity Market Reforms: Lessons of Two Decades, World Bank, Washington, D.C., pp. 35-82.

[11] Anaman, K.A. (1977). Some Economic Aspects of Cocoa Production in the Techiman Cocoa District of Brong Ahafo. Bachelor of Agricultural Economics Thesis, University of Ghana, Legon, Accra, Ghana, 144 pp. DOI: 10.13140/RG.2.1.4563.0324.

[12] Kolavalli, S. and Vigneri, M. (2011). "Cocoa in Ghana: Shaping the Success of an Economy", Yes, Africa Can: Success Stories From A Dynamic Continent, pp. 201-208, World Bank, Washington, D.C.

administrative problems, the company stopped paying premiums to cocoa farmers for some years leading to farmer agitations in the 1930/31 cropping season and another in 1937 which lasted for about eight months[13]. This caught the attention of the British colonial government which set up the COCOBOD to regulate the cocoa marketing and pricing of cocoa in Ghana.

The cocoa marketing system in Ghana is currently operated by four main groups of actors. These actors are (1) the producers (cocoa farmers), (2) the Licensed Buying Companies (LBCs), (3) cocoa haulers and transport companies, and (4) the regulator-cum-exporter, COCOBOD. Figure 2 shows actions of the various actors in the cocoa marketing system in Ghana. These actors have specific roles with regards to the production and marketing of cocoa. The farmers produce the cocoa; LBCs buy the cocoa beans from the various farms and the COCOBOD oversees to the pricing and international marketing of the cocoa beans and transport companies bring the dried cocoa beans to designated centres. COCOBOD has several subsidiaries which oversee specific aspects of the marketing process. These subsidiaries are the Produce Buying Company (PBC), Quality Control Division (QCC) and the Cocoa Marketing Company (CMC).

Figure 2: Various actors in Ghana's cocoa marketing system.

From 1947 to 1992, Ghana practiced the full marketing board system where the COCOBOD and its subsidiary companies regulated the entire marketing process from the farm gate to the international buyer. The PBC directly purchased the cocoa beans from the various farms and/or cooperatives; the QCC was stationed at the collection points (in villages, depots, in the ports) to check the quality of the beans to ensure they meet international standards at all stages until export; and the CMC was in charge of exporting the beans to overseas destinations.

When the new system of cocoa marketing was introduced in Ghana in 1992, the monopoly of the PBC as the

[13] Kotey, R.A., Okali, C. and Rourke, B.E. (editors; 1974). Economics of Cocoa Production and Marketing, Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana, 547 pp.

sole buyer of cocoa from farmers was broken; a number of private companies were licensed by the COCOBOD to buy cocoa from farmers. Currently there are about 35 private companies licensed to buy cocoa from farmers in addition to the state-owned PBC. Because many private companies prefer to operate in the major cocoa-producing areas which are easily accessible by roads, many villages are without buyers except for PBC. This factor has been responsible for this company to maintain its relatively large share of internal cocoa marketing despite the liberalization ushered in 1992. In 2000, the PBC was partially privatized when government sold some of its shares to the public[14]. PBC has remained a government-controlled company; its representatives are important in the determination of local prices paid to farmers and the evacuation of cocoa beans to ports for exports.

Private companies buy cocoa from farmers on behalf of COCOBOD for a fee or commission determined by the Producer Price Review Committee (PPRC), at the beginning of each production year normally during the first week of October. Due to the fixed nature of local producer prices, competition among buying companies is generally limited though some non-price competition does exist. This non-price competition includes incentives given by some companies to cocoa producer associations and the development of modern amenities such as schools and clinics in some cocoa villages.

Cocoa farmers transport their produce to the closest and often most reliable LBC in terms of payments and avoidance of cheating by the purchasing clerks of LBCs. There are thousands of purchasing points in the six producing regions with at least one purchasing point in each cocoa village or major town near a cocoa village. The work of LBCs is regulated by the COCOBOD; their operations are subject to annual reviews leading to the renewal or suspension of their licenses. Before an LBC is licensed to purchase cocoa beans, it must comply with a set of procedures and guidelines. Further, the company must pass an interview conducted by the Cocoa Sector Marketing Committee (COSMARC), a committee of the COCOBOD[15].

The required criteria for the approval of an LBC include organization and structure of the company, financial strength, and access to the tools of trade, warehousing facilities and availability/ access to vehicles or transport and the ability the company to buy at least 2,000 tonnes of cocoa in the first cropping year. In addition to all these specifications that must be met, the company must also subject the location of its warehouses to be vetted and its condition approved by QCC of the COCOBOD. Applications for licenses are reviewed by the COSMARC. COSMARC is made up of representatives from the COCOBOD, the Bank of Ghana, Ministry of Food and Agriculture, the University of Ghana, and farmers[16].

In areas where lower quantities of cocoa are harvested, the PBC is likely to be the only buying company in operation. LBCs buy cocoa beans through Purchasing Clerks at the community and village levels, as well as through farmer cooperatives. These purchasing

[14] Vigneri and Santos, 2009
[15] Ghana COCOBOD, undated
[16] Kolavalli and Vigneri, 2011

clerks receive a commission fee which is a percentage of the price of a bag of cocoa. All cocoa beans that are bought by purchasing clerks are inspected by the QCC. Inspected cocoa beans are graded and sealed by the QCC and the process of inspection goes on throughout the cocoa marketing process until the product is exported. From the village level, LBCs transport the cocoa beans to takeover centres where they receive a receipt indicating the amount of cocoa beans they handed over to the CMC. With the receipt and other invoices, the LBC receives a reimbursement of costs incurred in the process of buying and transporting cocoa beans from the buying centres to the takeover centres.

2.4 Cocoa Price Determination in Ghana

Ghana usually sells her cocoa based on the forward contract, which is an agreement arrived at between the international buyer and the COCOBOD, based on expected prices in the world cocoa market. Ghana also uses the spot sales method where cocoa is sold for the prices prevailing at the time of the sale. This system of selling cocoa tends to protect Ghana from price volatility as the buyers and sellers are forced to accept the price agreed upon in the contract. Commonly, COCOBOD sells about 70 percent of the expected total cocoa output for the production year through forward contract around August and September before the start of the major season in October. The remaining 30 percent is sold at spot prices to various buyers in both Ghana and overseas markets. The Ghanaian buyers include the local cocoa processing companies.

The actual local cocoa prices paid to farmers in Ghana depend on prices bid for by COCOBOD. The determination of local cocoa producer prices is based on a margin that is set and reviewed yearly by the PPRC. The determined price margins fluctuated over the period from 1993 to 2017. The PPRC is made up of individuals representing government, the COCOBOD, farmers' representatives, LBCs, cocoa transport operators, Bank of Ghana, and University of Ghana. The size of the PPRC is between 15 to 20, of which about three are farmers' representatives. The PPRC meets regularly on a monthly or bi-monthly basis as required, from January to September of each year. The COCOBOD announces the decision of the PPRC on a new price during the first week of October. This price must be approved by the designated Minister for the cocoa sector.

Based on data provided by Kotey *et al.* (1974), within the period 1920-1946, cocoa farmers in Ghana on average received 60.2 percent of the gross fob price. This went down to about 48.7 percent during the years 1947 to 1956. From 1957 to 1965, the average share of the producer price to the gross fob price was 60.3 percent. This share dropped to 39.6 percent over the 1966 to 1971 period. The share of the net fob price paid to farmers over the period from 1993 to 2017 varied from 70 percent to 77 percent largely as a result of the reduction of government taxes on cocoa beans.

The costs of the inputs distribution scheme related to cocoa mass spraying and fertilizers distribution are directly borne by farmers, and other industry

stakeholders, through the industry cost deduction, before the announcement of the fixed local producer prices for the production year. Hence, over the 1993 to 2017 period, the farmer share of the gross fob price was lower than their shares of the net fob prices given that the so-called industry costs are around six percent to 10% of the gross fob price. The estimated share of the gross fob price earned by cocoa farmers varied from 63.6 percent to 72.6 percent over this period.

The PPRC conducts local producer price reviews, based on world market prices as well as the expected amount of annual cocoa crop production. In order to arrive at the gross and net fob cocoa prices, the expected amount of cocoa to be produced (in tonnes) is multiplied by the average expected gross fob price using the given Bank of Ghana cedi-dollar exchange rate. On arriving at the gross fob price, the PPRC then subtracts industry costs, the COCOBOD (disease and pests control, jute sacks and related items, scholarship, farmers' pension scheme and specific projects approved by the COCOBOD) to reach the net gross revenues to be distributed among the various stakeholders in the cocoa industry.

2.5 Transparency in the Setting of Local Producer Prices in Ghana

Since 1992/1993 production year, local cocoa producer prices in Ghana have been determined based on the technical work of the PPRC. The PPRC was established with the objective of ensuring equitable distribution of the total cocoa revenues among players in the industry. As indicated earlier, the PPRC includes representatives from farmers' groups and other stakeholders such as licensed buyers and transport companies involved in the local movement of cocoa.

For each production year, items included in the determination of the internal producer price of cocoa and fees for various stakeholders in the cocoa industry are (1) producer price (2) margin for the licensed buying companies (3) fees for local transport companies hauling cocoa from buying centres to warehouses of COCOBOD, (4) the Cocoa Marketing Company's (CMC) internal marketing cost, disinfestation/ grading/sealing cost, crop finance cost, scale inspection and phyto-sanitary cost, export duty/cocoa roads, farmers' housing scheme, rehabilitation cost (cocoa and coffee) and stabilisation fund.

While farmers' representatives are part of the PPRC that sets the annual producer price which is announced during the first week of October each year since 1993, the actual price setting mechanism is much more influenced by the officials of COCOBOD, the Ministry of Finance and the Bank of Ghana. This situation reflects the situation of millions of Ghanaian cocoa farmers who are largely unorganized and have little bargaining power compared to a powerful regulator, the COCOBOD. The power of the COCOBOD is also linked to the role of cocoa export revenues being channelled into the foreign reserves of the country in maintaining the exchange rate and the inflation targeting policy of the Bank of Ghana.

2.6 Actual and Real Producer Prices Received by Cocoa Farmers

The actual and nominal prices received by cocoa farmers over the last 12-year period from 2006 to 2017 are summarised in Table 1 and illustrated in Figure 3. In 2017, real cocoa prices declined by about four percent. There were substantial increases in real cocoa producer prices in 2009, 2010 and 2015. However, there were also substantial declines in real cocoa producer prices recorded in 2007, 2012 and 2013. Overall, the growth of real cocoa producer prices has fluctuated while real per capita GDP of Ghana has increased steadily over the 2006 to 2017 period. However, the average growth rate of real cocoa producer price was 5.62 percent compared to the average growth of per capita GDP of 3.89 percent. Yet the variability of the growth rates as measured by the coefficient of variation (CV) reveals an important finding (refer to Table 1). The growth of real cocoa producer prices is much more highly variable (314% coefficient of variation) than that of growth of real per capita GDP (70% coefficient of variation). This suggests that the improvement of the welfare of cocoa farmers would have to take into account the need to establish bigger and more extensive stabilization funds for cocoa farmers that could establish steadier producer prices for cocoa farmers.

Figure 3: Illustration of Nominal and Real Producer Prices of Cocoa, 2006 to 2017.

Source: Derived from Data from Ghana Statistical Service and Ghana COCOBOD

Table 1: Nominal and Real Producer Prices of Cocoa from 2006 to 2017 in Ghana Cedis

Calendar Year	Nominal Cocoa Price Per Tonne in October (Ghana Cedis)	Ghana Statistical Service Annual GDP Deflator	Real Cocoa Producer Price Per Tonne	Growth of Real Cocoa Producer Price (%)	Real GDP Per Person in Ghana Cedis	Growth of Per Capita Real GDP (%)
2005	900	88.686	-		813.84	
2006	915	100.000	903.75		843.49	3.52
2007	950	118.629	778.69	-13.84	857.11	1.59
2008	1632	141.659	790.98	1.58	911.04	5.92
2009	2400	163.852	1113.20	40.74	930.16	2.06
2010	3200	191.038	1360.99	22.26	977.38	4.83
2011	3280	217.624	1479.62	8.72	1085.47	9.96
2012	3392	250.716	1319.42	-10.83	1155.27	6.04
2013	3392	289.779	1170.55	-11.28	1207.30	4.31
2014	5520	338.115	1160.55	-0.85	1222.55	1.25
2015	6800	393.463	1484.25	27.89	1236.22	1.11
2016	7600	464.559	1510.15	1.74	1245.62	0.76
2017	7600	525.292	1445.90	-4.25	1316.11	5.36
Average				5.62		3.89
Coefficient of Variation (Percent)				314.10		70.24

Source: Derived from Data from Ghana Statistical Service (2018) and COCOBOD

2.7 Possibility of Total Cocoa Price Liberalization

Some scholars have proposed total liberalization of cocoa pricing to resemble the free marketing era of the 1920 to 1946 period in Ghana. The effect of total liberalization on the generation of poorer quality of cocoa produced for international markets is noted by Tollens and Gilbert (2003). Liberalization of the marketing of cocoa is often a favourite of Ghanaian politicians while in opposition; however the fact that nothing has changed with

the cocoa marketing system in Ghana since 1993 probably suggests that the current system is working though not perfectly. It is generally well established that the drastic decline of the Nigerian cocoa industry was partly due to the reduction of the role of the government in ensuring fixed and reasonable prices to cocoa farmers to cushion them from world cocoa price volatility.

Total price liberalization for cocoa often fails to take into account the real political economy power variables in the cocoa production and marketing system in Ghana. It is not clear whether the cocoa production sector, largely underpinned by a huge migrant workforce with limited land tenure rights, could sustain itself in a system of a free uncontrolled market system. The history of internal cocoa marketing and the agitation of cocoa farmers in Ghana in the 1930s against British companies buying cocoa beans from Ghanaian producers are useful in approaching total price liberalization in Ghana with some caution. Further, total cocoa price liberalization will expose cocoa farmers in Ghana to the full set of vagaries and instabilities in the international markets.

