CSIR COLLEGE OF SCIENCE AND TECHNOLOGY

ASSESSING THE CONTRIBUTION OF CERTIFIED COCOA PRODUCER ORGANISATIONS TO CLIMATE CHANGE ADAPTATION IN THE AHAFO REGION OF GHANA

ADWOA BAAH ADJEBENG-DANQUAH

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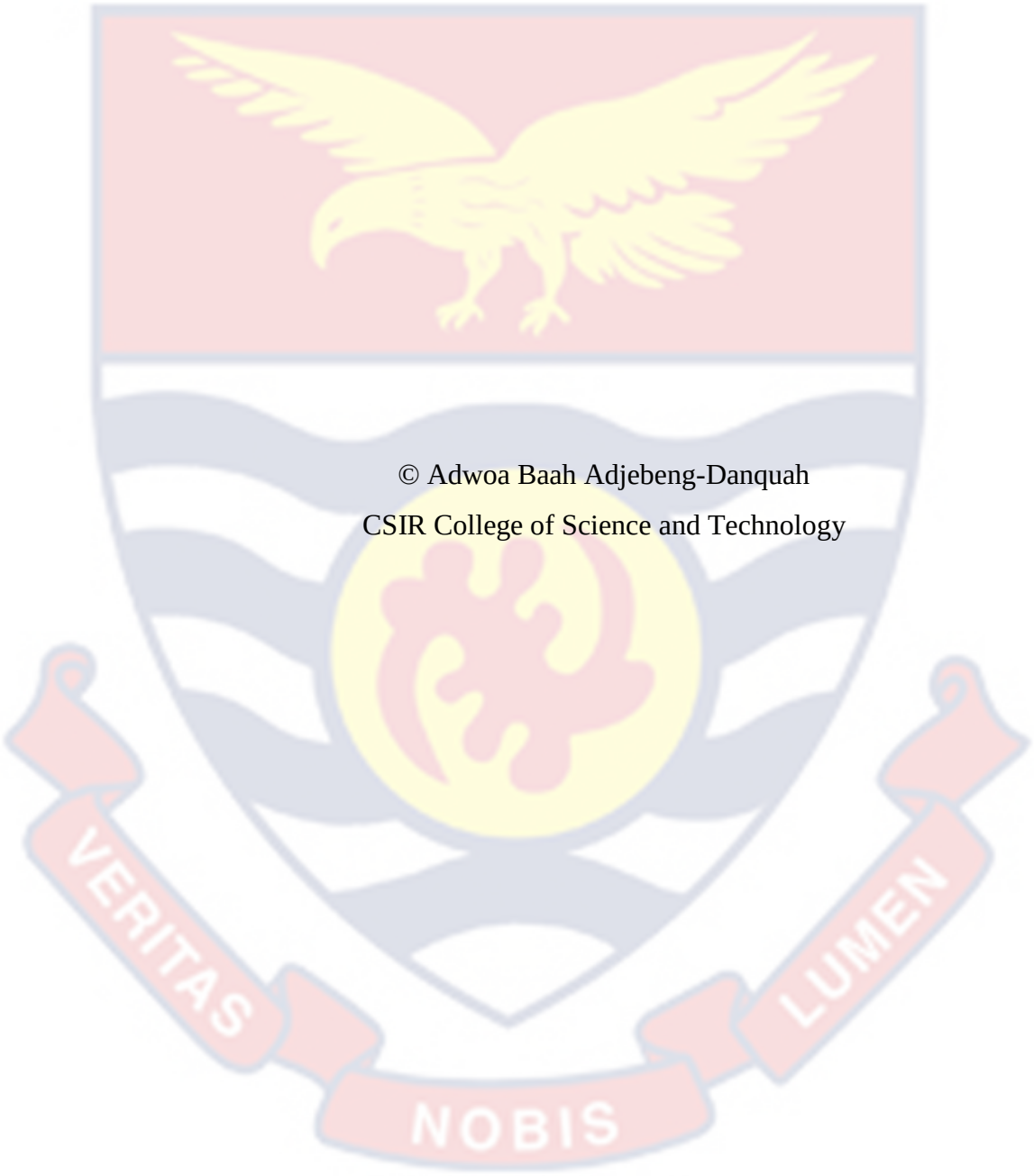

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ASSESSING THE CONTRIBUTION OF CERTIFIED COCOA PRODUCER ORGANISATIONS TO CLIMATE CHANGE ADAPTATION IN THE AHAFO REGION OF GHANA

BY

ADWOA BAAH ADJEBENG-DANQUAH

Thesis submitted to the Department of Natural Resources Management of the CSIR College of Science and Technology, in partial fulfilment of the requirement for the award of Master of Philosophy degree in Climate Change and Natural Resources Management

JULY 2023

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this college or elsewhere.

Candidate's Signatur:  Date: 6th March, 2024

Name: Adwoa Baah Adjebeng-Danquah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the CSIR College of Science and Technology.

Principal Supervisor's Signature:..……Date:……

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Co-Supervisor's Signature:……....Date:……...

Name: Dr. Reginald T. Guuroh

ABSTRACT

Climate change adaptation in Ghana has been of concern over the years. This study examined how cocoa producer organisations contribute to climate change adaptation in a Asunafo North Municipality, Ghana by analyzing 405 responses gathered using questionnaires. The study identified the standard strategies within the certification scheme that promote climate change adaptation, assessed the effectiveness of the strategies for climate change adaptation, determined the correlation between these strategies and the adaptation of climate change and determined the challenges to climate change adaptation by farmers. The study revealed that farmers enjoy trainings and farm development from certified cocoa producer organisations to climate change adaptation ($\bar{x}$ = 3.84, SD = 0.44). The cocoa producer organisation and members' standards had a positive statistical relationship with farmers' adaptations to climate change ($r = 0.67$, $p < 0.001$), significantly predicting climate change adaptation ($\beta = .728$, $p < .001$). In all, the study found that cocoa producer organisation certification accounted for 54% variance in explaining climate change adaptation measures ($F = 73.53$, $p < .001$). The study revealed expensive farm inputs, fertilizer/input politicization, cost of hiring mechanized spraying machines, Illegal logging activities, Pest and diseases control and lack of irrigation systems as challenges faced by farmers. The study recommends that the non-certified farmers get certified to enhance productivity as well as effectiveness.

KEYWORDS

Adaptation

Certification

Climate Change

Cooperative

Standards

Strategies

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I am highly indebted to my husband and children. I appreciate their love, understanding, motivation, prayers, sacrifices, continuous support and willingness to give me an education and a better future. I am most grateful to my parents for their continuous support and encouragement. God bless each and every one who supported this work.

DEDICATION

To my husband, children and parents

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LIST OF ACRONYMS

CCE	Certification Capacity Enhancement
CMC	Cocoa Marketing Company
COCOBOD	Ghana Cocoa Board
FAO	Food and Agricultural Organisations
IFOAM	International Federation of Organic Agriculture Movement
IPCC	Intergovernmental Panel on Climate Change
JHS	Junior High School
LBC	Licensed Buying Companies
MSCL	Middle School Leaders Certificate
PPRC	Producer Price Review Committee
SHS	Senior High School
UNFCCC	United Nations Framework Convention on Climate Change

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CHAPTER ONE

INTRODUCTION

Background to the Study

Certification is a procedure by which a third party gives written assurance that a product, process or service conforms to certain standards. Certification can be seen as a form of communication along the supply chain. The certificate demonstrates to the buyer that the supplier complies with certain standards, which might be more convincing than if the supplier itself provided the assurance. The organisation performing the certification is called a certification body or certifier. The certification body might do the actual inspection, or contract the inspection out to an inspector or inspection body.

The certification decision, i.e., the granting of the written assurance or "certificate", is based on the inspection report, possibly complemented by other information sources (Foundjem-Tita, Donovan, Stoian, & Degrande, 2016). Certified producer organisation refer to a farmer-based organisation that have been certified against a certification scheme by a recognized certification body. They include Fairtrade, Rainforest Alliance, organic certification schemes and among others. These cocoa producer organisations have certification identification obtained from the certification schemes by their membership which requires them to strictly abide by certain production, environmental and social compliance standards.

Agricultural expansion is the predominant cause of deforestation responsible for about 80% of total deforestation in the world (Austin, Schwantes, Gu, & Kasibhatla (2019). In addition, covering an estimated 1.8 million ha of land, cocoa is the single most important agricultural commodity

driver of deforestation. From 1990 to 2008, about 27% of total deforestation in Ghana is estimated to have been driven by cocoa cultivation (Acheampong, Macgregor, Sloan, & Sayer (2019). In Ghana, conversion of the intact forest has increased from 2.8% per year from 1986 – 2000 to 6.1% from 2000 – 2011 (Fountain & Hutz-Adams, 2015).

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate that is attributed directly or indirectly to human activity, altering the composition of the global atmosphere. The phenomenon of climate change is caused by both natural and anthropological factors (UNFCC, 2007). Climate change is manifested in Ghana through (i) rising temperatures, (ii) declining rainfall totals and increased variability, (iii) rising sea levels and (iv) high incidence of weather extremes and disasters (Kabo-Bah *et al.*, 2014).