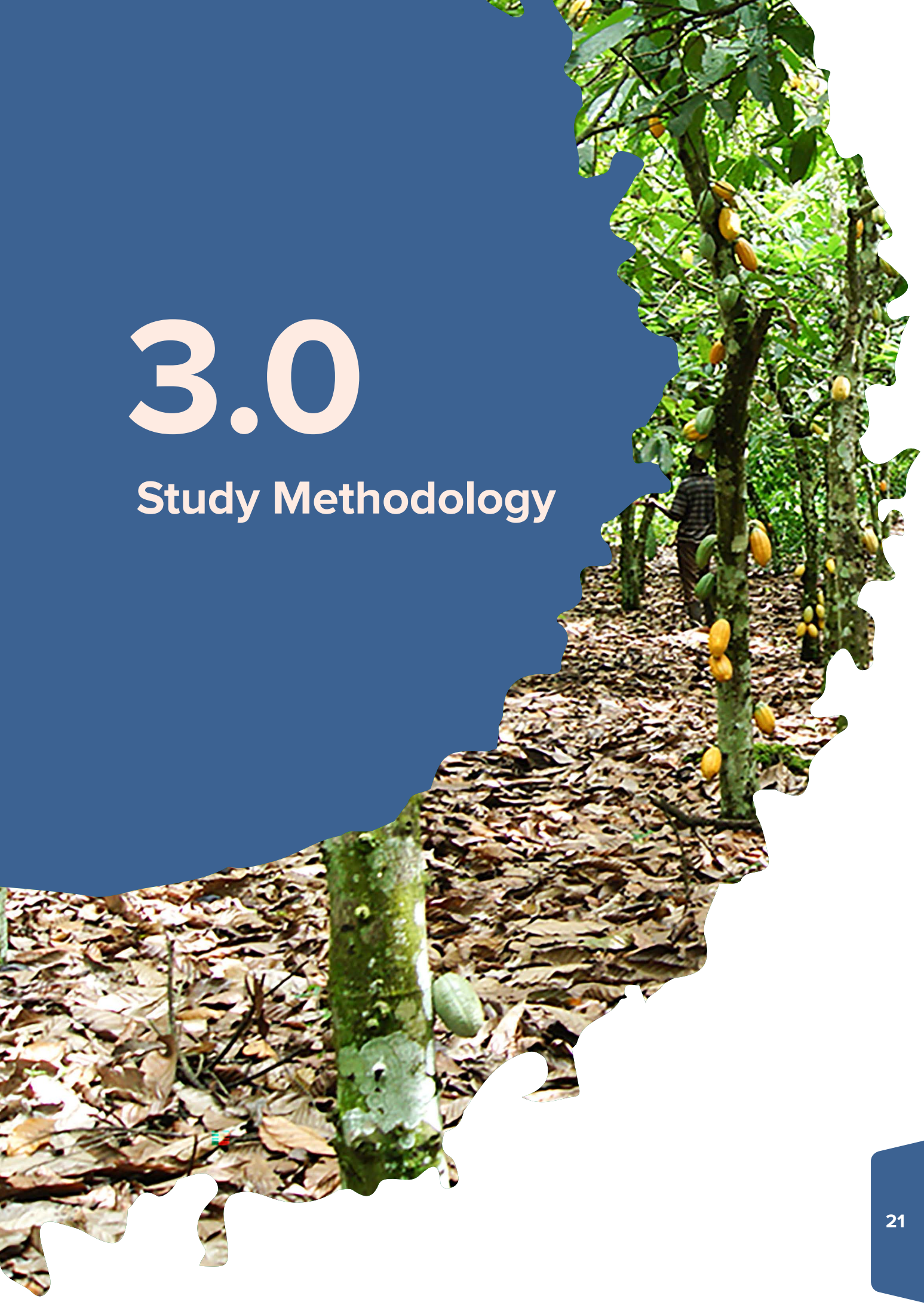
2.8 Cocoa Stabilization Fund in Ghana

The concept of a stabilization fund for cocoa to cushion farmers during periods of very low international cocoa prices has been tried by various countries including Ghana, La Cote d'Ivoire and Papua New Guinea. Cocoa stabilization funds can be very useful when international cocoa prices remain low for a relatively short period. Political interferences often mean that monies from stabilization funds are not built up adequately to shore up local prices during worst years of international prices. McIntyire and Varangis (2001) indicated that although the stabilization fund in La Cote d'Ivoire was established and funds were stored over the years, it was observed that, during periods of low world prices, it was not reimbursed with monies from the stabilization fund thus, affecting farmers' incomes. With all stabilization funds, a big problem arises when international commodity prices remain depressed over a long period of time such that stabilization funds simply ran out of money. This happened to the cocoa and coffee stabilization funds in Papua New Guinea in the early 1990s.

In the Ghanaian context, given the persistent instability of world commodity prices especially that of cocoa, Aidam and Anaman (2014) argued that larger stabilisation funds are required to cushion farmers against world price instability. The setting up of larger stabilisation funds will require some sacrifices in the short-term period from the industry to ensure long-term survival and stability. This sacrifice may include the reduction of the cost of the industry input distribution scheme and the reduction of the overall operation cost of the COCOBOD.

3.0

Study Methodology



3.1 Methodological Components of the Study

A desktop study was one of the two major components of the research project and this was supported with data and information gathered from active industry players such as the COCOBOD, cocoa farmers' associations, the Ministry of Finance and others. The objectives set out require interactions with various stakeholders in the cocoa industry from smallholder farmers to buying agencies and to the industry regulator and exporter, the COCOBOD. As such the bigger component of the study involved a farmer-survey to address the questions posed through direct personal interviews with randomly selected farmers in typical cocoa villages in the Agona East District of the Central Region.

3.2 Brief Description of the Survey Area

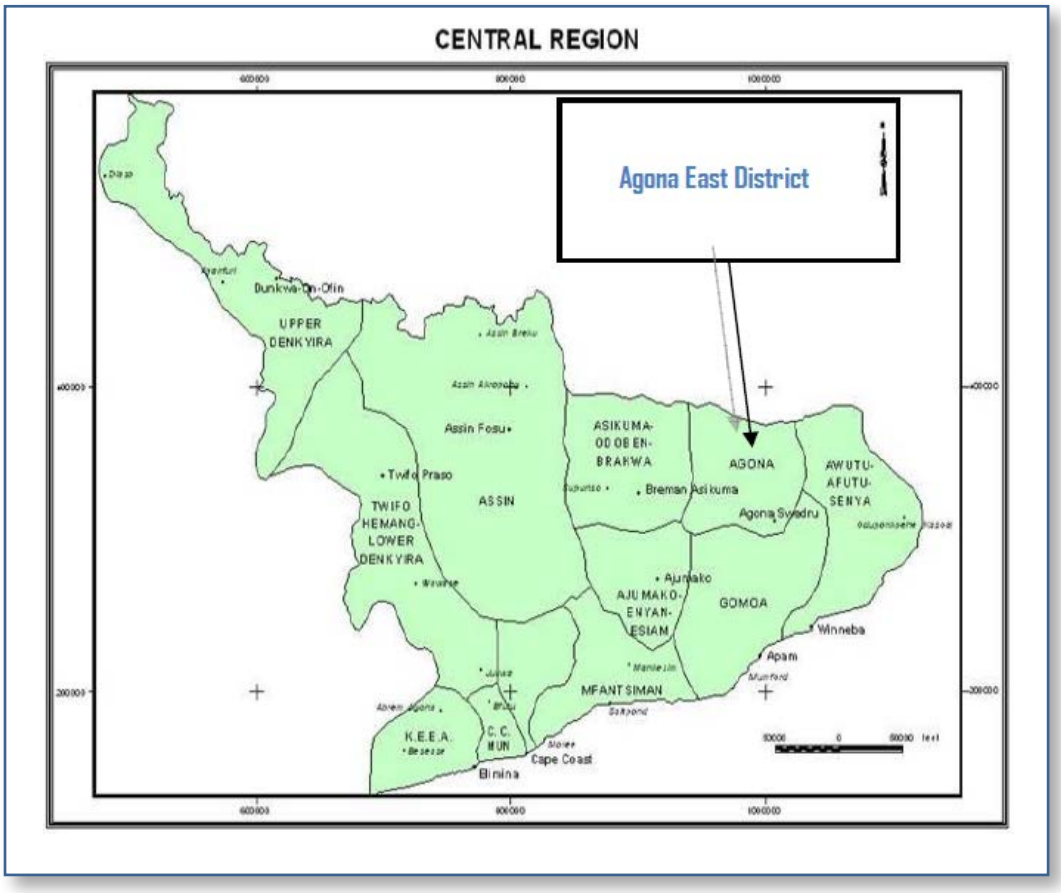
The Agona East District is an intensive cocoa producing area near the border with the Eastern Region. Figures 4a and 4b show the location of Agona East District in Ghana and in the Central Region of Ghana. The Agona Cocoa District is one of the 68 designated cocoa producing districts by the COCOBOD. It is only one of seven such cocoa districts in the Central Region. The Central Regional Headquarters of the COCOBOD is in the Agona District indicating the historical importance of Agona as a major producer of cocoa in Ghana. According to COCOBOD, the Agona District produced around 10,000 tonnes of cocoa since 2013/2014[17]. In terms of cocoa trees planted per hectare, the Agona District is one of the most intensively producing areas in Ghana.

The Agona District was also one of the first areas in Ghana outside Akuapem-Mampong that cocoa seedlings from the farm of Tetteh Quarshie were planted. Tetteh Quarshie smuggled cocoa seeds from Fernando Po and planted at his farm at Akuapem-Mampong in the late 19th Century heralding a new era in the mass scale production of cocoa in Ghana. These new seedlings were planted at Agona Kwanyako through the work of Basel Missionaries stationed in the Agona Area before their spread to other areas of Ghana in the Central, Eastern and Western Regions through the agricultural extension activities of the Basel Missionaries.

[17] Ghana COCOBOD District Cocoa Production figures from 2009/2010 to 2016/2017 sourced from the National Planning

Figure 4a: The Location of Agona East District in Ghana

Figure 4b: The Location of Agona East District in the Central Region of Ghana



3.3 Description of the Survey Administration Procedures

The field work was undertaken in the Agona East district of the Central Region over a three-week period from 16 July to 3 August 2018. This field work included both a pilot survey component (lasting two days), and the major survey component (lasting 14 days), and various interviews with other persons knowledgeable about the industry in the district. The study involved a survey of 90 randomly-selected farmers in three cocoa villages of the Agona East District. The three cocoa villages are Seth Okai, Ninta and Kwasi Paintsil. These villages were purposively selected given that virtually every house or household has a person actively working in the cocoa industry. These villages are also at the border of the Central and Eastern Regions and had characteristics of cocoa production industry of both the Central and Eastern Regions, the two oldest cocoa producing regions in Ghana.

Key cocoa industry officials in the district of the study were interviewed including the Omanhene, the Paramount Chief of the Agona Nsaba Traditional Area, and three sub-chiefs of the Agona Nsaba Traditional Area. Focus-group discussions were held at Agona Ninta and Seth Okai hosted by the Chief of the two villages involving a cross-section of 10 people in the villages including representatives of the local buying agencies and farmers. Detailed in-depth personal and confidential interviews were conducted with one chief cocoa farmer, two cocoa purchasing clerks at the sites of their farm-based homes and one Agona East District Assembly representative for the Seth Okai and Kwasi Paintsil Electoral Area.

The farmer survey was based on private personal and confidential interviews; the survey was conducted over a period of two weeks from 20 July to 3 August 2018 at the three villages. Several interviews of farmers were conducted at the farm sites of these farmers. The optimal sample size of 81 was established based on statistical theory using the concepts of binomial and normal probability distributions[18][19]. An oversampling of 19 persons was done to increase the optimal sample size 100 (81+19). The assumptions were that each residential house contained at least one cocoa farmer; 30% of cocoa farmers were women; thus male farmers constituted 70% (p=0.30 and q=0.70). The assumption that about 30% of cocoa farmers in the villages were female was given to the consultant by the chiefs of these villages.

Appendix 4 provides more details on the derivation of the optimal sample size used for the survey. Based on the information from the chiefs of the villages, there were approximately 300 houses in the three villages: 120 houses at Seth Okai, 100 houses at Ninta and 80 houses at Kwasi Paintsil and its related cluster villages of Broferase, Sekwan and Kofi Addo. Overall, 100 houses were selected randomly, 40 from Seth Okai, 33 from Ninta and 27 from the Kwasi Paintsil cluster of villages. Ninety

[18] de Vaus, 2014
[19] Anaman, 2014

(90) farmers were actually interviewed with 35 coming from Seth Okai, 30 from Ninta and 25 farmers from Kwasi Paintsil and its adjacent cluster of villages. The interviewed farmers were based on the randomly-selected houses in each village. About ten out of the 100 selected farmers could not be interviewed due to their busy schedules.

The survey questionnaire used to interview the 90 randomly-selected cocoa farmers was composed of four sections. The first section was concerned with general information about cocoa production and other livelihood activities. This section asked various questions about operations of cocoa farming, management of cocoa farms, state of conditions of cocoa trees and farms and activities related to non-cocoa agricultural activities undertaken by the farmer. The second section dealt with a series of questions related to farmers' perceptions about cocoa farm gate pricing processes and determination. In line with the objective of the study, this section explored farmers' perceptions about the importance of various actors in the determination and setting of cocoa farmgate or producer prices in Ghana.

The third section asked various questions related to the changes in the economic welfare of cocoa prices under currently unchanged nominal cocoa producer prices. Specific questions were also asked on methods employed by cocoa farmers to sustain their livelihoods including undertaking non-farm employment opportunities. This section also requested cocoa farmers to indicate the major challenges facing their cocoa production operations. The fourth and final part of the questionnaire was devoted to questions dealing with socio-economic characteristics of cocoa farmers and included questions related to incomes of farmers in cocoa production, and non-cocoa agricultural and forestry enterprises and incomes from off-farm enterprises. The survey questionnaire is available from the authors on request.

3.4 Analysis of the Survey Data

Simple descriptive statistical analysis was undertaken with the survey data through the compilation of the mean and standard deviations of key socioeconomic characteristics of the respondents to provide basic profile information about the surveyed cocoa farmers and their farm operations and non-cocoa farm activities. Simple statistical analysis and qualitative reasoning were used to analyse the survey data to address the objective related to farmer perceptions of the processes involved in the determination and setting of the annual cocoa producer prices. This approach was used to assess the perceptions of cocoa farmers with regards to the impact of the unchanged nominal cocoa producer prices on their economic welfare.

The impact of the COCOBOD's mass spraying and fertilizers distribution programmes on the economic welfare of cocoa farmers was analysed in two ways. First, a logistic regression analysis was used to identify factors influencing the likelihood of participation in the two programmes related to political economy group variables such as religious affiliation and sex. Second, the

actual impact of the two programmes on total gross cocoa incomes was analysed using a production function analysis. The production function methodology analysis is discussed in Section 3.5. A major component of the study was the analysis of income diversification of cocoa farmers as a risk management tool for assuring stable household incomes especially given the current situation of unchanged nominal cocoa producer prices. The methodology underlying the analysis of income diversification of cocoa farmers is discussed in Section 3.6.

3.5 Methodology Used for the Production Function Analysis of Cocoa Production to Reveal the Impact of Participation in COCOBOD's Mass Spraying and Fertilizers Distribution Programmes on the Gross Cocoa Incomes of Farmers

A multiple regression analysis was undertaken to establish the factors influencing the level of gross cocoa income of the respondents based on the model developed by Anaman (1977) and Anaman (1988). An important issue that necessitated the use of production function analysis was the need to ascertain whether participation in the COCOBOD's mass cocoa spraying exercise and the fertilizer inputs distribution programme led to statistically significant increase in cocoa yields and gross incomes. The model of gross income is based on the production function of cocoa established as of output being influenced by four factors of production - land, labour, capital, and management. The model used is denoted as follows:

$$\mathbf{LOGCOCOAINCOME = B_0 + B_1\ LOGTOTALFARMSIZE + B_2\ LOGTOTALLABOUREMPLOYED + B_3\ TREEAGE + B_4\ TREEAGESQUARED + B_5\ PCOCOASPRAYINGPROG + B_6\ USEOWNSPRAYING + B_7\ PFERTILIZERSPROG + B_8\ USEOWNFERTILIZERS + B_9\ LOGCOCOAFARMINGEXPERIENCE + B_{10}\ MANAGEMENT + U}$$

where LOGCOCOAINCOME is the natural logarithm of the total gross income derived from cocoa by respondent in the 2017/2018 production year;

LOGTOTALFARMSIZE is the natural logarithm of the total area of land planted with cocoa by respondent in the 2017/2018 production year in poles;

LOGTOTALLABOUREMPLOYED is the natural logarithm of the total number of workers including family members employed to work on the cocoa farms by respondent in the 2017/2018 production year;

TREEAGE is the average of the cocoa trees being managed by respondent in

the 2017/2018 production year in years; the values of 1, 2, 3 and 4 denoted the average ages of trees less than 10 years, 10 to 19 years, 20 to 29 years, and 30 years or greater respectively;

TREEAGESQUARED is the square of TREEAGE; this variable allows for a curvilinear relationship between output of cocoa farm and the age of trees to be investigated;

PCOCOASPRAYINGPROG is a dummy variable taking a value of 1 if the farmer participated in the COCOBOD's mass spraying programme during the 2017/2018 production year and zero if otherwise;

USEOWNSPRAYING is a dummy variable taking a value of 1 if the farmer sprayed his/her cocoa farms by directly purchasing materials from the market during the 2017/2018 production year and zero if otherwise;

PFERTILIZERSPROG is a dummy variable taking a value of 1 if the farmer participated in the COCOBOD's fertilizers input distribution programme during the 2017/2018 production year and zero if otherwise;

USEOWNFERTILIZERS is a dummy variable taking a value of 1 if the farmer applied fertilizers on his/her cocoa farms by directly purchasing materials from the market during the 2017/2018 production year and zero if otherwise;

LOGCOCOAFARMINGEXPERIENCE is the natural logarithm of the number of years of cocoa farming experience acquired by the respondent;

MANAGEMENT is a dummy variable with 1 for farmers who directly owned and managed their own cocoa farms; 0 for farmers who did not manage their cocoa farms and assigned them to caretakers and others to manage during the 2017/2018 production year; and

U is the equation error term initially assumed to have zero mean and constant variance.

3.6 Methodology Used for the Analysis of Income Diversification of Cocoa Farmers

Diversification of income-generating activities to improve income stability and resilience of farmers is widely practised by farmers and rural people around the world. There is extensive literature on income-diversification activities by farmers (see, for example, the recent review of the literature in this area reported by Minot *et al*., 2006; Amurtiya *et al*., 2016 and Daud *et al.,* 2018). Given the unchanged cocoa producer prices over the last three years in Ghana (since September 2016), and declining real incomes of cocoa farmers, economic diversification by cocoa farmers was considered an important objective of this study. Utilising information from the randomly-selected cocoa farmers, an analysis was conducted to establish the extent of income diversification and factors influencing the degree of income diversification by cocoa farmers in the Agona East District. This section of this report is devoted to the discussion of income diversification of cocoa farmers obtained from the survey component.

Following the work of Daud *et al.* (2018), the approach used in this study focussed on three measures of income diversification. These are (1) the number of income-generating sources (NIGS) pursued by cocoa farmers, (2) the share of off-farm income in total gross income of the cocoa farmer (OFIS), and (3) a diversification index related to the Herfindahl Concentration index (HCI), sometimes called the Simpson

diversification index (see for example, Minot *et al*., 2006). The HCI measures the overall concentration of various income-generating activities of the cocoa farmer and includes the size of off-farm income as a proportion of total gross income.

The HCI is derived by the sum of squares of income shares of each income source. Three income sources were used in this study and these were (1) cocoa, (2) non-cocoa farm activities, and (3) off-farm income sources. The Simpson diversification index (SDI) is 1-HCI and depicts the spread of various income-based activities of the cocoa farmer with respect to their importance in the farmer's overall income portfolio. The SDI is derived as follows:

SDI = 1 – ∑ Pi^2

where:

SDI = Simpson diversification index.

i = number of income sources indexed by I which is three in our study

Pi = The share of total gross income generated from income source i.

The Herfindal concentration index, HCI, is denoted by ∑Pi^2.

The three income diversification measures, NIGS, OFIS and SDI were regressed on a number of socioeconomic variables (independent variables) to ascertain the various factors that influenced each measure of income diversification. The independent variables used for all these three diversification models are as follows:

EDUCATION is the number of years of formal schooling education acquired by respondent;

SEX is a dummy variable for sex of respondent with 1 denoting female and zero for male;

CURRENTLYMARRIED is a dummy variable for the current marital status of the respondent with 1 denoting that the respondent is currently married and zero denoting otherwise;

AGE is the age of the respondent in years;

MANAGEMENT is a dummy variable with 1 for farmers who directly owned and managed their own cocoa farms; 0 for farmers who did not manage their cocoa farms and assigned them to caretakers and others to manage during the 2017/2018 production year; and

HOUSEHOLDSIZE is the number of persons living in one household.

For the regression model using NIGS, this was essentially a count data model with the number of income-generating sources varying from one to three. Hence, the proper estimation procedure is through the Poisson regression model. We assume that Y, the number of income-generating activities of a cocoa farm (NIGS) is a Poisson random variable with parameter , being both its mean and variance. The probability density function of the Poisson function is denoted in Equation 3.1 below (where exp denotes an exponential function)

$P(Y=k) = exp^{-\lambda} \lambda^k/k!$ **EQUATION 3.1**

The Poisson regression function assumes that is a function of the matrix of the independent variables (X) defined earlier. This also implies that the conditional mean of Y is an exponential function of X_i where are the parameters as shown below in Equation 3.2.

$\lambda_i = exp (X_i\beta)$ **EQUATION 3.2**

The Poisson regression model was estimated by the use of maximum likelihood method procedures available through the Time Series Processor

software (Hall and Cummins, 2009). The theoretical foundations of the Poisson regression model are described in details by Gujarati (2003, pp. 616-619).

The empirical estimation of the Poisson regression model based on Equation 3.2 for $_i$ is denoted in Equation 3.3.

$$\lambda_i = \exp(\beta_0 + \beta_1 \text{EDUCATION} + \beta_2 \text{SEX} + \beta_3 \text{CURRENTLYMARRIED} + \beta_4 \text{AGE} + \beta_5 \text{MANAGEMENT} + \beta_6 \text{HOUSEHOLDSIZE})$$

The regression models involving the second and third diversification measures, OFIS and SDI were estimated using the Tobit regression procedure given the relatively large number of zeros for each of the two dependent variables. This relatively large number of zeros is due to situations where some cocoa farmers do not have any off-farm income generating activities. The use of the standard ordinary least squares regression model is inappropriate as the error term would not be normally distributed. The Tobit model is expressed in Equation 3.4 below:

$$Y^* = (X_i\beta) + U \qquad \textbf{EQUATION 3.4}$$

where Y* is Tobit latent value for the dependent variable, (for both OFIS and SDI), and U is the error term. The Tobit regression functions were also estimated using maximum likelihood procedures using the Time Series Processor software (Hall and Cummins, 2009). The Tobit model is described in details by Gujarati (2003, pp. 616-619).

4.0
Discussion Of Results

4.1 Summary of the Socio-economic Characteristics of Respondents

Several key socio-economic characteristics of the 90 respondents are summarised in Table 2 based on frequency analysis. These characteristics provide a brief background of the type of cocoa farmers that were interviewed. About 32 percent of the respondents were females; this proportion almost matched the assumed proportion of females used to determine the optimal sample size of 33.3% (or one in three farmers). Exactly 60% of the respondents were aged between 30 and 59 years. The proportion of respondents below 30 years was 1.1% while those aged 80 years and above constituted 3.3% of the respondents. This result suggested that the age structure was more of a middle-aged cocoa farming community. Four out every five respondents (80%) were married. About seven out of every 10 (70.8%) respondents completed at least one year of schooling with 46% completing junior secondary school and only 7.9% having senior high school or higher qualifications.

Based on religious preferences, 81.8 percent of respondents were Christians. Muslims accounted for 13% of the respondents with adherent of traditional religions comprising the remaining 5.2 percent of the sample. Despite the relatively small size of followers of traditional African religions, the reality in the Agona East District, similar to many parts of Ghana, is that most of the respondents could be described as followers of mixed religions of Christianity and traditional African religions given their observed daily practices. Ethnically, the majority of the people are Fantes. The indigenous Agona people comprise of about 11.7 percent of the respondents. Despite the predominance of Fantes in the cocoa villages, the land cultivation and cocoa production systems largely remain in the hands of the indigenous Agona people who have traditionally co-existed peacefully with many other people from different ethnic groups[20].

Table 3 provides summary socio-economic characteristics of the respondents in average forms for the whole group of respondents, male cocoa farmers, and female cocoa farmers respectively. For the whole group, the mean age of the respondents was 54.6 years; the age ranged from 29 to 82 years. The average number of years of formal schooling undertaken by respondents was 6.0; this figure meant that on average each respondent completed primary school. The average number of children (alive) was 6.3 as compared to an average household size of 6.5. The average household size of 6.5 was higher than the average size of 3.8 reported for rural Agona East in the 2010 District Census report published by the Ghana Statistical Service.

With respect to the two sex groups, female cocoa farmers were far less educated on average than male cocoa farmers (3.3 years of formal educational schooling for females versus 7.2 years

[20] refer to the Agona East District Census report published by the Ghana Statistical Service in 2014

for males). Female cocoa farmers on average had slightly higher numbers of years of experience in cocoa production than male cocoa farmers. The total size of farms managed by male respondents averaged 8.0 poles which was almost twice the size of cocoa farms managed by the female respondents (4.3 poles). Not surprisingly, the average income from cocoa production for male respondents was much higher than the average income for females.

Political economy theories suggest that dominant groups or structures dominate and/or shape considerably the economic outcomes of individuals as actually observed within a community or the nation state (Sackrey *et al*., 2016; Hayami, 2009; Balaam and Veseth, 2008). The summary socio-economic characteristics of cocoa farmers surveyed include those of gender, religious affiliation, ethnic origins and migrant status. These socio-economic structures or group identification markers are used in analysis in this paper to determine access of cocoa farmers to the inputs distribution programme of the Ghana COCOBOD, such as the mass cocoa spraying activity. This programme is financed by various cocoa industry stakeholders, including all cocoa farmers through a percentage levy on each bag of dried cocoa beans, but the programme does not reach all cocoa farmers.

Further analysis is also undertaken on the degree of difficulty of different groups of cocoa farmers in accessing selected inputs from markets. Political economy theories also suggest that the analysis of the welfare of cocoa farmers can also explore welfare status and impacts of societal programmes and interventions, not only on all farmers as a whole, which just provide average-type information, but also on specific groups of farmers, with regards to both incomes and access to inputs used to obtain the incomes. This analysis directly addresses the objective of this study related to the welfare of cocoa farmers as the *actual net price* received by cocoa farmers for their dried beans depends on the quality of the inputs used on their cocoa farms. The quality of cocoa beans is often due to the degree of difficulty of farmers getting inputs such as drying mats and bags and sacks from markets and other sources.

Table 2: Summary of Socio-Economic Characteristics of Survey Respondents Based on Frequency Analysis Using Percentages for Specified Groups

Socio-Economic Characteristic	Percentage
Sex	
Male	67.8
Female	32.2
Age Group	
Below 30 years	1.1
Between 30 and 39 years	10.0
Between 40 and 49 years	25.6

Between 50 and 59 years	24.4
Between 60 and 69 years	24.4
Between 70 and 79 years	11.1
80 years and above	3.3
Marital Status	
Currently Married	80.0
Not Currently Married	20.0
Level of Formal Educational Attainment	
None/No Schooling	29.2
Six years of schooling or less (Primary School)	16.9
Ten years of schooling or less (JSS or Middle School)	46.1
At least twelve years of schooling (SSS and above)	7.9
Religious Affiliation	
Christian	81.1
Islam	14.4
Traditional	4.4
Ethnic origin	
Agona	11.7
Ewe	2.6
Fante	63.6
Ga/Ga Adangbe	5.2
Groups Originating from Northern Ghana	13.0

Table 3: Summary of Socio-Economic Characteristics of Survey Respondents Based on Average and Range Figures for Whole Group, Men Farmers and Women Farmers

Item	Mean Whole Group	Range Whole Group	Mean Men Farmers	Range Men Farmers	Mean Women Farmers	Range Women Farmers
Age (years)	54.8	29 to 85	53.6	29 to 85	57.3	30 to 75
Formal Educational Level Attained (Years of Schooling)	6.0	0 to 15	7.2	0 to 15	3.3	0 to 15
Number of Children Born Who are Alive	6.4	1 to 15	6.9	2 to 15	5.7	1 to 12
Number of Children Born Who are Dead	0.64	0 to 6	0.66	0 to 6	0.62	0 to 4
Household Size	6.7	2 to 15	6.8	2 to 15	6.3	2 to 14

Cocoa Farming Experience (years)	19.8	3 to 58	19.3	3 to 58	20.9	4 to 55
Total Size of All Cocoa Farms Owned and/or Managed (poles)	6.8	1.0 to 25.0	8.0	1.0 to 25.0	4.3	1.5 to 11.0
Total Income From Cocoa Alone During the 2017/2018 Production Year (Ghana Cedis)		zero to 27,075		22.62 to 27,075	1,387.39	zero to

4.2 Motivations for Undertaking Cocoa Farming

The three most important reasons for undertaking cocoa farming in order of importance were earning more money, to prepare adequately for retirement and financial independence. Career option, job security and the maintenance of family interests and work balance were also considered very important reasons for undertaking cocoa farming. The least important reasons were for hobby purposes and supplementation of other sources of income; these two reasons were ranked very lowly on the 1 to 5 Likert scale with average scores of 1.60 and 1.44 respectively. Thus cocoa farming in the survey area was considered a serious profit-making venture for the participating farmers.