The Intergovernmental Panel on Climate Change (IPCC) predicted spatially differentiated climate impacts for cocoa in Côte d'Ivoire and Ghana, with losses of climatic suitability especially near the forest-savannah transition, and smaller negative or positive changes in other areas. Overall, they predicted a decrease in climatic suitability for cocoa in these two key cocoas producing countries that, if not addressed, could impact future world cocoa supplies as indicated by Läderach, Martinez-Valle, Schroth, and Castro (2013). Ghana's intact forest sector according to the Forestry Commission has dwindled from about 8.2 million hectares in the 1900s to about 1.5 million hectares in the 2010s. And cocoa as a crop planted mostly in the forest areas paints a bleak picture of its sustainability as the forest cover continues to decline (Forestry Commission, 2016).

The agriculture sector is very vulnerable to climate change because it is mostly dependent on rainfall. Climate change is likely to intensify seasonal and inter-annual rainfall variation (for example, drought in one year and floods in the next), as long-term changes and trends take place (for example, rising annual mean temperatures) (IPCC, 2019).

Intergovernmental Panel on Climate Change (IPCC) defines adaptation as adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects (Smith *et al.*, 2001). It includes adjustments to moderate harm from, or to benefit from, current climate variability as well as anticipated climate change.

In the economic sectors, agriculture which is the largest employer within the Ghanaian economy suffers the most from climate change. The distribution of rainfall is the single most important factor affecting agriculture. The increasing variability of rainfall increases the risk associated with farming as prediction becomes almost impossible. Total rainfall amounts are projected to fall or experience great variability which will impact crop production and the livelihoods of many in rural areas (Kotir, 2011). The social fallouts of climate variability will include changes in land tenure arrangements and social relations, migration and subsequent urban vulnerability. Agricultural production is predominantly rain-fed and any changes in rainfall pattern would have a serious impact on productivity (Ghana National Climate Change Adaptation Strategy, 2012).

The severity of climate change impacts is felt mostly by poorer groups depending on natural resource-based activities and living in marginal environments. The socio-economic groups affected most by climate change

include small-scale food crop farmers, women small-scale farmers, Livestock operators, fishermen and fishmongers, slum dwellers, and migrant farmworkers. These groups are vulnerable due mostly to institutional bottlenecks, legal frameworks, poor capacities and market imperfections. These non-climate drivers of vulnerability define the access patterns of different people in different places to productive resources which build resilience and adaptive capacity (Ghana National Climate Change Adaptation Strategy, 2012).

This study looks into how certified producer organisations have helped cocoa producers to adapt to climate change impacts. The focus is mostly on adaptation since the standards of these certification bodies are very much concentrated on how best to build the environmental and socio-economic resilience of producers to enhance sustainable production. The mitigation strategy which often involves policy engagements, international, regional and national carbon emission reduction Programs such as the REDD+ only involve producers at the micro-level hence the reason why this study is restricted to adaptation.

Statement of the Problem

In Ghana, like many other parts of the world, climate change or variability may have a dwindling effect on agricultural activities, including cocoa production. The continued deforestation for cocoa is not sustainable for the industry in a changing climate, and companies have taken some of the first steps to improve the social and environmental footprint of their operations. Despite their limitations, some companies are utilizing certification schemes

that seek to promote responsible practices, while others are relying on their community programs in combination with certification, to support climate-smart practices of smallholder farmers. However, there are growing concerns on whether building the capacity of farmers through certification lead to climate change adaptation and mitigation. While certification standards in the agriculture sector are a central component of private-sector commitments to reduce deforestation and forest degradation, there is little empirical evidence regarding their large-scale and long-term impacts on forests.

Several smallholder cocoa farmers in the Ahafo region of Ghana rely on cocoa for their livelihood, yet there is little knowledge of adaptive procedures in the light of climate change in the cocoa-producing communities Some studies done on climate change, its effect and adaptation strategies in Ghana have targeted food crop farmers (Etwire, Fielding, & Kahui, 2019; Fosu-Mensah, Vlek, & MacCarthy, 2012; Sienso & Donkoh, 2014). However, the effect of climate change on cocoa cannot be ignored. It is, therefore, significant to access the contribution of certified cocoa producer organisations to response measures and their current adaptation strategies related to climate change.

The popular certification schemes and labels in Ghana are Fairtrade, Organic and Rainforest Alliance. These producer organisations are mostly involved in the crop production sector - cocoa, Shea nuts, banana, mango, pineapple, cashew and coconut. Ideally, producers of these commodities come together to form farmer cooperatives, apply and go through the certification protocols which involves meeting minimum requirements of groups incorporated as a cooperative, limited liability or an association pay

certification fees and undergo an initial audit after which a certificate is issued upon satisfactory performance (Foundjem-Tita *et al.*, 2016). This would help identify the knowledge gap of cocoa farmers on climate change and help prepare them with the necessary knowledge and skills on climate change and increase the production of cocoa. this study is to explores the role of certified cocoa producer organisations in contributing to climate change adaptation. It examines cocoa farmers perceptions of climate change, their adaptation strategies, and investigates the influencing factors within different certification schemes that contribute to enhanced climate change adaptation.

Purpose of the Study

The purpose of the study is to find out how the certification status of producer organisations contribute to their climate change adaptation. The study specifically sought to identify requirements in certification standards that help certified cocoa producers to adapt to climate change.

Research objectives

The main Objective of the study was to assess the contribution of certified cocoa producer organisations to climate change adaptation in the Ahafo Region of Ghana. The specific objectives were:

1. To examine strategies in certification standards and farmers' practical approaches influencing climate change adaptation.
2. To determine the correlation between certification requirements and the adaptation of climate change by cocoa farmers in the study Region.

3. To determine the challenges to climate change adaptation by farmers in the Ahafo Region.

Research Questions

1. What are the strategies in the certification scheme standards that promote climate change adaptation?
2. What are the strategies adopted by the certified producer organisations for influencing climate change adaptation?
3. What is the relationship between these requirements and the farmer's adaptation to climate change at the organisation?
4. What are the challenges to climate change adaptation by farmers in the Ahafo Region?

Significance of the Study

Cocoa certification programs have been implemented in Ghana for a number of years now, however, little work has been done on how these schemes address climate change in the areas of adaptation. The study will contribute to the existing body of knowledge that demonstrate the benefits of certification as an adaptation strategy in addressing climate change. The study will also help to bring to light how producer organisation are using the requirements of certification schemes in addressing climate change in cocoa production. Additionally, the results from this study are expected to deepen the understanding of stakeholder in the cocoa industry on benefits of sustainability schemes.

At the global scale, certification schemes have emerged to address environmental and socioeconomic issues related to cocoa, including biodiversity loss and forest conversion and climate change as a whole. This research would therefore contribute to the body of knowledge in the area of contributions made by certified producer organisations to climate change adaptation.

Companies see multiple benefits from certification. First, they can respond to customer demands by purchasing from known communities where they can track their impact and know that training and efforts to eradicate child labour is taking place. Second, certification offers traceability, which manages their risk over food safety, quality and supply volumes – it is harder to manage a supply chain that is invisible to the brand. Moreover, conserving the ecosystem and introducing practices such as tree planting and nurseries helps secure the long-term supply of cocoa (Fountain & Hutz-Adams, 2015).

Delimitation

In terms of scope the study was limited to mechanisms/standards within the certification scheme that promotes climate change adaptation, assess these mechanisms/standards and how they have helped the producer organisations to adapt to climate change, determine the correlation between these strategies and the adaptation of climate change in the study Municipality and determine the challenges to climate change adaptation by farmers.

Limitations

A lot of hard work was required in investigating and establishing the challenges faced by the cocoa purchasing process in Ghana in ensuring how the certifications process is carryout in the cocoa sector. This was because the study employed questionnaire interview surveys in gathering data for this study work. This study method was centered on some perceived variables facing Ghana's cocoa sector. Hence, the method of analysis heavily depends on detailed research and interviews among variables forming the sampling size for this research work. The sample size could have been bigger than what was chosen due to time and financial constraints.

Organisation of the Study

The study consists of five chapters. Chapter One is the introduction which has outlined the background and the statement of the problem. The chapter also has delineated the purpose of the research, its objectives and research questions. The chapter further addressed the significance of the study and it concluded by explaining the delimitation and limitation of the study. In this part, only literature related to this topic were surveyed.

The chapter, therefore, starts by surveying the educational acts which support the functions of the certification bodies in Ghana. Other issues surveyed in this chapter include cases of community involvement from around the globe and their impact on education development. The chapter ends by giving a summary of the whole chapter. Chapter Three confers the research methodology that guided the study. In this part, research design, the sampling methods and methods of data analysis are discussed. Chapter Four provides

analysis, presentation and discussion of the findings. The final chapter summarizes the findings and provides recommendations for both administrative reactions and further research.

CHAPTER TWO

LITERATURE REVIEW

Climate Change and Its Effect on Cocoa Production in Ghana

Climate change is a global phenomenon that influences human presence these days. This includes unpredictable weather and modifications to natural components such as icy masses. It has a profound effect on individual nations' economic strength worldwide (Folke *et al.*, 2021). Be that as it may, it is getting to be progressively clear that the climate is changing, and its impacts have gotten to be more recognizable on agricultural production (Bukola, Oluwadunsin, & Abimbola, 2021)

Climate change is caused by the release of 'greenhouse' gases into the atmosphere (Kemausuor *et al.*, 2011). These gases accumulate in the atmosphere, which results in global warming. The related factors which cause changes in global climate such as temperature, precipitation and soil moisture, block the transmission of heat levels, Therefore, rainfall should be plentiful and well distributed throughout the year (Owoeye & Sekumade, 2016).