4.3 Characteristics and Management of Cocoa Farms and Farmer Incomes

Tables 4 and 5 provide summary information on characteristics of farms owned and managed by the respondents. As indicated in Table 4, slightly over three-quarters (76.6%) of the farms managed by the respondents were considered to be healthy (trees were in excellent condition). About four percent of the farms were heavily diseased which would require major replanting. The most important means of acquisition and development of cocoa farms was through planting of cocoa trees using clan lineage or extended family land (36.4% of farms), followed by the development through the use of caretakers who received 50 percent of gross proceeds through the "abunu" system (30.9% of farms). Development of cocoa farms one's own land was reported for 21.8 percent of the total number of farms. The most important type of management was the abunu-based system (60.8% of farms) followed by owner-managed farms (30.7%).

Table 5 shows the characteristics of the cocoa farms owned by the respondents. The average number of cocoa farms per farmer was 2.4 and the average total size of cocoa farms held by a farmer was 6.7 acres. The average number of years of cocoa farming experience was 19.8 with the range from 3 to 58 years. Children participated in various activities in cocoa production. The proportion of the total

number of workers used on the cocoa farms during the 2017/2018 production year attributed to children was about 5.1%. These children were defined as those between 7 and 14 years. About 1.7 percent of the total number of workers were boys and the remaining 3.4% were girls. Children were largely used for harvesting operations such as the gathering of harvested cocoa pods and breaking of cocoa pods, and also for fetching of water to mix with the insecticides for spraying of cocoa trees.

The average annual gross revenues from cocoa farming were 3,493 Ghana cedis, with a range from zero to 27,075 Ghana cedis. The zero income level was reported by one farmer who had just cultivating cocoa. Annual gross revenues from agricultural and forestry ventures, outside of cocoa farming, averaged 982 Ghana cedis, while income from non-agricultural and forestry ventures averaged 1,165 Ghana cedis. Ventures outside agriculture and forestry (simply non-farm) provided an important source of diversified incomes for cocoa farmers. The average annual total gross revenues from agricultural and forestry sources was 4,475 (3,493 + 982) Ghana cedis. The annual total income from non-farm ventures was 1,165 Ghana cedis (see Table 5). Non-farm ventures therefore constituted a key risk management strategy for cocoa farmers providing an additional diversified source of livelihood income.

Table 5 also provides important information about gross incomes obtained from cocoa production for farmers participating in the mass spraying and fertilizers distribution programmes of the COCOBOD and those farmers who did not participate in these two programmes. The average gross income from cocoa production for farmers participating in the COCOBOD's fertilizers distribution programme was 6,872 Ghana cedis as compared to an average of only 2,972 Ghana cedis for those who did not participate in that programme. Using the Student t test for comparisons between the mean gross incomes for the two groups of farmers, we derived a Student t value of 1.87 which indicated a statistical significance at the 10% level. The critical Student t value at the 10% level was 1.665.

For the mass spraying exercise, the average gross income from cocoa production for participating farmers was 3,705 Ghana cedis compared to the average gross income from cocoa production of only 2,837 Ghana cedis. Using the Student t test for comparisons between the mean gross incomes for the two groups of farmers, we derived a Student t value of 1.27 which indicated lack of statistical significance at 10% level.

Table 4: Characteristics of Farms Managed By Respondents Using Frequency Analysis

Characteristic	Percentage
State or Condition of Cocoa Farm (218 farms total)	
Healthy (trees are in excellent condition)	76.6
Partly diseased (some trees have diseases)	17.9
Heavily diseased (the majority of the trees are diseased)	4.1
Burnt	1.4
Method of Acquisition and Development of Cocoa Farm (220 farms total)	
Caretaker of a farm (owned by other people) based on the abunu 50% gross revenue share system	30.9
Farm developed from extended family or clan land	36.4
Owner of bearing trees and not the land arising from the farmer developing the cocoa farm and getting half of the bearing trees but not land ownership	5.9
Developed the cocoa farm from own land	21.8
Acquired the cocoa farm as a gift from a relative	4.1
Acquired the cocoa farm as a gift from husband	0.9
Current Management of Cocoa Farm (220 farms total)	
Owner of farm but not actively managing it	1.1
Owner of farm and actively managing it	30.7
Caretaker on farm owned by other people based on the abunu 50% gross revenue share system	60.8
Owner and manager of the bearing cocoa trees but not the land which is owned separately by an indigene	7.4
Types of non-cocoa farms owned or managed	
None	3.4
Root crops only	42.0
Vegetables only	1.1
Root crops and vegetables	9.1
Root crops and tree crops	12.5
Root crops, vegetables and tree crops	8.0
Root crops with some separate and some intercropped with cocoa	22.7
Root crops, vegetables with some intercropped with other tree crops	1.1

Table 5: Characteristics of Cocoa Farms Owned and Managed by Respondents and Farmer Incomes Based on Mean and Range Values

Item	Mean	Range
Number of cocoa farms	2.4	1 to 6
Size of all cocoa farms in acres	6.8	1 to 25
Age of cocoa farms	9.8	1 to 45
Number of years of cocoa farming experience	19.8	3 to 58
Proportion of work force on cocoa farms over the last 12 months who were children between 7 and 14 years	0.051	0 to 0.80
Proportion of work force on cocoa farms over the last 12 months who were boys between 7 and 14 years	0.017	0 to 0.31
Proportion of work force on cocoa farms over the last 12 months who were girls between 7 and 14 years	0.034	0 to 0.80
Individual gross income from cocoa in Ghana cedis over the last 12 months	3,493	0 to 27,075
Individual gross income from non-cocoa agricultural and forestry ventures in Ghana cedis (outside of cocoa) over the last 12 months	982	0 to 8,000
Individual income from non-farm ventures (outside agriculture and forestry) in Ghana cedis over the last 12 months	1,165	0 to 15,000
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers participating in the COCOBOD's fertilizers programme	6,878	475 to 27,075
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers NOT participating in the COCOBOD's fertilizers programme	2,972	0 to 17,733
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers participating in the COCOBOD's mass spraying exercise	3,705	0 to 27,075
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers NOT participating in the COCOBOD's mass spraying exercise	2,837	30 to 6,888
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers who had their own spraying machines	4,128	0 to 17,733
Individual gross income from cocoa over the last 12 months in Ghana cedis for farmers who DID NOT HAVE their own spraying machines	3,323	23 to 27,075

4.4 Use of Variable and Fixed Capital Inputs on Cocoa Farms

As indicated in Section 4.1, the price received by cocoa farmers for their dried beans depends on the quality of the inputs used on their cocoa farms; the latter also depends on the degree of access and ownership of farmers for farming inputs such as drying mats and sacks. Table 6 provides information on the use of owned and hired fixed and variable capital inputs for cocoa farming during the 2017/2018 production year. Fixed capital inputs are generally those tools and equipment with life spans of one year or more. Variable capital inputs are those that are directly used in production to produce outputs, for example, fertilizers and insecticides. Fertilizers and insecticides are some of the inputs that are supplied directly to farmers under the COCOBOD inputs distribution programme. Information provided in Table 6 included those involving the mass cocoa spraying programme and fertilizer distribution scheme operated by COCOBOD.

The most popular capital inputs used by farmers that were directly owned by them were cutlasses, cocoa knives to break the pods to remove the beans (93%), sharpening stones used for sharpening of cutlasses (90%), and plucking knives to remove the bearing pods from the trees (83%). All respondents owned cutlasses – an important tool used for brushing and weeding of cocoa farms. Tree pruners were the least popular tool owned by cocoa farmers with only 14 percent of respondents declaring ownership of this tool. This low use was largely due to its high cost and the use of cutlasses as substitutes for operations that are undertaken with tree pruners.

In terms of variable capital inputs, insecticides used for spraying cocoa trees were the most popular with 83 percent of farmers using the input. Fertilizers were used sparingly by farmers with only 21% declaring that they used this input. In terms of hired fixed or variable capital inputs, the most popular was the hiring of spraying machines, which was indicated by about 84 percent of the respondents. Spraying machines were owned by only 21 percent of the respondents. As shown in Table 6, the mean annual cocoa income for farmers who had their own spraying machines was 4,128 Ghana cedis. For farmers who did not own spraying machines, the mean annual cocoa income was 3,323 Ghana cedis, a difference of 805 Ghana cedis.

The next most important use of hired or externally-acquired inputs was through the use of insecticides. This use of insecticides is obtained through participation in the COCOBOD's mass spraying exercise. This was the second most popular source of hired capital inputs with 76 percent of farmers indicating that they participated in that programme. The third most popular hired inputs were bags and sacks; this was indicated by 74 percent of respondents. Due to regulations concerning the packing of cocoa beans in appropriate bags, most farmers preferred to hire bags from their buying agencies for the reported fee of 1 kg per bag of 64 kg of dried cocoa beans. The least important hired inputs were farm boots, nets for carrying cocoa

beans, cocoa knives, cutlasses, baskets, sharpening stones and pans and trays. Not surprisingly, the two most important challenges facing cocoa farmers were related to the difficulty of acquiring capital inputs. Based on 1 to 5 Likert scale, the availability and affordability of fertilizers from either COCOBOD programmes and/or the market was ranked the most important with an average score of 4.7 followed closely by availability and affordability of insecticides from either COCOBOD programme or the market with an average score of 4.69.

An important issue of transparency in pricing at the local purchasing centre or depot is related to the charge levied on farmers for hiring sacks and bags from the local purchasing centres and depots to put their dried cocoa beans into before transporting them for weighing and sale. Farmers were charged for hiring bags or sacks from the local buying centre or deposit to pack their dried cocoa beans before sale. The charge was one kg of cocoa beans deduction for each bag of dried cocoa beans sold to the buying agency. This charge could be arbitrarily increased as a form of fraud by a purchasing clerk if the farmer was not fully aware of the charge. About 28% of the cocoa farmers purchased their own bags from the market or acquired them from friends and relatives, rather than hiring them from local buying centres or depots (refer to Table 6).

Given the reported widespread deduction of one kg per 64 kg bag of dried cocoa beans as a compulsory levy for farmers who hired the bags and sacks from buying centres, a logistic regression analysis was undertaken to establish the factors responsible for farmers choosing to acquire bags and sacks on their own rather than sourcing them from the local buying centres, and thus avoiding the one kg deduction in the price for 64 kg dried beans. The results of this analysis are presented in Table 7 and they showed that the significant variables were sex, ownership of spraying machines, and the level of formal schooling attainment acquired by the farmer. Female farmers were more likely to acquire their own bags and sacks as compared to male farmers. Increased likelihood of acquiring one's own bags and sacks was associated with ownership of spraying machines, and the increasing level of formal schooling attainment.

Table 6: Respondents' Declared Use of Variable and Fixed Capital Inputs in Cocoa Farming during the 2017/2018 Production Year

No.	Capital Input	Proportion of Farmers Who Used Their Own Inputs and/ or Equipment Purchased From Market Sources Or As Gifts From Friends And Relatives	Proportion of Farmers Who Used Hired Inputs and Equipment, Including Fertilizers and Spraying Inputs Supplied Through Ghana COCOBOD Programmes, and the Hiring of Bags and Sacks for Dried Beans from Local Cocoa Buying Depots and Centres
1	Fertilizers	0.21 (0.410)	0.13 (0.342)
2	Insecticides	0.83 (0.375)	0.76 (0.432)
3	Spraying machine	0.21 (0.410)	0.84 (0.394)
4	Bags and sacks	0.28 (0.450)	0.74 (0.349)
5	Cutlasses	1.00 (0.000)	0.07 (0.251)
6	Cocoa knives	0.93 (0.271)	0.07 (0.251)
7	Plucking knives	0.83 (0.375)	0.17 (0.375)
8	Sharpening stones	0.90 (0.302)	0.10 (0.302)
9	Pans and Trays	0.79 (0.410)	0.10 (0.302)
10	Baskets	0.49 (0.503)	0.08 (0.271)
11	Drying mats	0.71 (0.456)	0.17 (0.375)
12	Wellington boots/Big boots	0.51 (0.503)	0.02 (0.151)
13	Nets for carrying for cocoa beans	0.29 (0.456)	0.06 (0.232)
14	Tree pruners	0.14 (0.350)	0.30 (0.462)

Note: *The figures in brackets are the standard deviations*

Table 7: Results of the Logistic Regression Analysis of the Likelihood of a Cocoa Farmer Acquiring His/Her Own Bags and Sacks for Packing Dried Cocoa Beans Through Local Markets or Friends and Relatives Rather Than Hiring These Bags and Sacks from the Local Buying Centres and Depots During the 2017/2018 Production Year

Explanatory Variable	Parameter Estimate	Standard Error	Probability Level of Significance
INTERCEPT (CONSTANT)	-1.976	1.273	0.121
MUSLIM (dummy variable with 1 for Muslims; 0 for non-Muslims)	0.029	0.911	0.974
SEX (dummy variable with 1 for females; 0 for males)	1.966	0.893	0.028*
OWNSPRAYINGMACHINE (dummy variable with 1 for farmers owning their own spraying machines; 0 for farmers who did not own their spraying machines). This variable acts as a proxy for the level of intensity of capital inputs owned by farmer	4.052	1.025	0.000*
EDUCATION (the number of years of formal schooling acquired by respondent)	0.166	0.098	0.092*
NUMBEROFFARMS (the number of cocoa farms managed by the farmer)	-0.572	0.368	0.120
COCOAEXPERIENCE (the number of years of cocoa farming experience obtained by the respondent)	-0.012	0.029	0.689

Notes

** Significant at the 10% level.*

The percentage of observations correctly classified based on the logistic regression model was 84.0%.

The fertilizers distribution and mass cocoa tree spraying programmes of the COCOBOD are not subsidized programmes but are financed directly through a compulsory levy on all cocoa farmers, and other industry stakeholders, based on a deduction of the gross fob price of dried cocoa beans before the derivation of the producer price of cocoa. The expenditures on these two programmes are included in the so-called industry costs which are deducted from the total gross cocoa revenues of the industry before the derivation of the net fob price.

The expected total gross revenues of the whole cocoa industry is the product of the expected industry production (tonnes) multiplied by the fob price per

tonne. The fob price per tonne is the world cocoa price less the transport costs and related insurance expenses from the ports in Ghana to overseas destinations. The net fob price is shared among the various stakeholders in the cocoa industry. These stakeholders are principally (1) cocoa farmers, (2) licensed buying agencies, (3) haulers and transport companies, (4) cocoa exporter which is the Cocoa Marketing Company, an agency of the COCOBOD and (5) COCOBOD/Government of Ghana.

Participation in the mass cocoa spraying and fertilizers programmes organized by COCOBOD is considered to be an important objective of COCOBOD to expand cocoa production in a cost-effective manner. Extensive participation by cocoa farmers in this programme is also to help to achieve the continued international competitiveness of the Ghanaian cocoa industry. Guided by political economy theories that access to important societal programmes in the cocoa industry could be influenced by structures that farmers belong to, we conducted logistic regression analysis to determine the likelihood of a cocoa farmer participating in the cocoa spraying and the fertilizer distribution programmes.

As indicated in Table 6, an average of 76% of cocoa farmers participated in the mass cocoa spraying scheme while only 13% of respondents participated in the fertilizer distribution programme. Further, as shown in Table 5, the individual gross incomes for farmers participating in the two programmes were higher than for those farmers not participating in the two programmes. With the wide variability in the participation of the two COCOBOD programmes, and the clearly established gross income differences from participating in the programmes, a logistic regression analysis was an ideal tool to identify factors influencing the likelihood of farmer participation in these programmes.

The results of the logistic regression analysis for the likelihood of a farmer participating in the Ghana COCOBOD's fertilizers distribution programme are reported in Table 8. From the results assembled in Table 8, the likelihood of a farmer using purchased fertilizers from the Ghana COCOBOD's fertilizers input distribution programme for the 2017/2018 production year was significantly related to the sex of the farmer. Female cocoa farmers were more likely to be excluded from the fertilizers input distribution programme reflecting their weaker bargaining position relative to the situation of very limited availability of fertilizers from the programme. Farmers who directly managed their own cocoa farms were more likely to participate in the fertilizers input distribution programme. This result suggested that owner-managers of were more likely to make much more efforts to be included in the programme as they would receive all the profits derived from the participation in this programme.

Farmers who owned their spraying machines were more likely to be included in the fertilizers input distribution programme (refer to Table 8). As pointed out in Table 6, only 21 percent of the respondents had their own spraying machines. Based on the initial Chi square analysis, using grouped data, there was also a statistically significant association between ownership of spraying machines and participation in the fertilizers' input distribution programme. Ownership of spraying machines reflected the relative wealth and financial position of the farmer

as it was the most expensive of the fixed capital inputs used by farmers in the cocoa industry. Hence the results of this particular analysis confirmed the power bargaining influence of relatively wealthy farmers being more likely to be included in the fertilizers input programme.

The results of the logistic regression analysis of farmer participation in the Ghana COCOBOD's mass spraying programme are the reported in Table 9. Similar to the results reported for the fertilizers input programme in Table 8, the two key statistically significant determinants of likelihood in participation in the mass spraying programme were sex and ownership of spraying machines. Female farmers were more likely to be excluded from the spraying programme while farmers who had their own spraying machines were more likely to be included. The other significant factor influencing the likelihood of participation in the mass spraying programme was the religious factor of being a Muslim. Muslims were more likely to be excluded from the spraying programme. The strong statistical significance of the Muslim parameter (0.009) suggested the exclusion of Muslims from the programme was not likely to be due to chance.

Table 8: Results of the Logistic Regression Analysis of the Likelihood of a Cocoa Farmer Using Purchased Fertilizers from the Ghana COCOBOD's Fertilizers Input Distribution Programme in the 2017/2018 Production Year.

Explanatory Variable	Parameter Estimate	Standard Error	Probability Level of Significance
INTERCEPT (CONSTANT)	-2.172	0.561	0.000*
MUSLIM (dummy variable with 1 for Muslims; 0 for non-Muslims)	-20.437	10,004.971	0.998
SEX (dummy variable with 1 for females; 0 for males)	-2.390	1.162	0.040*
OWNSPRAYINGMACHINE (dummy variable with 1 for farmers owning their own spraying machines; 0 for farmers who did not own their spraying machines). This variable acts as a proxy for the level of intensity of capital inputs owned by farmer	1.790	0.785	0.023*
MANAGEMENT (dummy variable with 1 for farmers who directly managed their own cocoa farms; 0 for farmers who did not manage their cocoa farms and assigned them to caretakers and others to manage)	1.347	0.761	0.077*

Notes

** Significant at the 10% level.*

The percentage of observations correctly classified based on the logistic regression model was 85.6%.

Table 9: Results of the Logistic Regression Analysis of the Likelihood of a Cocoa Farmer Using Insecticides from the Ghana COCOBOD's Mass Spraying Exercise in the 2017/2018 Production Year.

Explanatory Variable	Parameter Estimate	Standard Error	Probability Level of Significance
INTERCEPT (CONSTANT)	1.615	0.427	0.000*
MUSLIM (dummy variable with 1 for Muslims; 0 for non-Muslims)	-1.902	0.730	0.009*
SEX (dummy variable with 1 for females; 0 for males)	-0.966	0.569	0.090*
OWNSPRAYINGMACHINE (dummy variable with 1 for farmers owning their own spraying machines; 0 for farmers who did not own their spraying machines) This variable acts as a proxy for the level of intensity of capital inputs owned by farmer	2.224	1.099	0.043*
MANAGEMENT (dummy variable with 1 for farmers who directly managed their own cocoa farms; 0 for farmers who did not manage their cocoa farms and assigned them to caretakers and others to manage)	-0.241	0.577	0.676

Notes

** Significant at the 10% level.*

The percentage of observations correctly classified based on the logistic regression model was 85.6%.

4.5 Results of the Production Function Analysis of Factors Influencing the Level of Gross Cocoa Income of Farmers in the 2017/2018 Production Year Including Participation in COCOBOD's Mass Spraying and Fertilizers Input Distribution Programmes

Given the likely exclusion of certain groups of cocoa farmers from the two COCOBOD's programmes, an important issue is the impact of these two programmes on the gross cocoa incomes of farmers. The results of the analysis of the impact of the two programmes based on a production analysis are presented Table 10. The estimated model had a strong power with the R^2 being 0.952 indicating that about 95% of the variation in the dependent variable (gross cocoa income) was explained by the ten independent variables. Further, based on the Ramsey Reset test result shown in Table 10, the estimated model was correctly specified. There was also no significant heteroscedasticity. Hence the model could be used for interpretative analysis.

Based on the results summarised in Table 10, seven of the 10 independent variables were statistically significant in influencing the level of the dependent variable (gross cocoa income). These statistically significant variables were (1) farm size, (2) total labour employed, (3) the age of the trees, (4) the square of the age of the trees, (5) participation in the COCOBOD's mass spraying programme, (6) the use of own fertilizers by the farmer and (7) owner-management of the cocoa farms. The curvilinear relationship between output of a cocoa farm with the age of the cocoa trees was established with the significant positive estimate for the TREEAGE parameter and the significant negative estimate for the TREEAGESQUARED parameter. Differentiating the estimated LCOCOAINCOME function with respect to TREEAGE would give the optimal age of cocoa trees at which the output of cocoa was maximized. This optimal age of trees was estimated in this study to be the normalized age value of 3.0, meaning 20 to 29 years age range.

Using the standardised regression estimates, which measured the relative importance of the independent variables, beyond the age of the trees, the five most important independent variables were the size of cocoa farm, the total labour employed on the farm, use of own fertilizers on cocoa farms, participation in the COCOBOD's mass spraying programme, and owner-management of the cocoa farms. The three insignificant variables were the use of own spraying (due to the widespread participation in the COCOBOD's mass spraying programme), participation in the COCOBOD's fertilizers input distribution programme (due to its very small scale implemented in 2017/2018), and cocoa farming experience (which had the correct expected sign).

Table 10: Standard Multiple Regression Analysis of the Factors Influencing the Level of Gross Cocoa Income of Farmers in the 2017/2018 Production Year

Dependent Variable is LOGCOCOAINCOME

Explanatory Variable	Unstandardised Regression Parameter Estimate	Standardised Regression Parameter Estimate	Probability Level of Significance	Variance Inflation Factor
INTERCEPT	-5.709	0.000	0.760	0.000
LOGTOTALFARMSIZE	0.707	0.276	0.001*	5.670
LOGTOTALLABOUREMPLOYED	0.398	0.166	0.016*	4.083
TREEAGE	3.590	0.951	0.004*	89.330
TREEAGESQUARED	-0.598	-0.697	0.009*	60.506
PCOCOASPRAYINGPROG	0.583	0.100	0.003*	1.892
USEOWNSPRAYING	-0.117	-0.017	0.698	1.802
PFERTILIZERSPROG	-0.049	-0.008	0.851	1.732
USEOWNFERTILIZERS	0.687	0.127	0.012*	2.166
LOGCOCOAFARMINGEXPERIENCE	0.158	0.063	0.381	4.697
MANAGEMENT	0.481	0.094	0.047*	1.946

Notes

R^2	*0.952**
Adjusted R2	*0.941**
Probability significance level of Ramsey Reset Test for correct model specification	*0.111*
Probability significance level of Langrange-Multiplier test of no heteroscedasticity	*0.154*
Probability significance level of Glejser's test of no heteroscedasticity	*0.523*

** denotes statistical significance of the parameter at the 10% level.*

4.6 Reported Changes in the Economic Welfare Status of Cocoa Farmers Arising from the Recent Years of Unchanged Local Cocoa Producer Prices

An important sub-objective of the study with regards to the farmers in the target case study area was the perceived changes in their economic welfare over the years especially during the years of no increase in cocoa prices and their welfare comparison with non-cocoa farmers. Local cocoa producer price was increased to 7,600 Ghana cedis per tonne or 450 Ghana cedis per 64

kg bag of cocoa beans in October 2016 by the COCOBOD. This price had remained unchanged from October 2016 to October 2018. Virtually all the respondents indicated that the economic conditions of cocoa farming had deteriorated with regards to the production of non-cocoa crops and other livelihood activities. This view was also indicated by the participants in the two structured focus-group discussions held at Seth Okai and Ninta villages, and in-depth discussions with selected with a chief cocoa farmer, two cocoa purchasing clerks and the Agona East District Assembly representative for the Seth Okai and Kwasi Paintsil Electoral Area. The Paramount Chief of the Agona Nsaba Traditional Area and three sub-chiefs of the Traditional Area also clearly asserted this view point in our private confidential in-depth discussions.

Table 11 summarises the respondents' assessment of their change in welfare position during the 2017/2018 production year (the year of no increase in local producer cocoa price) as compared to the two previous years (2015/2016 and 2016/2017) when there were increases in local cocoa producer prices. Four out of five respondents (80%) declared that in the face of unchanged local cocoa prices over the last 12 months, their livelihood status as cocoa farmers had worsened compared to non-cocoa farmers. Only 12.2 percent of respondents indicated that cocoa farmer's livelihood remained better than that of non-cocoa farmers. A few respondents (7.8%) indicated no change in status. This observation is supported by the trend analysis reported in Table 1, which showed that real cocoa producer price declined by about 4 percent in 2017, after a marginal rise in 2016 and high increase in 2015. Further, with the local cocoa producer price not increased during the current 2018/2019 production year, it is obvious that the real cocoa producer price would decline further. After three years of unchanged local cocoa producer prices, the real price received by farmers would decline to about 38% as compared to the level in 2016. Hence it is expected that aggregate cocoa production in Ghana would likely decline in the 2018/2019 production year given a three-year decline in real cocoa producer prices.

Respondents were also specifically requested to provide information related to their economic welfare situation in the previous 12 months period of unchanged local cocoa producer prices as compared to the two previous years when local producer prices were increased sharply. Economic welfare in this study is defined as the capacity to purchase material goods and services available within markets. This information on perceived welfare changes is also summarised in Table 11 under several categories. About half of the farmers (47.8%) indicated no change in the gross revenues obtained from cocoa farming.

Surprisingly, in the midst of no change in local producer prices, slightly over one quarter (25.8%) of the respondents indicated an increase in total revenues from cocoa farming. This observation was due to the expansion of cocoa acreage by some farmers. Five out of six farmers (83.3%) had expanded their acreage of cocoa farm over the last 12 months though local cocoa prices remained unchanged, with 61.8 percent using improved cocoa seedlings over the same period. The major reason for this development was their anticipation of increases in the producer prices in the near future.

In terms of economic welfare changes directly related to consumption activities, the comparative analysis reported in Table 11 depicts welfare deterioration in all three measures – household food consumption, household non-food consumption and total household consumption over the period of unchanged local cocoa producer prices. During the interviews, consumption was clearly explained to the respondents in terms of the volume or basket of material goods and services that they consumed over the specific periods. About 78.7 percent of the respondents indicated a decrease in their total household non-food consumption as compared to about 56.2 percent of respondents who declared a decrease in household food consumption over the period of unchanged local cocoa producer prices (refer to Table 11). The difference appeared to be the inelastic demand for food products compared to non-food products.

Table 11: Cocoa Farmers' Declared Changes in their Economic Welfare Position During the 2017/2018 Production Year When There Was No Increase in Producer Price as Compared to the Two Previous Years (2016/2017 and 2015/2016) When There Were Increases in Producer Prices.

	Welfare Measure	Percentage of Farmers Declaring an Increase In Welfare Status	Percentage of Farmers Declaring a Decrease in Welfare Status	Percentage of Farmers Declaring Unchanged Situation
1	Total revenues from cocoa farming	25.8	25.8	47.8
2	Profits from cocoa farming	28.1	66.3	5.6
3	Cocoa farm land expansion	83.3	1.1	15.6
4	Access to and use of improved cocoa seedlings	61.8	12.4	25.8
5	Access to and use of insecticides	29.2	38.2	32.6
6	Access to and use of credit and borrowing	18.9	20.0	61.1
7	Household food consumption (volume)	10.1	56.2	33.7
8	Household non-food consumption (volume)	5.6	78.7	15.7
9	Total household consumption (volume)	7.9	73.0	19.1

Source: Authors, Cross-sectional Survey, July and August 2018.

4.7 Results of the Analysis of Cocoa Farmers' Income Diversification Activities

As indicated in Section 4.2, ventures outside agriculture and forestry (simply non-farm) provided an important source of diversified incomes for cocoa farmers. Non-farm ventures therefore constituted a key risk management strategy for cocoa farmers providing additional sources of livelihood income for cocoa farmers. Specifically, when farmers were asked what methods that they used to deal with relatively low cocoa producer prices in order to sustain their livelihoods, about 51.7 percent indicated that they diversified through the production of other crops and the keeping and maintenance of various livestock types. About one in seven cocoa farmers (14.9%) indicated that they had no serious options to deal with low cocoa producer prices. Trading, mainly petty trading, was an additional source of livelihood for about 10 percent of the cocoa farmers. Some of the cocoa farmers worked as daily wage-based employees mainly in the construction and related industries (5.7%). About five percent of the farmers revealed borrowing as a major source of sustaining their livelihood activities. Only one farmer indicated remittances as an important source of income for the maintenance of his livelihood.