Currently, the agricultural sector contributes 22% of Ghana's GDP and employs 42% of the economically active workforce (Ghana Statistical Services, 2012). The sector has been described as the bedrock of the country in polst-independence history. One major contributor to agriculture's share of Ghana's GDP is the cocoa sub-sector. Apart from all other crops combined, the cocoa subsector contributed 13.3% to agriculture's share of Gross Domestic Product (GDP) in 2012 (Ghana Statistical Services, 2012).

The total land area under production in 2012 was 16,007,000 hectares with an average yield of 0.4 metric tons per hectare (Ministry of Food and

Agriculture, 2013). Institute of Statistical, Social and Economic Research (ISSER) (2013) noted that Ghana has recorded economic growth despite the world recession as a result of an increased price for Ghana's major export commodities, cocoa, and gold. For instance, Ghana received US$2.8 billion and US$5.6 billion export revenues from cocoa and gold, respectively; accounting for 62% of export receipts in 2012 (Institute of Social, Statistical and Economic Research, 2013). Ehiakpor *et al.* (2016) therefore described cocoa as a notable industrial tree crop that dominates agricultural exports.

Locally, cocoa production provides an important source of employment and income for many households and it is estimated that cocoa production accounts for the livelihoods of over 800,000 smallholder families (350,000 farm owners) in Ghana (Anim-Kwapong & Frimpong, 2006). The authors further noted that the share of cocoa to smallholder household annual income is between 70–100%. The implication is that some households depend entirely on cocoa production for all their income needs. Ghana's cocoa production is concentrated in the forest belts; Ashanti, Western, Eastern, Volta, Brong Ahafo and Central regions due to their favourable weather, especially, the high levels of rainfall as well as the bi-modal nature of the rains (Asare, 2018).

Unfortunately for Ghana, like many other parts of the world, climate change or variability may have a dwindling effect on agricultural activities, including cocoa production. The features of weather variability have over the years affected the production of cocoa. For instance, variation in the two key weather parameters, rainfall and temperature affect the sprouting and growth of the cocoa trees as well as the cocoa pods. The variation in rainfall patterns

most times confuse farmers and alter the cocoa tree's production process. Farmers study the weather to apply inputs like fertilizer and pesticides to supplement soil nutrients and prevent insects and diseases while the normal (Kongor *et al.*, 2018).

According to Kothari (2004), a research design is a strategy, the roadmap and the general outline which is followed in the pursuit of information that is used to answer the questions of a research project. It is the crux of general research work. The research design is the general strategy that is used to integrate the different aspects of the study logically in a coherent manner to ensure that the research problem is realized in a definite and clear manner (Kothari, 2004). Yin (1992) also noted that the research design constitutes the logic linking the empirical data to be collected, and the research questions to the conclusion of the study. The research design is therefore that logical model which helps the researcher in identifying the needed data to suffice the objectives of research work. The research problem is what determines the kind of research design that should be employed to address it (De Vaus, 2001).

The Perception of Cocoa Farmers on Climate Change and Adaptation Strategies

According to the Intergovernmental Panel on Climate Change (IPCC, 2012), climate is the average weather conditions of a particular geographical area, measured over a longer period. Generally, climate refers to the patterns of variation in variables such as temperature, rainfall, humidity, wind, atmospheric pressure and precipitation. Climate change is a long-term

continued change, either increase or decrease, in the average weather condition. Climate change is the changes in the climate condition as a result of the changes in the mean and/or the variability of its properties and that which persists for an extended period, typically decades or longer (National Aeronautics and Space Agency, 2015).

On the other hand, climate variability is the year-to-year fluctuations in the average weather condition. Climate variability refers to how each year's climate deviates from a long-term average climate value. These changes must be measurable by statistical tests and may result from natural occurrences or human activities that affect the composition of the environment. This means that climate variability defines short term changes while climate change describes long-term changes in a climate variable. For example, rainfall variability is the differences in rainfall from place to place (spatial variability) or the differences in rainfall between years (inter-annual variability) (Jiri, Mafongoya, & Chivenge, 2015).

Generally, temperatures have increased by about 1°C over the last 40 years of the twentieth century as rainfall reduced by about 20% while projections for Ghana indicates that the country is experiencing temperature increase in all agro-ecological zones by an average of 0.25°C from 2010 to 2020 (Environmental Protection Agency of Ghana, 2014).

Normally, farmers' perception is partly based on past observations with a key interest in the recent climatic events to form their perceptions of climatic conditions and to make their decisions about adaptive behaviour (Bryman, 2013). However, farmers' opinions may be influenced by others through collaborations. This, notwithstanding, the farmers decide on the

choice of trends in the climate variables. In a study by Bryman (2013), two main variables, temperature, and rainfall were used as indicators for measuring climate variability. The study defined climate variability as perceived changes (year to year variations) in the average temperature and rainfall in recent times (less than 10 years). Farmers were asked about their perception of the year-to-year variations in temperature and rainfall for the past 10 years.

The results indicated that the majority (69.5%) of the farmers perceived an increase in the average temperature while 22.5% perceive an increase in the average rainfall. Additionally, 17.5% and 52.08% perceived a decrease in temperature and rainfall, respectively. However, 12.92% and 25.42% of the respondents claimed they observed no change in average temperature and rainfall respectively. On rainfall, in particular, the farmers stated that the main change was the later onset of the rains leading to a short rainfall season. In a similar study, Obeng (2014) found that as high as 85.7% and 87% of smallholder farmers perceived precipitation as decreasing and average temperature as increasing, respectively.

The Contribution of Certification and Certified Producer Organisations to Climate Change Adaptation

Certification is a procedure by which a third party gives written assurance that a product, process or service conforms with certain standards. Certification can be seen as a form of communication along the supply chain. The certificate demonstrates to the buyer that the supplier complies with certain standards, which might be more convincing than if the supplier itself provided the assurance (Kimengsi & Tosam, 2013). The organisation

performing the certification is called a certification body or certifier. The certification body might do the actual inspection, or contract the inspection out to an inspector or inspection body. The certification decision, i.e., the granting of the written assurance or "certificate", is based on the inspection report, possibly complemented by other information sources (Foundjem-Tita *et al.,* 2016).

Cocoa certification has grown fastest in Côte d'Ivoire. By mid-2010, there were 15,872 newly certified farmers, who between them could have produced 42,798 tons of certified cocoa. Actual traded volumes were much lower, as high prices convinced many farmers to sell their crops in the conventional market (Läderach *et al.,* 2013). The spread of certification was slower in Ghana, but approximately 2,000 farmers were already a year or more into the training process and were expected to achieve certification soon.

Farmers enjoyed upgraded skills, stronger organisations, and healthier farms. They knew more about safely handling chemical inputs, and more children were able to attend school. Four 'training of trainers' sessions had been conducted, and 24 local trainers in Ghana and Côte d'Ivoire had been selected. Farmer organisations had established internal management systems, and the farms were more environmentally sound with many more shade trees. The private sector, motivated in part by the scarcity of certified cocoa, was taking on the costs of Rainforest Allaince training and the annual audit. Groups selling certified cocoa benefited from this market dynamic, selling their beans for an average premium of $200/ton in the 2009–10 season, with a similar outlook for 2011.

By 2011, the governments of Ghana and Côte d'Ivoire were comfortable with certification operations, although both were still anxious to (Ayenor *et al.*, 2004) quantify the net economic benefit to the farmer. Rainforest Alliance and other project partners were confident that certification could lead to improved incomes for farmers and a variety of social and environmental benefits for their families and farms. From the beginning of the project, they planned to test these assumptions through rigorous data collection and analysis (Asante et al., 2017).

Factors Influencing Climate Change Adaptation

According to Maddison (2010) farmers' perceptions of climate inconsistency influence their adaptation since it influences their agricultural planning and management decisions. Hadgu, Tesfaye, Mamo, and Kassa, (2013), also revealed that adaptation to climate change and variability requires that farmers must first realize changes in the climate before they can identify and implement potential useful adaptations strategies.

Slegers (2014) identified, farm size, farm management training, household size and organisational membership as a significant influence on farmers' perception. The researcher adopted Wald chi-square to verify the significance of each variable on the influence of climate change adaptation. The significance of the Wald chi-square showed that the model estimated is appropriate and adequate. Farm size had a positive influence on farmers' perception which means that farmers with larger farm sizes are more likely to perceive climate variability than their counterparts with smaller farm sizes (Onyeka, 2014).

For sustainability of agriculture under climate variability and change, it is important that farmers, in general, can properly perceive climate variability. In their study, Neil Adger, Arnell, and Tompkins (2015), found no significant effect of farm size on farmers' perception, although the former study also found a positive sign on perception. Farm management training was found to have a positive effect on farmers' perceptions. This indicates that farm management training received by farmers increase their perception levels in temperature and rainfall variations. Like education, training improves the farmer's human capacity as well as their knowledge level. In this case, farmers can appreciate possible changes in the climate and production environment (Läderach *et al.*, 2013).

Similarly, Deressa, Hassan and Ringler (2011) found that access to climate change conferences has a positive influence on farmers' perception of climate change. Tesso, Emana, and Ketema (2012) suggested that access to climate change information improves the farmer's perception of the subject matter. From the result of Deressa *et al.* (2011) also, household size was found to have a negative influence on farmers' perception. Thus, farmers with small household sizes are more likely to perceive climate variability than those with large household sizes. One would have expected that information flow or knowledge transfer on climate variability would increase with larger households. Perhaps, the quality of information accessible to the smaller households is higher than those with larger households.