During the 2017/2018 production year, the total annual income from non-farm ventures was 1,165 Ghana cedis (see Table 5). This amount was higher than the total annual gross income from non-cocoa agricultural and forestry ventures which averaged 982 Ghana cedis and was one third of the total annual gross income from cocoa farming (3,493 Ghana cedis). During that year, the average number of broad income-generating activities was 2.4 ranging from one to three (that is (1) cocoa farming, (2) non-cocoa agricultural and forestry ventures, and (3) off-farm employment activities). Off-farm enterprises constituted about 14.9% of the total gross income of respondents with the range of 0.0% to 97.0%. The Simpson diversification index measure averaged 0.35 ranging from 0.00 to 0.66. The calculated index generally showed a modest overall level of diversification of income-based enterprises of cocoa farmers.

The results of the Poisson count data regression model analysis of the factors influencing income diversification by cocoa farmers based on the number of income-generating activities are summarised in Table 12. The results showed that the level of formal educational attainment, current marital status, age and household size significantly influenced the number of income-generating activities of cocoa farmers. Educational attainment and household size led to increased number of income-generating activities. Educational attainment led to increased off farm work activities due to increased market-based skills. Increased household size implied heavier economic burden that often necessitated participation in off-farm work activities.

Increasing age of the farmer led to declining number of income-generating numbers; this was probably the result of reduced number of work opportunities available to older people in the off-farm market sectors due to reduced health status and human capacity. Currently-

married cocoa farmers on average had less number of income-generating activities than those not currently married probably reflecting the fact that household work and management, which is not formally considered to be an economic generating income source, is an important part of household arrangements of currently-married cocoa farmers.

The results of the Tobit regression model analysis of the factors influencing the share of the total gross income of a cocoa farmer that is attributed to off-farm work activities are summarised in Table 13. The statistically significant factors were education, currently married status, age and management of cocoa farms. The share of the total gross income of a cocoa farmer attributed to off-farm work activities increased with increasing level of formal educational attainment acquired. However, this share decreased with increasing age of the farmer. Respondents who managed their own cocoa farmers had relatively lower share of their total gross income from off-farm sources as compared to farmers who were caretakers of other people's cocoa farms. Currently-married respondents had relatively lower share of their total gross income coming from off-farm income sources. The parameter of the SIGMA variable was highly significant suggesting that the Tobit model was an appropriate model.

The results of the Tobit regression analysis of factors influencing the level of income diversification employed by the surveyed farmers are reported in Table 14. The age of the farmer and the type of management of cocoa farmers were the only the variables with significant parameters. Increasing age of the farmer led to decreased level of overall income diversification; while farmers who owned and managed their own cocoa farmers had relatively lower overall income diversification than caretakers of cocoa farms. Again, the parameter of the SIGMA variable was highly significant suggesting that the Tobit model was an appropriate model. Overall, the results of the analysis in this section indicate that educational attainment of the farmer, age of the farmer, and the type of management of cocoa farms, were the consistent factors influencing income diversification activities undertaken by farmers.

Table 12: Results of the Poisson Count Data Regression Model Analysis of the Factors Influencing Income Diversification by Cocoa Farmers Based on the Number of Income-Generation Activities in the 2017/2018 Production YearDependent Variable is NIGS (Number of Income Generating Activities)

Explanatory Variable	Regression Parameter Estimate	Student t Test Value	Probability Level of Significance
INTERCEPT	1.080	6.387	0.000*
EDUCATION	0.014	2.623	0.009*
SEX	-0.012	-0.192	0.848
CURRENTLYMARRIED	-0.138	-1.916	0.055*

AGE	-0.005	-2.647	0.008*
MANAGEMENT	-0.047	-0.933	0.351
HOUSEHOLDSIZE	0.017	2.287	0.022*

Notes

R^2 *0.232**

* *denotes statistical significance of the parameter at the 10% level.*

Table 13: Results of the Tobit Regression Model Analysis of the Factors Influencing Income Diversification by Cocoa Farmers Based on the Share of the Total Gross Income Attributed to Off-farm Work Activities during the 2017/2018 Production Year

Dependent Variable is OFIS (Share of Off-farm Income in the Total Gross Income)

Explanatory Variable	Regression Parameter Estimate	Student t Test Value	Probability Level of Significance
INTERCEPT	0.486	1.441	0.149
EDUCATION	0.038	2.701	0.007*
SEX	0.199	1.477	0.140
CURRENTLYMARRIED	-0.293	-2.017	0.044*
AGE	-0.012	-2.559	0.011*
MANAGEMENT	-0.207	-1.737	0.082*
HOUSEHOLDSIZE	0.013	0.774	0.439
SIGMA	0.392	7.602	0.000*

Notes

Proportion of Observations Which Were Censored (Those With Values of 0.0) *0.591*

Proportion of Observations Which Were Not Censored (Values Greater than 0.0) *0.409*

* *denotes statistical significance of the parameter at the 10% level.*

Table 14: Results of the Tobit Regression Model Analysis of the Factors Influencing Income Diversification by Cocoa Farmers Based on the Simpson Diversification Index

Dependent Variable is Simpson Diversification Index

Explanatory Variable	Regression Parameter Estimate	Student t Test Value	Probability Level of Significance
INTERCEPT	0.662	5.113	0.000*
EDUCATION	0.002	0.354	0.723
SEX	-0.0006	-0.011	0.991
CURRENTLYMARRIED	-0.072	-1.257	0.209
AGE	-0.005	-3.004	0.003*
MANAGEMENT	-0.080	-1.945	0.052*
HOUSEHOLDSIZE	0.006	0.924	0.356
SIGMA	0.174	12.778	0.000*

Notes

Proportion of Observations Which Were Censored (Those With Values of 0.0) *0.045*
Proportion of Observations Which Were Not Censored (Values Greater than 0.0) *0.955*

* *denotes statistical significance of the parameter at the 10% level.*

4.8 Cocoa Farmers' Perceptions of the Determination and Setting of Farmgate Prices by Various Actors and the Transparency of the Farmgate Pricing Process

Farmers' assessment of the importance of various actors in the determination of the level and amount of local cocoa producer prices in Ghana is summarised in Table 15. Based on the Likert scale of 1 to 5 index, the most important actor in the determination of the level of local cocoa producer prices was the Government of Ghana. This was followed by the COCOBOD, the industry regulator. While several respondents noted that the COCOBOD worked in conjunction with the Government of Ghana in setting local producer prices, the majority of the respondents indicated that they saw the two agencies as separate institutions

which seemed to use processes to determine local prices that were unknown to them.

Not surprisingly, about 88% of respondents indicated that they could not do anything to determine the level of local producer prices. Further, about 86% of the respondents declared that they had no knowledge of the processes carried out to determine the level and amounts of local prices. Rather, the mass media, especially the radio, was the main source of information through which they got to know the level of local producer prices of cocoa. The 2017/2018 production year cocoa producer prices were deemed to be inadequate by the respondents with a score of 2.48 out of the maximum score of 5.0. All respondents, with the exception of two people, wanted an increase in the local producer prices for the 2018/2019 production year. This wish was not honoured by the COCOBOD as local cocoa prices were not increased but remained unchanged for the 2018/2019 production year.

The results from Table 15 indicated that the third most important actor in the determination of the level and amount of local producer prices of cocoa was the purchasing clerks of the local Ghanaian companies. Purchasing clerks were deemed important because some of them engaged in fraudulent practice of adjusting the scale during the weighing of the cocoa beans at the final sale point to reap extra profits. The cheating of cocoa farmers by purchasing clerks through the adjustment of the weighing scales has been acknowledged and condemned by the Chief Executive of the COCOBOD in a recent news item[21]. The other important actor in the determination of the level and amount of local cocoa prices was foreign or international cocoa buying agencies with a score of 2.48. Several respondents indicated that these foreign buyers actually set the local prices while others suggested that they set the local prices through negotiation with the Government of Ghana and COCOBOD. The least important actors in the determination of the level and amount of local cocoa producer prices as declared by the respondents were civil society organizations, traditional chieftaincy authorities, local buying companies and individual cocoa farmers and lastly the purchasing clerks. While purchasing clerks were deemed to be the least important actors in the actual setting of the local cocoa producer prices, the respondents ranked them to be very influential in manipulating the actual amount they received from the sale of their cocoa beans.

As indicated earlier, this influence was primarily due to the perceived common occurrence of the fraudulent adjustment of the scale during the weighing of dried cocoa beans. The respondents also indicated several other ways that purchasing clerks cheated them or committed fraudulent acts with regards to the sale of dried cocoa beans. These included excessive deductions from the price for the bags or sacks hired by farmers, excessive deduction for payment of loans owed by farmers, insisting on the farmer paying transportation fees for the clerk to transport his/her cocoa beans to the office of the buying agency and non-provision of information to farmers concerning new rules dealing with purchasing of dried beans. Some respondents who complained of possible

[21] This was reported by Ghana Web News on 20 August 2018.

cheating by purchasing clerks indicated that they reported such incidents to their chief cocoa farmers in their villages. However, they suggested that not much was done to reduce the problem. A few respondents, especially male cocoa farmers, reported directly confronting the purchasing clerks if they felt they were being cheated.

The rent-seeking activity of weighing scale adjustment by purchasing clerks was further analysed using Chi square analysis based on grouped data, and multiple regression analysis to identify farmer characteristics significantly linked to the perception of this practice. The Chi square analysis results reported in Table 16 showed that only the sex of the respondents was significantly associated with the degree of perceived fraud. The regression analysis results, reported in Table 17, indicated that sex, formal educational attainment in years, age of respondent, and the farmer owning his/her own bags and sacks used to pack the dried cocoa beans to be transported to the buying centre, influenced the farmer's perceived level of fraud. Relatively-less educated young women cocoa farmers perceived this fraudulent act to be of low importance. This finding was due to the inadequate information acquired by women cocoa farmers on the proper procedures in the weighing of dried cocoa beans and the legally-accepted methods of adjusting weighing scales by purchasing clerks. Farmers who owned their own bags and sacks for packing dried beans suspected the increased likelihood of fraud through the hiring of bags from purchasing clerks and hence preferred to use their own bugs and sacks.

In a summary, the reduction of the gross price of dried cocoa beans paid to cocoa farmers by purchasing clerks at the buying centres and depots during the time of sales of cocoa beans, was due to a number of factors, such as excessive deduction for the hiring of bags and sacks from the buying centres for the packing of the dried cocoa beans, excessive deduction for under-dried cocoa beans, unapproved charges levied on cocoa farmers for activities such as transfer of dried cocoa beans from the buying centres to the offices of the licensed buying agencies, and inadequate verification of the scale used for weighing the dried cocoa beans.

Table 15: Respondents' Assessment of the Importance of Various Actors in the Determination of the Level and Amount of Local Cocoa Producer Prices in Ghana and Whether the Current Local Cocoa Prices Were Adequate

	Actor	Mean Score of Importance	Standard Deviation	Coefficient of Variation
1	Government of Ghana	4.71	0.723	0.154
2	Ghana COCOBOD	4.26	1.393	0.327
3	Purchasing clerks of buying companies through adjustment to the weighing scale at point of sale	3.86	1.491	0.386

4	Foreign or international cocoa buyers and companies	2.52	1.739	0.690
5	Civil society organizations	1.48	1.004	0.678
6	Traditional chieftaincy authorities	1.31	0.816	0.623
7	Local Ghanaian buying companies	1.22	0.738	0.605
8	Individual cocoa farmers	1.15	0.518	0.450
9	Purchasing clerks of local cocoa buying companies	1.08	0.345	0.319
10	Local cocoa producer prices are adequate	2.48	1.581	0.638

Source: Author, Cross-sectional Survey, July and August 2018.

Note

The scoring is based on 5 denoting that item is very powerful influential actor, 4 powerful influential actor, 3 moderately influential actor, 2 low influential actor, 5 very low influential actor.

Table 16: Statistical Significance of the Association Between the Cocoa Farmer's Perceived Cheating by the Purchasing Clerk During Weighing of Dried Cocoa Beans at the Point of Sale Through Adjustment to the Weighing Scale (PCWSCALEFRAUD) and Selected Socio-Economic Characteristics Based on Chi-Square Analysis Using Grouped Data

No.	Items for Comparison	Chi-square Test Significance Probability Level
1	PCWSCALEFRAUD Versus VILLAGE OF FARMER	0.937
2	PCWSCALEFRAUD Versus MIGRANT STATUS	0.780
3	PCWSCALEFRAUD Versus NUMBER OF FARMS OWNED	0.842
4	PCWSCALEFRAUD Versus EXPERIENCE IN COCOA FARMING	0.869
5	PCWSCALEFRAUD Versus SEX	0.048*
6	PCWSCALEFRAUD Versus MARRIAGE STATUS	0.637
7	PCWSCALEFRAUD Versus TRIBE	0.606
8	PCWSCALEFRAUD Versus EDUCATIONAL ATTAINMENT	0.145
9	PCWSCALEFRAUD Versus RELIGIOUS AFFILIATION	0.167
10	PCWSCALEFRAUD Versus AGEGROUP	0.819

Note

*** Significant at the 10% level.*

Table 17: Standard Multiple Regression Analysis of the Respondent's Score Value of the Perceived Importance of Cheating by the Purchasing Clerk at the Point of Sale of Dried Cocoa Beans at the Local Buying Centre or Depot Through Adjustment to the Weighing Scale (PCWSCALEFRAUD) Related to Respondent's Socio-economic Characteristics of Cocoa Farmers.

Explanatory Variable	Unstandardised Regression Parameter Estimate	Standardised Regression Parameter Estimate	Probability Level of Significance	Variance Inflation Factor
INTERCEPT	52.182	0.000	0.001*	0.000
SEX (dummy variable with 1 for females; 0 for males)	-2.438	-0.301	0.001*	1.652
YEARS OF EDUCATION	0.130	0.355	0.000*	1.536
AGE (years)	0.032	0.345	0.017*	1.858
MUSLIM (dummy variable with 1 for Muslims; and 0 for non-Muslims)	-0.511	-0.080	0.237	1.054
USEOWNBAGSANDSACKS (dummy variable with 1 if farmer uses only his/her own bags and sacks to pack dried cocoa beans for transport to buying agency; and 0 otherwise	0.878	0.160	0.029*	1.189

Notes

R^2	*0.690**
Adjusted R^2	*0.668**
Probability significance level of Ramsey Reset Test for correct model specification	*0.256*
Probability significance level of Langrange-Multiplier test of no heteroscedasticity	*0.750*
Probability significance level of Glejser's test of no heteroscedasticity	*0.110*

* *denotes statistical significance of the parameter at the 10% level.*

5.0

Conclusions And Policy Recommendations

5.1 Summary of the Study

This study analysed farmers' perceptions of factors influencing the determination and setting of cocoa farm gate prices, the impact of COCOBOD's mass spraying and fertilizers distribution programmes on the economic welfare of cocoa farmers, the effect of unchanged nominal cocoa producer prices on the welfare of cocoa farmers, and factors influencing cocoa farmers' income diversification activities in Ghana, using Agona East District as a case study. In addition to the personal confidential interviews of 90 farmers, we had two focus-group meetings involving various stakeholders in the cocoa industry of the district, in-depth interviews with two purchasing clerks, one chief cocoa farmer, three sub-chiefs, one Agona East District Assembly representative and the Paramount Chief (Omanhene) of the Agona Nsaba Traditional Area.

The desktop literature review discussed various processes that determine local cocoa producer prices and domestic marketing arrangements in Ghana. This review noted the little involvement of the typical cocoa farmer in the decision making processes leading to the establishment of local cocoa producer prices at the beginning of the production year in October. The results of the farmer-survey analysis confirmed little or no role of farmers in the setting and determination of local cocoa producer prices. The most important factors that farmers perceived to determine local cocoa producer prices were the largely unknown processes carried out by the government of Ghana and the COCOBOD in setting local producer prices.

The third most important factor in the determination and setting of local cocoa producer prices as indicated by survey respondents was the weighing scale adjustment fraud, perpetrated by purchasing clerks of local Ghanaian buying agencies, at the point of sale of dried cocoa beans. Multiple regression analysis established that age, sex, educational attainment, and the farmer owning his/her own bags and sacks used to pack the dried cocoa beans to be transported to the buying centre, influenced their perceived level of fraud. Women farmers, who tended to be less educated and had less power bargaining, indicated less weighing scale fraud perceptions compared to their male counterparts possibly due to the easiness in cheating women farmers at the point of sale of dried cocoa beans. The more educated a farmer the higher the perception of weighing scale fraud at the point of sale of the cocoa beans. Farmers who owned their own bags and sacks for packing dried beans to be transported to buying centres perceived higher likelihood of fraud through the hiring of bags from purchasing clerks and hence preferred to use their own bugs and sacks.

The accessibility of cocoa farmers to the mass cocoa spraying and fertilizers input distribution programmes of the COCOBOD for the 2017/2018 production year was evaluated. The logistic regression analysis indicated that Muslim cocoa farmers in the survey area were more likely to be excluded from the mass cocoa spraying programme. This likelihood of exclusion from the mass spraying programme was also shown for the sex of the farmer with female farmers more likely to be excluded from

this programme. However, farmers who had their own spraying machines were more likely to be included in the spraying programme. The analysis of fertilizers input distribution programme established that there was increased likelihood of exclusion of female farmers from the programme. This suggested that female cocoa farmers were subsidizing male cocoa farmers for both the mass cocoa spraying and the fertilizers distribution programmes while Muslim cocoa farmers were subsidizing non-Muslim farmers for the spraying programme.

We established that off-farm income constituted about one third of total gross cocoa income and therefore was an important risk management strategy for cocoa farmers providing an additional source of livelihood income. The analysis of income diversification of cocoa farmers suggested that educational attainment of the farmer increased his/her income diversification activities. However, farmers who owned and directly managed their cocoa farms tended to undertake less income diversification activities and rather focussed more on the management of their cocoa farms. Further, currently married respondents had relatively lesser degree of diversification activities, largely due to their increased role in home-based work duties and production which were not classified as income-generating activities. Remittances were not considered to be a major regular source of income. Local cocoa producer prices have remained unchanged for three continuous years, 2016/2017, 2017/2018 and 2018/2019. This factor even makes income-diversification activities of cocoa farmers more important.

5.2 Recommendations

Several policy implications flow from this study and these are provided below. First, the COCOBOD should strengthen its public education on the processes involved in the determination of local cocoa producer prices. This public education could involve more meetings with farmers through their district and regional representatives over a period of time before the announcement of official local cocoa prices during the first week of October each year. The COCOBOD may need to consider expanding the number of farmer representatives in the producer price review committee that recommends the local producer prices for cocoa for each year.

The mass spraying and fertilizers distribution programmes should be strengthened in terms of increased quantity and quality of services as the use of both spraying and fertilizers was shown to increase gross cocoa incomes. Increasing the number of pesticides spraying beyond the average one per farm per year can lesson farmers' burden. However, agrochemicals need to be used responsibly in order not to have any negative effects on biodiversity, soil, health of farmers etc. The mass spraying programme needs to be depoliticized and should involve specific farmer groups such as women farmers and Muslim farmers. Therefore liberalizing the market for fertilizers and pesticides is highly recommended; however, COCOBOD should play a regulatory role.

Significantly, the policy of the COCOBOD and the Government of Ghana and its related agencies in the cocoa sector should ensure equitable distribution of resources and services for all cocoa farmers, regardless of their ethnic background, migrant status, political party affiliation and religious preferences. This study showed that the input distribution programmes of the COCOBOD appeared to discriminate against Muslim cocoa farmers and relatively small scale cocoa farmers in the survey area. The COCOBOD needs to vigorously pursue an agenda that eliminates any real or perceived discrimination against any group of cocoa farmers.

COCOBOD needs to strengthen its surveillance and intelligence work to reduce considerably fraud related to the adjustment of weighing scale by some purchasing clerks at the time of the sale of dried beans. This work may include the adoption of electronic weighing machines as a pilot study in selected parts of the country and regular quarterly training of cocoa farmers, especially women cocoa farmers, throughout the country on the processes of weighing of cocoa beans to eliminate fraud. Fraud related to the weighing scale is often linked to farmer hiring bags and sacks from buying centres. Hence farmers should be encouraged to acquire their own bags and sacks for storing dried cocoa beans before transporting them to buying centres.

It is suggested that the COCOBOD publishes information related to the setting of the annual cocoa producer price each year after it has publicly announced the new price through the mass media. The information could be published in details through the leading national daily newspapers to ensure increased transparency to the cocoa farmers and the general public on the pricing processes. The publication of such information may also stem the tide of agitation by groups of farmers and others when the local producer price is not increased or is increased marginally. The publication of such information must also include data on the level of the cocoa stabilization fund set up to cushion farmers from drastic falls in world cocoa prices.

In support of the efforts of the COCOBOD, Ghanaian civil society organizations (CSOs) need to devise appropriate educational programmes toward addressing the perceived weighing scale adjustment fraud. Educational programmes by CSOs could include training for farmers on the correct methods that should be employed by purchasing clerks in the weighing of dried cocoa beans as stipulated by COCOBOD. These programmes could lead to a real increase in actual producer prices received by cocoa farmers through reduction of the scale adjustment fraud.

Additionally, attention should be directed towards addressing the needs of women cocoa farmers who tend to be younger than male farmers and are less educated. Women cocoa farmers also tend to be marginalized in the delivery of specific COCOBOD programmes aimed at transparency in cocoa pricing because the Board often targets their programmes through chief cocoa farmers who tend to be males. Such programmes could help women cocoa farmers to increase their incomes from cocoa farming and improve their livelihoods through getting the actual producer prices that they should be paid for their products. Therefore, to encourage participation in decision making, sensitizations and inputs distribution, CSOs and women groups should advocate for the

formation of “female queen” leaders who will oversee the interest of women in government’s initiatives, programmes and related issues that matter to them.

Further, advocacy work should be also geared toward supporting farmers in the acquisition of key inputs including fertilizers and insecticides which are distributed to cocoa farmers, through the COCOBOD inputs distribution programmes, whose costs are borne by all cocoa farmers through the reduction of the gross price of cocoa by COCOBOD before the announcing of local producer prices in October Ninth, one area of work for CSOs is to assist farmers and farmer groups to lobby for increased producer prices and various measures to improve the welfare of farmers. This work can be undertaken by CSOs in an annual assessment and computation of local cocoa producer prices taking into account world cocoa prices. These prices could then be compared to those announced by COCOBOD as alternative benchmarks for the setting of local prices. Industry costs are subtracted from the total gross revenues of the expected total cocoa output before the local producer prices are derived.

Very high industry costs reduce the actual producer prices paid to cocoa farmers by COCOBOD. An important area of activity for CSOs is to ensure that industry costs deductions by COCOBOD are not excessive and are consistent with international benchmarks. Appendix 6 illustrates the income of a typical cocoa farmer versus his/her living income showing the gap needed to be bridged to improve the welfare of cocoa farmers. This information is obtained from the KIT real income study for cocoa published through the INKOTA netzwerk.

Importantly, the analysis of income diversification activities of cocoa farmers established that farmers who owned and directly managed their cocoa farms tended to undertake less income diversification activities and rather focussed more on the management of their cocoa farms.. An increase in cocoa producer prices by COCOBOD would encourage better management of farms by cocoa farmers especially the less educated and older farmers who rely on cocoa as a major source of their livelihood. Given the relatively large depreciation of the Ghana cedi over the last year, it is imperative that COCOBOD revisit the issue of unchanged cocoa prices during 2019.

Finally, we suggest that a nationwide survey of all the cocoa producing regions of the country is undertaken for a better generation of findings and more specific policy directions. This survey undertaken and reported here could be described as a rapid reconnaissance one. Given its findings which are innovative and revealing, we suggest that the study and its related survey be replicated throughout the six cocoa producing regions of Ghana aiming at a sample size of about 600 farmers to establish more definitive conclusions that pertain for the whole country. The suggested study could be undertaken in 2019 or 2020.

REFERENCES

1. Aidam. P. W. and Anaman, K.A. (2014). "Export Earnings Instability and Investment in Ghana, 1981 to 2011", *Modern Economy*, 5, 625-634.
2. Agona East District Assembly (AEDA) (2013). *Annual Progress Report 2*, AEDA, Agona Nsaba.
3. Anaman, K.A. (1977). *Some Economic Aspects of Cocoa Production in the Techiman Cocoa District of Brong Ahafo.* Bachelor of Agricultural Economics Thesis, University of Ghana, Legon, Accra, Ghana, 144 pp. DOI: 10.13140/RG.2.1.4563.0324.
4. Anaman, K.A. (1988). *African Farm Management: Principles and Applications with Examples*, Ghana Universities Press, Legon, Accra, Ghana.
5. Anaman, K. A. (2014). *Research Methods in Economics and Other Social Sciences Second Edition*, Lambert Academic Publishing, Saarbrucken, Germany.
6. Balaam, D.N. and Veseth, M. (2008). *Introduction to International Political Economy Fourth Edition*, Pearson and Prentice Hall, New Jersey, United States.
7. COCOBOD (undated). *Regulations and Guidelines for the Privatization of Internal Marketing of Cocoa,* COCOBOD, Accra, Ghana
8. Daud, A. S., Awoyemi, T. T., Omotoso, A. B. and Omotayo, A. O. (2018). "Human Capital and Income Diversification among Crop Farmers in Rural Oyo State, Nigeria", *Journal of Agribusiness and Rural Development,* 3, 251-260.
9. De Vaus, D.A. (2014). *Surveys in Social Research, Sixth Edition*, Routledge, London.
10. Inkota Netzwerk (2018), Living Income Community of Practice and KIT.
11. Ghana Statistical Service (GSS) (2014). 2010 *Population and Housing Census: Agona East District Analytical Report*, GSS, Accra, Ghana.
12. Ghana Statistical Service (GSS) (2018). *Provisional 2017 Annual Gross Domestic Product*, GSS, Accra, Ghana (April).
13. Ghana Web News (2018). *COCOBOD Boss Cautions Purchasing Clerks Against Cheating Poor Farmers*, 20 August Issue.
14. Government of Ghana (2017). *The Budget Statement and Economic Policy of the Government of Ghana for the* 2017 *Financial Year*, Presented to Parliament on 2 March 2017 by the Ministry of Finance and Economic Planning, Accra, Ghana.
15. Gujarati, D. N. (2013). *Basic Econometrics, Fourth Edition*, McGraw-Hill, New York.
16. Hayami, Y. (2009). "Social Capital, Human Capital, and the Community Mechanism: Toward a Conceptual Framework for Economists", *Journal of Development Studies*, 45(1), 96-123.

17. Hall, B. H. and Cummins, C. (2009). *Time Series Processor (TSP) Version 5 Reference Manual*. TSP international, Palo Alto, California, United States.

18. International Cocoa Organisation (ICCO). *Quarterly Bulletin of Cocoa Statistics*, Various Issues, ICCO, Abidjan, La Cote D'Ivoire.

19. Kherallah, M., C. Delgado, E. Gabre-Madhin, N. Minot, and M. Johnson (2000). *Agricultural Market Reforms in Sub-Saharan Africa: A Synthesis of Research Findings*, International Food Policy Institute, Washington, D.C.

20. Kolavalli, S., Vigneri, M., Maamah, H., and Poku, J. (2012). *The Partially Liberalized Cocoa Sector in Ghana: Producer Price Determination, Quality Control, and Service Provision*, International Food Policy Research Institute (IFPRI), Washington, D.C.

21. Kolavalli, S. and Vigneri, M. (2011). "Cocoa in Ghana: Shaping the Success of an Economy", *Yes, Africa Can: Success Stories From A Dynamic Continent*, pp. 201-208, World Bank, Washington, D.C.

22. Kotey, R.A., Okali, C. and Rourke, B.E. (editors; 1974). *Economics of Cocoa Production and Marketing*, Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana, 547 pp.

23. McIntire, J. and Varangis, P. (2001). *Reforming the Cocoa Marketing and Pricing System in La Cote d'Ivoire*, World Bank, Washington, D.C., United States.

24. Minot, N., Epprecht, M., Anh, T. T. T., Trung, L. Q. (2006*). Income diversification and Poverty in the Northern Upland of Vietnam*, Research Report No 145, International Food Policy Research Institute, Washington, D.C., United States.

25. Murtiya, A., Lumbonyi, C.A., Abdullah, A., Olayiwola, S.A., Yaduma, Z.A. and Abdullahi, A. (2016). "Livelihood Diversification and Income: A Case Study of Communities Along the Kiri Dam, Adamawa State, Nigeria", *Journal of Agribusiness and Rural Development*, 4, 483-492.

26. Sackrey, C., Schneider, G. and Knoedler, J. (2016). *Introduction to Political Economy Eighth Edition,* The Economic Affairs Bureau, Boston, United States.

27. Stryker, J. D. (1990). *Trade, Exchange Rate, and Agricultural Policies in Ghana. World Bank Comparative Studies*, World Bank, Washington, D.C.

28. Tyszler, M., Bymolt, R. and Laven, A. (2017). *Analysis of the Income Gap of the Cocoa Producing Households in Ghana: Comparison of Actual Incomes with the Living Income Benchmark*, Royal Tropical Institute, Amsterdam, The Netherlands.

29. Varangis, P. and Schreiber, G. (2001). "Cocoa Market Reforms in West Africa", in Akiyama, T., Baffes, J., Larson, D., and Varangis, P. (eds.), *Commodity Market Reforms: Lessons of Two Decades, World Bank*, Washington, D.C., pp. 35-82.

30. Vigneri, M., and Kollavali, S. (2018). *Growth through Pricing Policy: The Case of Cocoa in Ghana*, Food and Agriculture Organization, Rome, Italy.