Bryan *et al.* (2013) also found that smaller households have a higher probability of predicting climate variability than larger households. Perversely, organisational membership had a negative relationship with climate

variability. This means that a non- organisational member has a better level of perception of climate variability than an organisational member. This may be due to the recent trend where organisations are focusing on market integration (good prices and bonuses), contract arrangements, input accessibility and other social benefits they gain from joining these groups. Thus, the orientation and focus of these bodies are negatively skewed towards environmental and climate variability issues. This is somehow consistent with a study by Ndambiri, Ritho, and Mbogoh (2013) who reported a negative relationship between farmer– farmer exchange of information and perception on temperature and rainfall variability.

The Impact Analysis of Ghana's Cocoa Sector After Liberalization

Liberalization of Ghana's internal cocoa sector took place in the 1980s as a solution to achieve economic growth as adopted by other West Africa cocoa-growing countries. Even though COCOBOD has gone through extensive reforms over time, it remains the central regulatory body of Ghana's cocoa sector (Onyeka, 2014). Marketing of cocoa both locally and internationally as well as all fixing of annual cocoa price in Ghana is done by COCOBOD. COCOBOD continues to regulate the operations of all LBCs other stakeholders directly involved in Ghana's cocoa sector. The impact of Ghana's cocoa sector after liberalization includes the following:

Improved quality of cocoa beans

The Quality of Ghana's cocoa bean is a result of proper fermentation of fresh beans after harvesting matured cocoa pods which tend to improve

cocoa bean quality significantly. The fermentation of fresh cocoa beans lasts for about three days, before drying them in the sun for about one week. Drying cocoa beans naturally in the open sunshine improves the quality of the dried beans while decreasing the acidity content in the beans.

Quality is essential since it controls the prices and status of cocoa. The quality standard of Ghana's premium cocoa is as a result of COCOBOD"s regulating the sector which encourages the use of acceptable farming practices and bean drying procedures. This is coupled with the Total Quality Management (TQM) system in quality assurance of Ghana's cocoa along the entire supply chain process.

Improved producer's price

One main objective of Ghana's cocoa sectors liberalized was to improve prices. Liberalization of internal purchasing of cocoa in Ghana has opened the door for more firms (LBCs) to enter the cocoa sector causing an increasing (Naab, Abubakari, & Ahmed, 2019). competition among LBCs without control over price as Cocobod fixed price for purchasing cocoa each year.

According to Anang (2011), there has been a reduction in the market share of major LBCs in Ghana's cocoa after privatization. The reforms of the Ghanaian cocoa sector have caused a surge in the producer price, but continuing macroeconomic difficulties affect cocoa prices negatively. Nevertheless, prices of cocoa have been fairly constant as a result of the establishment of the Stabilization Fund which takes care of paying cocoa farmers an appreciable constant price even when world cocoa prices fluctuate

downwards. Ghana obtains higher prices for its extraordinary quality cocoa through quality-price it benefits.

Increased cocoa production

The Ghana cocoa sector liberalization seems to have profited cocoa farmers. Zeitlin (2006) observed a positive relationship between the existence of many licensed buying companies (LBCs) in cocoa-growing communities and cocoa farmers' overall production outputs. Ghana's cocoa sector recovery and expansion initiatives began with the implementation of Economic Recovery Programmes from the early 1990s to 2008.

These helped incorporate special Programmes to improve Ghana's cocoa sector through the Cocoa Rehabilitation Project (Ehiakpor *et al*., 2016). During the period some policies aimed at improving cocoa production were initiated which included: (1) increasing the cocoa purchasing prices paid to cocoa farmers relative to the price paid to their counterparts in some cocoa growing countries like Cote d'Ivoire. That initiative by the Ghana government helped to reduce the challenges of cocoa smuggling, and (2) evaluation of the Ghana Cedi also helped to reduce the size of taxation on cocoa farmers. (3) Cocoa farmers were rewarded for replanting trees infected with Cocoa Swollen Shoot Virus (CSSV).

These policies encouraged significant improvements in Ghana's cocoa production output, with a greater number of farmers replanting their low yielding cocoa trees with higher-yielding cocoa tree varieties developed by the Cocoa Research Institute of Ghana (CRIG). Annual cocoa production increased to 400,000 tons by 1995/6 as a result of improved productivity from

210 to 404 Kg/ha (Happold and Lock, 2016). More so, Ghana's cocoa sector reform in 1992, which led to the renamed of CMB to Cocoon in 1984, helped improve cocoa outputs significantly.

Thereafter Ghana cocoa production growth became more evident from 2001 onwards, probably motivated by the exceptional increase in world market cocoa prices and by efficient administrative policies made by Cocobod to improve farming practices: through mass cocoa spraying Programmes, high tech subsidy packages and regular applications of fertilizer by cocoa farmers supplied to them by Cocobod (Vigneri & Santos, 2008), and an increasing share of the international prices passed on to producers. It is indisputable that Ghana's cocoa sector liberalization has not only led to an increase in Cocoa is the mainstay of Ghana's formal economy. It accounts for 30% of the total export earnings and provides income for about six million people (Gockowski and Sonwa, 2011).

Ghana also plays an important role in the international cocoa market being the second-largest producer of cocoa beans in the world after Ivory Coast and representing about 20% of global production (ICCO annual reports). As in most cocoa-producing countries, Ghanaian cocoa is grown by small-holder farmers. The sector employs about 2 million people who are engaged in farming, trade, transportation and processing of cocoa (World Bank, 2011).

In Ghana premium quality cocoa produced increases cocoa production and guarantees stable cocoa prices independent of falling world market cocoa price instability. This has therefore led to an intense rivalry among LBCs to increased market share in cocoa purchases. The ability to purchase more cocoa

beans from cocoa farmers by LBCs determines their profitability level by these license buying companies. A study conducted by Lundstedt and Pärssinen (2009) concluded that liberalizations have a positive relationship among variables such as production output, producer prices, and incomes levels, without compromising on quality. A comparison with other cocoa-producing nations that practice comprehensive liberalization reforms like Cote d'Ivoire, the overall performance of Ghana's cocoa sector is sluggish comparatively insignificant and believed that the researcher also supports that full liberalization of Ghana's cocoa sector will help increase the price per each kilogram of cocoa through competition. This is believed to serves as an incentive to encourage more people into cocoa farming hence increasing the total production of cocoa supplied to the global market.

Cocoa Supply Chain of Ghana

The cocoa supply chain of Ghana is characterized by a unique marketing arrangement that combines elements of privatization with a strong government presence. The entire supply chain is made up of input suppliers, farmers, collectors/cooperatives, Licensed Buying Companies (LBCs) (and their clerks who engage in purchases at cocoa buying centres), Haulers, Cocoa Marketing Company (CMC) (the wholly-owned subsidiary of the COCOBOD with the sole responsibility to market and export cocoa beans to local and foreign buyers), local processors, local retailers, global marketers/manufacturers and international and local consumers. Activities on the domestic side in the entire chain are supervised by the Ghana Cocoa Board (COCOBOD).

In holding firmly unto its high standards in terms of quality of cocoa beans export, the Quality Control Division of Ghana under the auspices of the COCOBOD oversees quality control measures at all stages of the supply chain. The supply of inputs in Ghana is mostly in the hands of the private sector. In line with its strategy to raise productivity and output, the Government of Ghana (GoG), through COCOBOD retains an active role through subsidized input distribution Programmes targeting cocoa farmers, although farmers bear the majority of the cost (World Bank, 2011). The input needs of farmers are met by suppliers through the marketing of agrochemicals (including fertilizers, pesticides, and insecticides) and farm equipment. The primary role of farmers in the chain is to ensure the availability of cocoa beans through a year-round production.

Cocoa production in the country is dominated by smallholder farmers who cultivate on smallholdings with an average size of two to three hectares. About a quarter of production is on a share-cropping basis (Hainmueller, Hiscox, & Tampe, 2011). After harvesting cocoa, the beans are dried and fermented to help develop the unique flavour and other attributes that attract a premium for Ghana cocoa beans on the world market. Once all the necessary post-harvest treatments have been performed, the beans are sold through either individual collectors or producer cooperatives to cocoa buying centres established in major cocoa-producing areas (Etwire, Fielding, & Kahui, 2019). Such centres are occupied by purchasing clerks of the Licensed Buying Companies.

The beans are purchased from the farmers at the minimum price set by a Producer Price Review Committee (PPRC) which comprises COCOBOD

officials, farmers' representatives, government representatives and representatives of the Licensed Buying Companies (LBCs). By this, the revenues of the LBCs are not based on prices differentials, but rather on volumes of cocoa marketed. Under this condition, LBCs maximize their profits by minimizing "turnaround" times (thus, the period from the purchase of the beans at the farm gate to the selling of them at the takeover centres). After purchasing the cocoa, the LBCs invite the Quality Control Division to grade and seal the cocoa at a fee determined by the PPRC.

The graded and sealed cocoa is then evacuated by the LBCs using private cocoa haulers to designated take over points at Tema, Takoradi and an inland port at Kaase (in Kumasi). The rates offered for evacuation are determined by the PPRC, and so are the LBCs paid by the COCOBOD according to margins set by the PPRC. On reaching the take-over points, the graded and sealed cocoa is taken over by officials of the Cocoa Marketing Company.

The Cocoa Marketing Company (Ghana) Limited (CMC) is a wholly-owned subsidiary of the Ghana Cocoa Board and has the sole responsibility for the sale and export of Ghana cocoa beans. Its major responsibilities include procurement of graded and sealed cocoa beans from the LBCs at the take-over points, stocking of cocoa before shipment, securing optimal prices and maximizing foreign exchange revenues, managing sales and collecting receipts, and settling any disputes via direct arbitration (World Bank, 2011). After the take-over, the management of cocoa becomes the responsibility of the CMC until it is shipped overseas. Before shipment, however, the Quality Control Division inspects and fumigates all shipping vessels and cocoa

consignments. A greater share of purchased (Ayenor *et al*., 2004) cocoa beans is exported in raw form.

The smaller sized (light crop) beans are sold to processing industries in the country at a discount. Light crop beans are smaller in volume than the main crop variety exported in the raw form, although the quality of the bean is the same. About 90% of all processed cocoa is exported while the remaining 10% is used in the production of confectionery products (Ashitey, 2012). Exports of domestically processed cocoa products to overseas destinations are as well done by the CMC. The processed products that are not exported are sold to domestic consumers, and some of the processed products on the international market find their way back into the country. Such imports attract a tariff of 20%.

Mass Balance and Physical Traceability

When a company purchases certified cocoa using mass balance, it means that the certified cocoa was produced by a certified farmer, but was not kept physically separated from non-certified cocoa throughout the whole supply chain. In the cocoa industry, cocoa beans are generally supplied in bulk and mixed during shipping and manufacturing, which in most cases makes it impossible to keep certified cocoa separate from non-certified cocoa (UTZ, 2016).

Physical traceability on the other hand is the ability to track any food/produce through all stages of production, processing and distribution (including importation and at retail). It is a risk-management tool that also allows food business operators or authorities to withdraw or recall products

that have been identified as unsafe. This ensures that the product is segregated from the farm-gate through shipment to the client (Govro, 2015).

Fairtrade, Organic and Rainforest Alliance share the goal of transforming the world's production systems and value chains to make them more sustainable. The focus is on the Sustainability of producer livelihood, empowerment and development. Rainforest Alliance is very much geared towards forest protection.

For Fairtrade, the central character is the minimum price for which a Fairtrade certified product can be sold to a Fair-Trade buyer, which is intended to cover the average costs of sustainable production and meet a broadly determined living wage in the sector. A Fairtrade buyer agrees to pay certified producers at least the minimum price when the world price is below this. In all situations, producers and traders remain free to negotiate higher prices based on quality and other attributes. By providing a guaranteed minimum price for products sold as Fairtrade, the price floor is intended to reduce the risk faced by growers. UTZ and Rainforest do not have a floor price but subjects their price negotiation based on the prevailing market price of the community. Organic certified products usually have higher floor prices and premiums.

Another important characteristic is a price premium, often termed the community development or social premium. This is paid by the buyer to the supplier or cooperative organisation in addition to the sales price. Currently, Fairtrade certified cocoa producers get $ 240 as a premium per ton of cocoa.

Challenges of Cocoa Farmers in Ghana

The producer price of cocoa has increased over the years, but these increases have lagged behind that of Cote d'Ivoire providing an incentive for the smuggling of cocoa from Ghana to Cote d'Ivoire. Intensified border patrols and checks and investigative journalism have recently been employed by the government to arrest the problem of cocoa smuggling which is affecting Ghanaian revenue generation efforts Afriyie-Kraft, Zabel, and Damnyag, (2020a).

Bonuses are paid by COCOBOD to farmers and a scholarship scheme is in place for the education of children of cocoa farmers in the country. Disease and pest control is an important problem faced by most smallholder cocoa farmers in Ghana. Ghanaian cocoa yield losses due to disease stand at between 30-50% and cocoa black pod disease is mainly responsible for the loss. Similarly, several insects are reported to attack different parts of the plant at different stages of development.

he most important and widely represented pest of cocoa is in the whole of West Africa are capsids. To address the problem of disease and pest control in Ghana, a mass spraying exercise was started by Government, but given the scale of cocoa production, the impact of the mass spraying of cocoa farms policy has been limited particularly for poorer farmers. Improved agronomic practices include increasing air circulation by regular weeding and pruning, ensuring adequate draining, removing poor husks after harvest and extracting beans, and shade control. However, high labour costs and a dwindling supply of family labour have the combined effect of producing ineffective and unsustainable agronomic practices.

The bulk of Ghanaian cocoa is still exported as cocoa beans (fermented and dried). Recently, there have been attempts to inject some value addition to cocoa, resulting in increased private participation in cocoa processing in the country e.g., Archer Daniels Midland (ADM) has established a plant in Kumasi early this year, however, the costs of processing and transporting chilled chocolate are high for tropical countries (Ryan, 2011).

The decline in yields linked to dwindling soil fertility has made most cocoa farmers resort to the application of chemical fertilizers in attempts to increase production, with environmental consequences. Most of these inputs are advertised in the media and on billboards all over the country, but the high cost and unavailability on the market at times of farmers' need still hamper production efforts. The quality of cocoa beans from Ghana is still ranked as number one in the world.

The Quality Control Department (QCD) of COCOBOD has multiple grading systems and this attracts a market premium for Ghanaian cocoa. This provides Ghana with the advantage of forwarding the sale of cocoa in the international market offering export stability. The concept of traceability has been applied in the case of some LBCs cocoa, including that of Kuapa Kokoo. Warehouse facilities at the ports are somewhat inadequate for efficient handling of cocoa and plans to increase warehouse space at the Takoradi port are yet to materialize. To address this shortage, LBCs often use vehicles loaded with cocoa as mobile warehouses and loads often remain on the vehicle for more than a month before being offloaded.

Concerns about living conditions of the farmer, child labour and environmental conservation by civil society organisations resulted in more

attention to sustainable supply chain management (SSCG) and businesses started to work together with NGOs on this subject. One of the most used forms of sustainable supply chain governance is the use of private sustainability standards. Retailers and manufacturers – in cooperation with certification bodies and NGOs or with their standards – increasingly use sustainability-oriented standards and labels in their supply chain (Shi *et al.*, 2017).

In cocoa, the biggest voluntary sustainability standards are Fairtrade, Organic and Rainforest Alliance. Except for Organic, which is regulated under national and European laws, all these private sustainability standards have been developed by private stakeholders in Western countries. Fairtrade and Rainforest Alliance are both initiated by civil society organisations, whereas UTZ is initiated by a retailer. As market shares of these certified products are growing, a whole set of literature is emerging on the contribution of these private sustainability standards to the conditions of the certified producers in the South (Dengerink, 2014).

The different certification schemes vary in their main focus or strategy for achieving a more sustainable cocoa production. Some of them focus on the creation of sustainable trade relations (e.g., Fairtrade), others focus on increasing productivity as a way to strengthen farmers' livelihood (e.g., UTZ Certified). Fairtrade differs in this sense from other schemes, as productivity increases are not the main focus. Instead, Fairtrade aims for better and more just trade relations. UTZ and Rainforest Alliance are more explicit about their objective of increasing farmers' yields (ibid: 16). Overall, it can be said that they seek improvements in farmers' livelihoods, focus on developing GAPs

and on capacity building. Most of the time premiums are added when complying with the standards. This can either be translated into the bag price directly or go to community or group projects.

The role of the Ghana Cocoa Board

Cocoa takes up an important part in the income of the government of Ghana, but much has changed in the way this is managed. From 1947, Ghana's government started to tightly control the cocoa trade with the implementation of the Ghana Marketing Board. In the 1990s, this control slightly loosened at the behest of the World Bank and International Monetary Fund to provide loans for "structural adjustments" and liberalization soon followed (The Borgen Project, 2016). After the 1992 elections, the reform of board gained momentum making the staff reduce from over 130,000 in the early 1980s to10, 400 in 1995 and just over 5,100 staff by 2003. Since then, the private Licensed Buying Companies (LBCs) were set up to compete with the state-owned Produce Buying Company (PBC) (ibid.).

Ghana is the only cocoa producing country in the region that has only partly liberalized its marketing and pricing system; the government still plays a governing role in the sector (Laven, 2010). Even though currently gold has overtaken cocoa as the country's main foreign exchange earner in absolute terms, foreign exchange from cocoa is more accessible to the government; as a foreign exchange from gold is largely foreign-controlled and often remitted abroad, while cocoa revenues flow through government channels (Williams, 2009). By taking this role the state functions both as 'balancer' as well as 'bottleneck'. It protects farmers from price fluctuations providing them with a

stable income and reinvesting part of the income back into the cocoa sector. COCOBOD also guarantees international buyers the supply of premium quality beans. But a downside of the pricing system is that it does not provide farmers with incentives to produce superior quality cocoa beans. It also does not allow negotiation for better prices. This is mentioned in a report by the Overseas Development Institute (Vigneri *et al.*, 2004).

The state can even work as a hinderer to development with a lack of transparency on how the state calculates and distributes the costs, benefits and risks involved in cocoa production and marketing (Laven, 2010). Currently, 30 per cent of the cocoa price is taken by COCOBOD and there is no transparent communication on where this money is used for. The main issue here is to determine an optimal level of taxation that will contribute to supporting national development policies, without excessively eroding small farmers' incomes (UNCTAD, 2015). Currently, it seems that cocoa is gaining much income for the economy of Ghana and still not much seems to be invested in the farmers.