31. Vigneri, M. and Santos, P. (2009). *What Does Liberalization without*

Price Competition Achieve? The Case of Cocoa in Ghana, Paper presented at the International Association of Agricultural Economists, 2009 Conference, Beijing, China, August, pp. 16-22.

32. Wiah, E. N. and Twumasi-Ankrah, S. (2017). "Impact of Climate Change on Cocoa Yield in Ghana Using Vector Autoregressive Model", *Ghana Journal of Technology*, 1(2), 32-39.

APPENDICES

Appendix 1:
Size of Nominal GDP in Millions of Ghana Cedis and the Distribution of Nominal GDP at Basic Prices Per Economic Activity and Sector from 2006 to 2017 (Percent)

Year	Size of Nominal GDP	Cocoa Industry	Agricultural Sector	Industrial Sector	Services Sector
2006	18,705.0	3.0	30.4	20.8	48.8
2007	23,154.0	2.7	29.1	20.7	50.2
2008	30,179.0	2.5	31.0	20.4	48.6
2009	36,598.0	2.5	31.8	19.0	49.2
2010	46,042.0	3.2	29.8	19.1	51.1
2011	59,816.0	3.6	25.3	25.6	49.1
2012	75,315.0	2.6	22.9	28.0	49.1
2013	93,415.9	2.2	22.4	27.8	49.8
2014	113,343.0	2.2	21.5	26.6	51.9
2015	136,957.4	1.8	20.3	25.1	54.6
2016	167,353.0	1.7	18.9	24.2	56.8
2017	205,914.0	1.8	18.3	25.5	56.2
Average 2006 to 2017	-	2.5	25.1	23.6	51.3

Note
The figures are sourced from the GDP Statistics based on data from the Ghana Statistical Service (2018).

Appendix 2:
Annual Growth Rates of Real GDP, Agricultural Sector, Industrial Sector and Services Sector from 2007 to 2017, based on 2006 Constant Monetary Values (%).

Year	Real GDP	Cocoa Industry	Agricultural Sector	Industrial Sector	Services Sector
2007	4.3	-8.2	-1.7	6.1	7.7
2008	9.1	3.2	7.4	15.1	8.0
2009	4.8	5.0	7.2	4.5	5.6
2010	7.9	26.6	5.3	6.9	9.8
2011	14.0	14.0	0.8	41.6	9.4
2012	9.3	-9.5	2.3	11.0	12.1
2013	7.3	2.6	5.7	6.6	10.0
2014	4.0	4.3	4.6	0.8	5.6
2015	3.8	-8.0	2.8	-0.3	6.3
2016	3.5	-7.0	3.0	-1.4	5.7
2017	8.5	17.3	8.4	16.7	4.3
Average 2007 to 2017	7.0	3.7	4.2	9.8	7.7

Note

The figures are sourced from the GDP Statistics based on data from the Ghana Statistical Service (2018).

Appendix 3:
Size of the Real GDP, Real Value Added to GDP by the Cocoa Industry, Real Value Added to GDP by the Agricultural Sector, Real Value Added to GDP by the Industrial Sector and the Real Value Added to GDP by the Services Sector in Ghana from 1993 to 2017 Based on 2006 Constant Values (Millions of Ghana Cedis)

Year	Real GDP	Real Value of Cocoa Industry	Real Value of Agricultural Sector	Real Value of Industrial Sector	Real Value of Services Sector
1993	10329.6	189.7	3123.6	2008.5	4402.5
1994	10667.3	212.9	3181.9	2067.7	4620.6
1995	11096.5	236.4	3301.0	2140.6	4836.2
1996	11606.5	243.2	3473.3	2236.4	5040.6
1997	12093.8	265.9	3622.5	2384.1	5370.7
1998	12661.4	295.4	3807.8	2461.6	5694.9
1999	13222.1	294.0	3955.4	2583.7	5980.4
2000	13716.1	312.2	4039.2	2683.4	6300.5
2001	14289.8	309.1	4201.4	2771.6	6620.0
2002	14939.7	307.5	4384.4	2903.4	6931.7
2003	15723.7	358.0	4650.4	3047.7	7256.4
2004	16600.8	465.0	4974.6	3195.2	7613.3
2005	17575.0	526.5	5180.5	3422.7	8142.2
2006	18705.1	537.2	5415.0	3704.0	8690.0
2007	19518.0	493.2	5322.0	3930.0	9358.0
2008	21304.0	509.1	5716.0	4522.0	10106.0
2009	22336.0	534.5	6129.0	4725.0	10667.0
2010	24101.0	676.7	6453.0	5053.0	11715.0
2011	27486.0	771.4	6507.0	7157.0	12813.0
2012	30040.0	698.5	6657.0	7947.0	14361.0
2013	32237.0	717.0	7035.0	8475.0	15798.0
2014	33522.0	748.0	7362.0	8542.0	16679.0
2015	34808.1	688.5	7567.0	8513.0	17734.0
2016	36016.0	640.2	7790.0	8475.0	18747.0
2017	39077.4	750.9	8441.0	9888.0	19554.0

Note

The figures are sourced from the GDP Statistics based on data from the Ghana Statistical Service (2018).

Appendix 4:
Derivation of the Optimal Sampling Size Used for the Study

The optimal sample size of 81 was established based on statistical theory using the concepts of binomial and normal probability distributions. An oversampling of 19 persons was done to increase the optimal sample size 100 (81+19). The assumptions were that each residential house contained at least one cocoa farmer; 30% of cocoa farmers were women; thus male farmers constituted 70% (p=0.30 and q=0.70). The assumption that about 30% of cocoa farmers in the villages were female was given to the consultant by the chiefs of these villages.

Allowing for 10% maximum standard error (MSE) to be achieved with 95 percent confidence level (1.96 standard errors from a normal distribution), the optimal sample size (n) was derived as follows:

MSE = s * 1.96 = 0.10. s = [(p * q)/n]0.5

s = 0.10/1.96= 0.0510 = [(0.7*0.3)/n]0.5 **0.00260 = (0.21/n)**

n = 384.615*0.21 **n = 80.769 or 81**

APPENDIX 5:
SUMMARY INFORMATION GATHERED FROM TWO STRUCTURED FOCUS GROUP MEETINGS INVOLVING TEN PEOPLE EACH AT SETH OKAI AND NINTA COCOA VILLAGES IN THE AGONA EAST DISTRICT, JULY 2018.

The following statements summarize the findings of the two focused group discussions (FGDs) with cocoa farmers and other people actively involved in the industry that took place in July 2018 at the Seth Okai and Ninta villages.

Regarding farmers' motivations to enter into cocoa production, nearly all of them strongly indicated being inspired by the desire to earn more income. Participants indicated several challenges affecting cocoa production in the area. These included the high cost of inputs which hindered the achievement of the potential outputs of their farms. Due to the high cost of labour, many farmers relied on their own labour and those of their family members necessitating the need to employ children for operations such as harvesting of cocoa beans and fetching water from streams for the spraying of cocoa trees.

Other challenges indicated by the participants were the non-availability of fertilizers under the inputs distribution programme of the Ghana Cocoa Board and the very high cost of fertilizers available from the open or free markets. In spite of the current government policy on fertilizer subsidization, farmers expressed disappointment as the price still remained high for them. Most farmers hardly applied fertilizer to their older cocoa trees.

Another issue that came out during the FGDs was the politicization of the previous government's programme on "free fertilizer distribution" undertaken

by the Ghana Cocoa Board. Farmers indicated that while there was no direct payment under that initiative, only those who were closely involved with the ruling political party had the opportunity to get fertilizers under this programme. Some participants indicated that some fertilizers were even given to non-cocoa farmers who ended up re-selling them to cocoa farmers for profits.

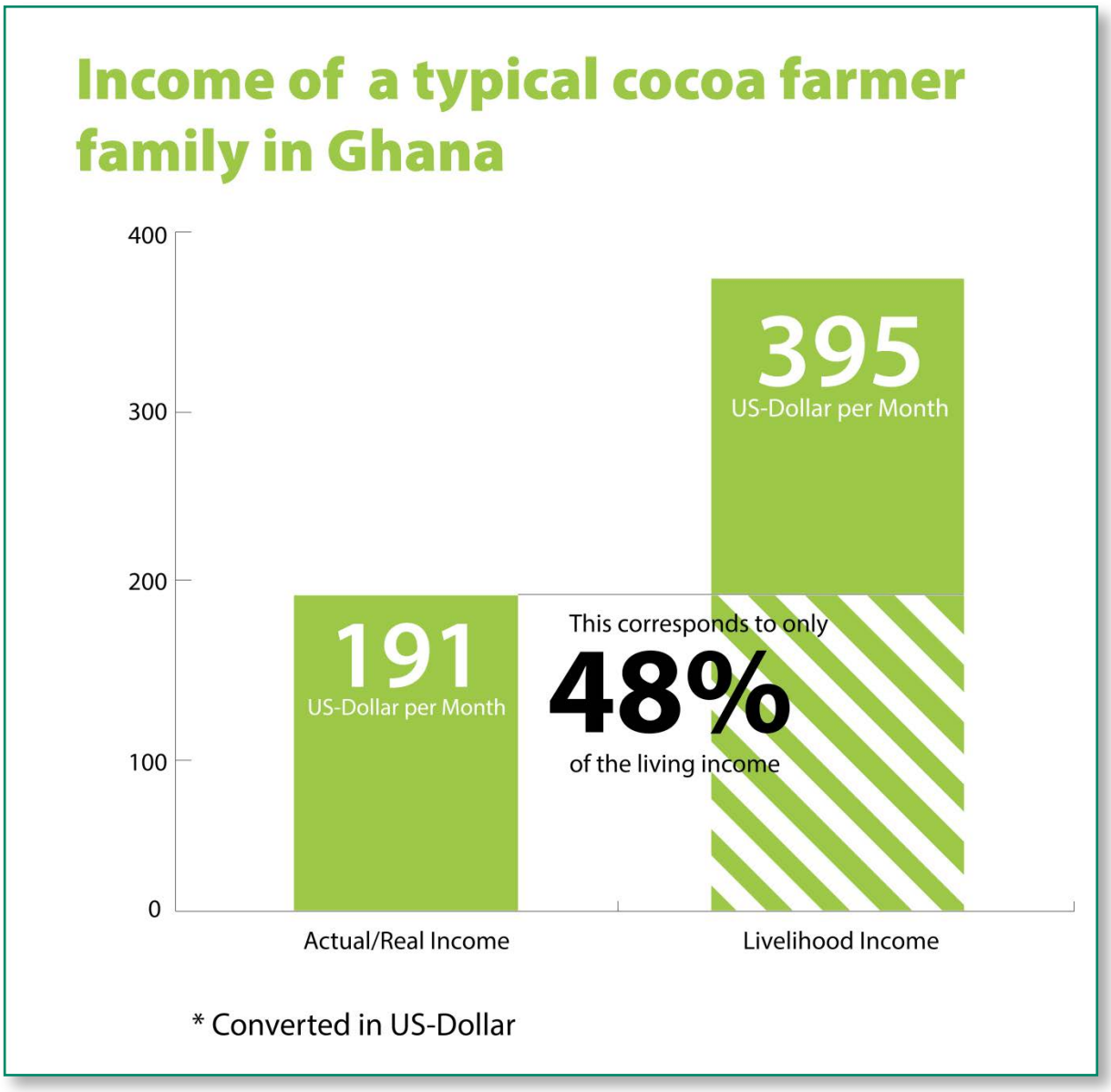
The mass spraying programme undertaken by the Ghana Cocoa Board attracted a lot of viewpoints in the discussion. Generally, participants were of the view that the programme was good and helped to improve yields of cocoa farmers. The Ghana Cocoa Board should intensify its efforts and expand the programme throughout the country.

Regarding transparency, participants indicated of having little knowledge of how players such as foreign companies, international bodies, civil society organizations and cocoa buying companies influenced the local producer prices that they received for their cocoa beans. To them, ordinary cocoa farmers and their associations tended to have almost zero influence in the price determination process. However, all participants thought that the government and Ghana Cocoa Board were the key players in the determination of local cocoa producer prices.

One other issue that came out was the weighing scale adjustment fraud which was perpetrated by purchasing clerks at the point of sale of dried cocoa beans. This problem was considered by almost all the participants as serious. This problem needed to be stamped out from the cocoa industry. Groups of farmers that were thought to be more affected by this fraud included women cocoa farmers, less educated farmers and less experienced cocoa farmers. Several participants suggested increased levels of monitoring by the Ghana Cocoa Board including surprise visits to buying centres to reduce this problem. Further, they urged the Ghana Cocoa Board and interested organizations to assist farmers with improved educational awareness programmes to reduce the level of fraud. One way suggested by some farmers to reduce the problem was for the purchasing clerk to weigh a standardized stone on the weighing scale first before weighing the dried cocoa beans stored in the sack. The weighing of the standardized stone or object was to ensure the workability of the weighing machine and for the farmer to have an idea of its weight.

Finally, nearly all participants indicated that the local cocoa producer prices were low and needed to be increased by the Ghana Cocoa Board this year (in October 2018). The lack of increase in local cocoa producer prices had affected their welfare in all aspects of their lives. The maintenance of bearing cocoa trees had been reduced due to the difficulty in hiring required labour for this operation. The increase in local cocoa producer price would help farmers to provide a better livelihood for themselves and their families.

Appendix 6:
Illustration of the Income of a Typical Cocoa Farmer and Living Income



Source: *INKOTA Netzwerk (2018).*

SEND WEST AFRICA HAS THREE AFFILIATES: SEND GHANA, LIBERIA AND SIERRA LEONE

SEND-WEST AFRICA

Siapha Kamara,
Chief Executive Office
+233 208 112 322
+233 242 038 533 (Ghana)
+231 886 453 326 (Liberia)
+232 785 923 18 (Sierra Leone)
siapha.kamara@sendwestafrica.org

SEND GHANA

George Osei-Bimpeh
Country Director
A28 Regimanuel Estate
Nungua Barrier, Sakumono,
Accra, Ghana
+233 302 716 860/716 830
+233 204 509 481
osei-bimpeh@sendwestafrica.org

SEND LIBERIA

Samuel N. Duo Ph.D
Acting Country Director
P. O. Box 1439
Robert Field Highway, Schiefflin Community
Lower Margibi Country, Liberia
+231 886 230 978
sendliberia@yahoo.com

SEND SIERRA LEONE

Joseph Ayamga
Country Director
Buedu Road Kissi Town
Kalaihun, Sierra Leone
+232 78 20 68 53
ayamga.sensl@gmail.com

www.sendwestafrica.org

sendghanaofficial @send_ghana

DESIGNED & PRINTED BY
BLUEVYNE +233 (0) 0504 662 121