Challenges in the Ghanaian Cocoa Sector

One major challenge in the Ghanaian cocoa sector much mentioned during the fieldwork of this research is climate change. There is a dire need for climate change adaptation in Ghana with more shaded production. Given the low incomes of most farmers and the low motivation to further invest, most farmers are not able to adopt recommended practices to mitigate the impacts of climate change and their high level of vulnerability to climate change effects (Anim-Kwapong & Frimpong, 2006). Adaption methods can be

diversified cropping incorporating cash crops and food crops to increase the resilience of these systems.

The use of drought-resistant crop varieties and the implementation of irrigation schemes. Also using bigger shade trees can keep trees coo. Though, the objective of using agroforestry should consider using species that satisfy the household needs for home consumption and opportunities for market commercialization. Another major challenge in Ghana is productivity, especially due to the ageing of farms and the lack of investments into the replanting of trees and the application of fertilizers. Something which in turn comes out of the little revenue farmers make out of cocoa to date. Within the cocoa sector, this issue is mainly mentioned as the quest for "the entrepreneurial farmer". The idea is that to create more productivity and more sustainable livelihoods, the farmer needs to approach cocoa farming as a business. Farmers who often inherit their farm from family members, sometimes do not replant or invest in new trees. Currently, this business mind by the farmer is also intervened by the offering of free inputs by COCOBOD.

Certification

Certification is considered by some as an adequate tool to promote sustainability in the cocoa value chain and to improve the livelihoods of cocoa farmers. Other actors involved seem to be less optimistic about the net benefits that certification offers at the farm level and highlight the burden that it can bring in terms of required investments. Scientifically there is a growing body of literature about the impacts of standards on farmers, focusing mostly on coffee. There is only a limited number of studies available for cocoa. As for

now, it is assumed that conclusions from other commodities, in particular from coffee, also apply to a large extent to cocoa Positive effects of certification mentioned are mostly the technical assistance and management skills, which increase productivity, quality and yield. Verkaart, for instance, found that UTZ affiliation in Uganda has contributed to the higher productivity of certified coffee farmers as compared to noncertified farmers (Verkaart, 2008).

The negative effects of certification mentioned in the literature are mostly the costs. Another much-made point in literature is the lack of demand for certified products. The decline in demand forces certified producers to sell their products on the conventional market. Liu et al. (2004) cite the cases of coffee from Tanzania and cocoa from Ghana where only a low percentage of total production was sold on the Fairtrade market.

Another downside of certification lies in the pre-certification situation as the certification process takes investment by the farmer, something that is easier for "better off" farmers. Also, certification schemes possibly choose farmers by their baseline situation as it is much easier to certify those farmers who are already 'on track' than those farmers that still have a long way to go until compliance. When certification schemes approach the relatively organized and well-off farmers, the more marginal producers – who need the certification the most – might be ignored (Dengerink, 2013). Other than the impact on productivity and income there is limited and mixed evidence of increasing social capital (Aidenvironment, 2012) and there is only some positive evidence of increasing education levels with certification (ibid.: 189). Especially literature on more direct poverty-related impacts, like food security, is lacking Cocoa certification and food security: synergies or trade-offs?

When analyzing the literature available on certification and food security some information can be found.

Oosterveer, Rossing, Hendriksen, and Keete Voerman (2014). had some concerns regarding the impact of global sustainability standards on food security. While voluntary certification schemes their article focuses on Roundtable for Sustainable Palm Oil (RSPO) are mostly oriented towards sustainability of primary production of the global commodities, they may have unintended and indirect impacts on food security as private certification schemes can entail supplementary costs for producers or divert attention from food production to crops with more attractive export markets (Oosterveer *et al.*, 2014).

Sinervo *et al*. (2010) did address food security in their research on certified coffee farming as a side note. They argue that although certified coffee-producing households earned higher gross revenue, this did does not translate to greater food security, possibly due to the higher production costs associated with certified production, or with the timing of payments for coffee production. Having more than one income source (i.e., not relying entirely on coffee sales for income) did, however, contribute to household food security, by providing a year-round income source.

The main focus of their study was not on food security and therefore could not focus on the four different dimensions, but they state that this should be an important issue in the future. As mentioned in the previous sub-chapter, talking about the impact of cocoa production or certification on food security enters many different debates in scientific literature. The use of export crops for development and food security as well as the impact of certification on

livelihoods are much written about topics. This research hypothesizes that smallholder farmers participating in the certification Programmes of Solidaridad will be producing greater amounts of cacao and will have better food access because of higher family incomes with which they can purchase food.

Also, the bookkeeping of their farms can create a better managing of the household income. Though, relying on only food purchases, with markets that might not work (due to lack of infrastructure) and price fluctuations of food products, the farmers can be negatively affected. In Ghana, cocoa farmers declared that despite rising cocoa prices their real income decreased between 2010 in 2012 due to rising costs for food and non-food items (Cocoa Barometer 2014). The case study of Anderman, Remans, Wood, DeRosa, and DeFries (2014) on cash crop production (cocoa and palm oil) in the Ashanti region of Ghana identified this trade-off as well. Households reported that local food prices had increased from 50% to 200% while prices for cocoa beans and oil palm fruit had remained relatively stable. Not only were food products expensive, but they were also mentioned as lacking in quantities and varieties on markets (Anderman *et al*., 2014).

Another expected outcome is that cocoa producers grow food crops themselves. Coffee and Cocoa international magazine published an article that coined cocoa producers' cornerstone of food security as the mastered concepts of farmers are equally essential for producing food crops. And even though cocoa as a crop is reliable, often the few bags sold provide little income for a farm family and "certainly cannot feed either the farmer's family or West Africa's burgeoning population." Growing food crops next to cocoa is a

necessity (C&CI, 2012) and, as mentioned by Mike Godfrey in a blog for the Sustainable Cocoa Initiative (2015), it is even essential for good cocoa cultivation. When cocoa trees are young, other crops like cassava and plantain can provide shade. Though, literature provides mixed messages on growing food crops next to cocoa.

In Cameroon, cocoa farmers are found intercropping groundnuts, cassava, maize, cocoyam and plantain with cocoa (Kazunari & Masters 2006) but in Nigeria cocoa farmers were not able to grow food crops with their cocoa trees as the farming system were not well established to combine food crops with cocoa cultivation. Also, in Ghana cocoa farmers argued to have difficulties combining food crops with their cocoa (Anderson *et al.*, 2014).

The main challenge here is that the shade provided for cocoa trees does not allow parables (food crops) to grow under them Ojo, and Sadiq, (2010). This can have consequences for the food security and nutritional status of the farming households. It is argued that in many cases, diversification into food crops on the farm is only done to satisfy the farmers' subsistence needs as they lack the capabilities to reach markets for these crops.

In many producing countries, there is no advice available as to which crops to select for diversification. Farmer's practice what has been handed down from generation to generation. There is no conscious investigation as to which products are demanded by markets in urban centres, or which crops would fetch a high price on the market, to maximize the resources available. Another spillover can be knowledge. The cocoa-focused training that farmers follow can create benefits for other farming activities: "A good cocoa farmer is a good farmer", Godfrey mentions (Sustainable Cocoa Initiative 2015). The

same can be said regarding inputs. Fertilizer applied to an industrial crop in the rotation might provide some residual nutrients to subsequent food crops. In addition, technologies and know-how for industrial crops may spill over to improve food crop yields as well Wiggins, Henley, Keats, (2015).

Food utilization can be both positive and negatively influenced. Incomes from growing cocoa can allow households to buy more food, and more diverse food. But when smallholders rely on local markets only, their dietary diversity can decrease when locally available food items are limited (ibid, 2013). In the case of stability, cocoa can expose growers to new risks, either from weather, pests and diseases. Certification might be providing higher incomes, making the farmer more able to save money for leaner times. At the same time, when not producing food crops, cocoa farmers are depending on de products in the market. Workers will be more dependent on income for food, which might not be sufficient to live from Wiggins, Henley, Keats, (2015).

Certified cocoa and certification bodies

Since the 1980s there has been a change in the attitudes towards food production and rural development projects where the focus on sustainable development, environmental concerns, quality products, issues of fair ethical trade and corporate social responsibility (CSR) has increased (Dicken, 2007; Guazzelli, Zeller,, Lin, & Williams, 2009). The increased inter-dependency of actors within the supply chain, the need for risk management and consumer pressure have forced manufacturers, processors and retailers to become involved in certification standard schemes. Correspondingly, there is a trend in

which these companies start to build partnerships with NGOs, research institutes and government agencies working in the sector (Laven, 2010).

Standards bodies advise farmers on how to implement better farming practices, establish protocols on dealing with environmental and social issues, implement auditing and third-party verification on these issues, and communicate to consumers at the end of the supply chains, thereby creating a necessary level of assurance.

Today, four main certification schemes currently co-exist in the cocoa sector. Besides the pioneers Fairtrade and Organic Agriculture (IFOAM), two certifications are driven by Rainforest Alliance and UTZ Certified. It can be said that overall, they seek improvements in farmers' livelihoods, focus on developing good agricultural practices and on capacity building, but they do differ when comparing their main focus (Basso et al., 2012).

Certification as a tool of sustainability standards

Certification is one tool of standard systems and not a panacea for all issues and barriers related to sustainability. Standard systems encompass not just a code, but interrelated components including field development, certification system, traceability and market development. Standard systems offer a variety of support systems for their members which include:

1. Provision of technical training & technical support for farmers & farming communities
2. Access to credit systems for farmers
3. Robust auditing & assurance including traceability
4. Market access & supply-demand management

5. Monitoring, evaluation and learning

It is also important to understand that for smallholders to make changes towards more sustainable practices takes time and resources and commitments should be embedded in business processes and supply chains to ensure long term sustainability. What these actions have in common is that they emphasize primary production: Besides primary production, mainstreaming sustainable cocoa is also about having in place an efficient cocoa chain and an efficient market.

Sustainability Standards

Certification cannot be seen as a quick fix, nor can it address the root causes of poverty. Along with micro-level management of specific interventions by mainly private actors dealing with specific problems facing cocoa, there is a need for having policies, systems and tools in place to ensure the sustainability of the cocoa sector in light of the broader development challenges. Governance issues such as land tenure and cooperative management are increasingly important for the sustainability of the cocoa sector.

Standards may contribute in highlighting some of the basic preconditions of sustainability, but some foundations necessary for successful implementation of standards include:

1. Ensuring secure access to land and other natural resources
2. Equitable and affordable access to inputs and services (extension, financial)
3. Child & youth well-being and appropriate education for all

4. Development of the needed support institutions on the ground

The scope and complexity of the challenges for a sustainable cocoa economy take partnerships and collaboration of different actors addressing different aspects. There is no single solution to the challenges faced by millions of cocoa farmers and their communities. There are numerous examples of many successful public-private partnerships among governments, local and international NGOs, industry and standard systems in the cocoa sector. More is needed to mainstream existing efforts as discussed in the next section.

Training on certification

Smallholders particularly lack knowledge and tools for implementing GAP, developing producer organisations and administration. Standard systems directly, and through partnerships with national organisations and international NGOs (e.g., WCF, Solidaridad), offer training on a variety of topics not directly related to meeting certification requirements, but aimed at improving quality, yields, strengthening business skills, among others. Without looking at all of these aspects, the uptake and implementation of sustainability requirements by smallholders will be difficult. A myriad of projects, donors and standards have provided training for thousands of producers and producer organisations, some of it overlapping leading to inefficiencies and confusion.

The Certification Capacity Enhancement project (CCE) is one example in West Africa of cooperation between standards initiatives, private enterprises and development organisations. The standards worked closely to develop a

collective training curriculum that complies with the requirements of all three initiatives. This will allow all future training measures for certification according to one or several of the standards to use the same curriculum and farmers can take further steps towards the certification of their choice.

Training will therefore become easier for the farmers, with lower transaction costs for certification; access to the market for sustainably produced cocoa will also become easier. The important lessons learned from the initial phase include the need for quality control of training, the need for organisation of farmers for efficiency, formalizing capacity development with national intuitions and the ongoing need for technical assistance and support to turn training knowledge into systemized practice. This successful collaboration can lead to scaling and replication in other regions of these efforts.

National and international standards of cocoa in terms of certification

National standards in cocoa serve many key purposes including subsidiarity, adaption to national context and priorities, wider access to smallholders, capacity building, national market demands and/or control. The existence of country-led efforts can bring local ownership as well as address the governance of cooperative structures. National standards can be real opportunities to effectively increase the demand and participation of farmers engaged in sustainable cocoa. Whether national standards are designed to be minimum or development standards, robust and credible implementation systems should be considered. National standards can be complementary to international standards only if internationally accepted norms and guidelines

are considered in the design (ISO/IEC, ISEAL). This includes the development of the standard (e.g. multi-stakeholder, open access, relevant), the implementation of the standard and assurance aspects. A lack of consistency between national and international standards could lead to confusion in the market. National standards that include a stepwise approach, leading to international certification (where demand exists) could provide a benefit to producers and standards systems.

Sustainability and Cooperative Schemes

The concept of sustainable development gained increasing attention in the decades following the publication of the Brundtland report. However, attention increasingly shifted from the role of governments to the pivotal role that corporations have in sustainable development. The new role of corporations meant that the focus should no longer be solely on making a profit, but that corporations also must address social and environmental issues in their respective supply chains. The increasing responsibility attributed to corporations became known as corporate social responsibility (CSR).

A new concept, known as People Planet Prosperity (PPP), was introduced to address the various social and sustainability issues related to the negative internal and external effects of corporate production-and consumption systems. The three P's, all roughly equally important, stand for ecological threats (Planet), obstructed development potentials for individuals in supply chains (People), and the development goal, namely creating shared value and prosperity in the communities linked in a supply chain (Prosperity) (Vermeulen & Witjes, 2016).

Governance aimed at sustainability is traditionally undertaken by national governments or intragovernmental organisations (Ruggie, 2004). Private governance, however, is a governance intervention implemented by non-state actors (Smith & Fischlein, 2010). An example of private governance is that of certification. Certification is usually the result of a partnership between market actors (e.g., corporations) and civil society actors (e.g., NGOs) (Glasberg, 2011).

Certification of a product can be used to combat social injustices (e.g., unfair prices, use of child labour) or to make the production of a good more ecologically sustainable (e.g., introduce new farming practices) (Ruggie, 2004) Certification has been applied to the cocoa supply chain in an attempt to make production more sustainable. Private certification standards, such as UTZ Certified, Rainforest Alliance, and Fairtrade, introduced production standards for sustainable production. If cocoa farmers meet these standards, they receive benefits such as a higher price for their produce, better market access, and access to training on good agricultural practices to be able to increase their yields, which should increase incomes and savings while simultaneously addressing other issues such as poor housing, sanitation, and the occurrence of child labour (UTZ 2016).

Certified Producer Organisations in Asunafo North Municipality

There are many certified cocoa producer oranizations in the Asunafo North Municipality. Some of them are; The Asunafo North Cocoa Farmers' Cooperative and Marketing Union Limited, AGROECOM, Tutton Eliho Kasapin B cocoa producers, The Asunafo North Cocoa Farmers' Cooperative

and Marketing Union Limited is a Fairtrade certified organisation. Fairtrade certifies the producer organisations whilst UTZ and Rainforest alliance certifies License Buying Companies. Armajaro, nyonkopa, Sika Aba are among the LBCs working with farmer groups in the Asumura zone, Kasapin zone, Akrodie and Mim zones. These farmers are not mobilized and incorporated into limited liability companies as the Fairtrade certified farmer organisations.

Asunafo North Cocoa Farmers' Cooperative and Marketing union Limited

The Asunafo North Municipal Cooperative Cocoa Farmers' and Marketing Union limited was established in 2011 with 1,052 members with 551 males and 501 females representing 52% and 48% respectively. The union was made up of 17 primary societies. The current membership of the Union is 4,685 comprising 2,530 males and 2,182 females from 67 primary societies located within the Asunafo North Municipality representing 54% and 46% respectively. The union was certified as a cooperative in 2011 with Cooperative Certificate Number: BAR/SD/AC/224 and Fairtrade certified since 2012 with FLO ID: 28305.

The Asunafo North Union is located in the Ahafo region of Ghana in the Asunafo North Municipality. Asunafo North Cocoa Farmers and Marketing union limited is a second-grade organisation made up of 67 primary cooperatives. Being a second grade organisation, its legal members are the 67 primary cooperative societies. Due to the geographical of these primary societies, the operation areas of the union are classified into 6 zones namely;

Goaso main zone, Kasapin zone, Asumura zone, Ayomso/Akrodie zone, Bediako Zone and Mim Zone. These zones are made up of primary societies or communities.

Asutifi District Cocoa Farmers' cooperative (Control)

The Asutifi Cocoa Farmers cooperative is a relatively younger and non-certified cocoa farmers' cooperative located in Dadiesoaba. It has a membership strength of 2,335 consisting of 1,470 men and 865 women. The average cocoa production per hectare is 7.5 bags with an average farm size of 1.2 hectares. Asutifi cocoa farmers' cooperative is registered as a primary Cooperative society. This means that its legal members are the individual farmers.

Conceptual Framework

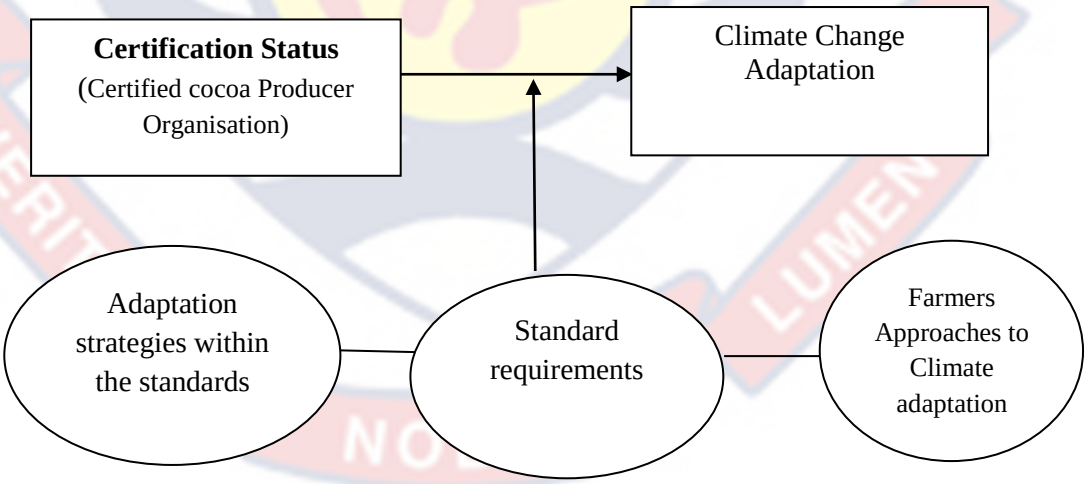

Figure 1: Conceptual framework.

Source:Author's Construct

The above framework describes the relationship between the variables and the influencing factors of the study. The Certification status of certified cocoa producer organisations is the independent variable that influences the dependent variable of climate adaptation. The standard requirements, the adaptation strategies and farmers approach or practices are the other influencing factors within the certification that contributes to climate change adaptation. The study delves into these standards requirements, strategies and approaches to ascertain the inherent provisions that enable producer organisation to adapt to climate change.

CHAPTER THREE

RESEARCH METHODS

Research Design

This study adopted a Cross-sectional design because it provides a clear 'snapshot' of the outcome and the characteristics associated with it, at a specific point in time. Cross-sectional designs focus on studying and drawing inferences from existing differences between people, subjects, or phenomena. Cross-sectional research focused on finding relationships between variables at one moment in time. Cross-sectional designs are observational surveys, conducted in situations where the researcher intends to collect data from a sample of the target population at a given point in time.

Study Area

This research was conducted in the Asunafo North Municipality and Asutifi South District. The municipality was carved out of the then Asunafo District in 2004 as Asunafo North District in the Ahafo Region. However, due to the rise of urbanization, population growth and its attendant functionality, it was given municipal status in 2008 through the Legislative Instrument (LI 1873). While the Asutifi South was also carved from Asutifi district in 2012 by the legislative instrument (LI 2054). The Asunafo North Municipality and Asutifi South were selected because they has a lot of certified cocoa producer organisations as compared to other districts in the region.

According to the 2021 Population and Housing Census of Ghana (2021 PHC), the Ahafo region had a population of 564,668. In the year 2017, Asunafo municipality was estimated to be 147,290 at an annual growth rate of

2.3%. The municipality has more females 74,948 (50.88%) than males 72,342 (49.12%). The urban areas take up 44.8% of the population whilst rural areas takes 55.2% of the population in the municipality (GSS, 2021).

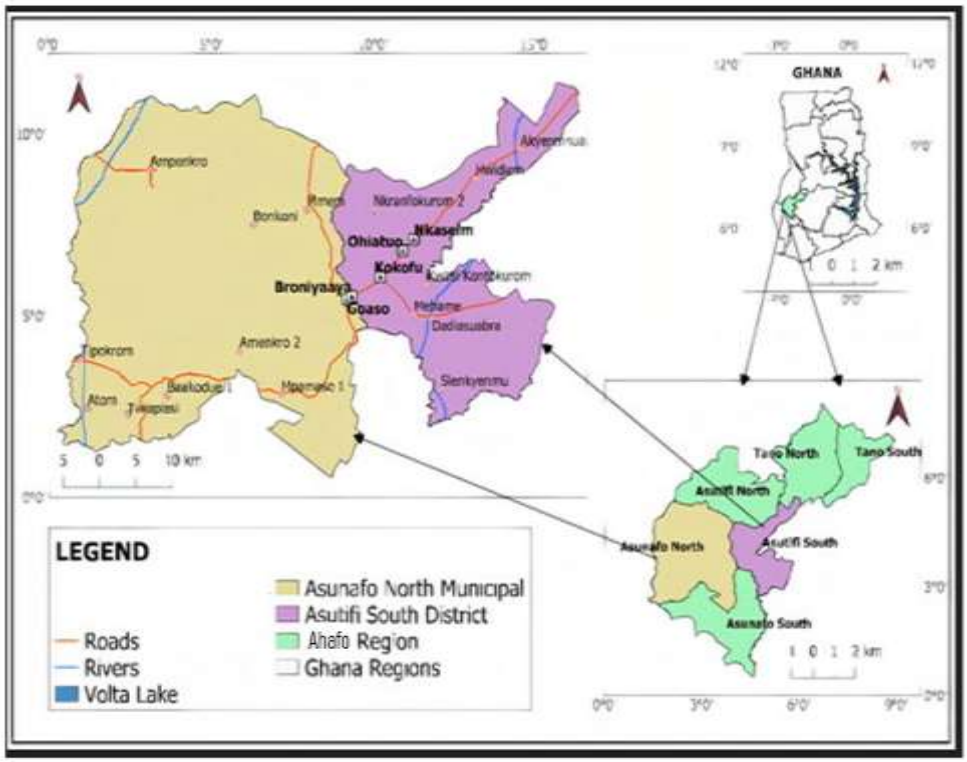

Figure 2: Map of the study area.

Sixty percent (60%) of the population is rural and out of the employed population, 60.3 per cent are engaged as skilled agricultural, forestry and fishery workers, 13.4 per cent in service and sales and 1.7 per cent are engaged as managers, professionals, and technicians (PHC, 2021). Households involved in agriculture in the district stands at 71.8 per cent. In the rural localities, 85.9 per cent of households and urban (51.1%) are agricultural households.

Population

The population of research applies to the collection of all possible individuals, objects or measurements of interest (Mason *et al*., 1999). The identification of the population of the research question helps in narrowing down to the specific objects that are the subject matter of the investigation. For this research, the study population is the Asunafo North Cocoa Farmer Cooperative and Marketing Union Limited which is a fairtrade certified organisation. This organisation was selected purposively for study.

This is because, as at the time of study, the other organisations that were rainforest certified were less than a year old and hence did not qualify for the study. This cocoa producer organisation is made up of 67 societies spread across the municipality and they are divided into 6 zones. This group of farmers has active members numbering four Thousand, six hundred and eighty-five (4, 685) individuals. The study also considered a non-certified producer organisation within the studied region (Asutifi South) as a control study to validate the study. A total of 50 farmers out of the 2,335 were randomly sampled for the control community.

Sample Size Determination and Sampling Technique

The study adopted both purposive at the initial stage of the research and simple random sampling technique from the entire sampled population. The population for the study is certified producer organisations in the Asunafo North Municipality and Asutifi South District. However, the Asunafo North Cocoa Farmer Cooperative and Marketing Union Limited which is a fairtrade certified organisation was selected purposively for study. The management of

this union were given sample questionnaire to provide information on measures put in at both organisational and members' levels to ensure compliance to standards including climate and environmental standards. The union has 67 certified societies (communities) under 6 zones and simple random sampling technique was used to select one community from each zone and farmers within each selected community were randomly selected. The total sample size of the study was four hundred and five (405) certified and uncertified cocoa farmer organisations in the municipality. This comprised of three hundred and fifty-five (355) and 50 farmers from the Asunafo North and Asutifi South (control study) respectively. The sample size (n) for the study community (Asunafo North) was determined by using Cochran formular for estimating the sample size:

$$n = \frac{Z^2 \, x \, p(1-p) \, / \, e^2}{1 + (Z^2 \, x \, p(1-p) / \, e^2 \, N)}$$ (Cochran 1977).

on an assumption of a 0.05 margin of error, 95% confidence level. N is the farming population size, Z is the z-score, p is the standard deviation and e is the margin of error.

Data Collection Instruments

The data collection methods or techniques formed a significant section of this research work. According to Patton (2012) using more than one data collection instrument strengthens and gives credibility to the study. The use of more than one data collection instrument shows a true image of the case under study. Given this, the researcher collected the essential data from two (2) different sources. This technique was adopted because it exposed concerns

that could not be preeminent in using only one data collection instrument. The study made use of primary and secondary data sources to gather pertinent information for the research work.

The secondary data was based on information from journals, books and articles that were of much relevance to the study. Primary data, on the other hand, which formed the core of the work, was collected by way of a questionnaire. The questionnaire was given to both certified and non-certified cocoa farmers as well as their leaders of their cooperative institutions. Both close and open-ended questionnaires were used. Close-ended questions requires YES or NO and a set of multiple-choice questions and also open-ended questions means choosing among alternatives. Primary data was collected for this research from the field. Primary data refers to data collected from the case study area chosen by the researcher. Such data is collected directly from the field. Given this, all information gathered from the municipality and the district were from farmers who dealt with cocoa production.

Ethical Consideration

Privacy and confidentiality were maintained throughout the study. Informed Consent was also obtained from all individuals. Any participant had the right to withdraw from the study as he/she so desires. Some of the items contained in the Informed consent include the signature column for both researcher and the respondent.

Data Analysis

The data gathered from respondents were edited and coded, and statistically analyzed using the Statistical Package for Social Science (SPSS) software (v. 20). Data exploration was performed on the main data before the main analysis. This was done to identify any missing values or wrongful entries and correct them before the main analysis begins. After this, the demographic data were presented in a composite table using frequencies and percentages. This was to offer a snapshot view of the basic background information to the respondents. The effectiveness of certified cocoa producer organisations to climate change adaptation and the factors posing challenges to farmers' productivity and the strategies for farmers' adaptation to climate change were analyzed using descriptive statistics. A 5-point Likert scale was used to rank the opinion of the farmers on the importance of the climate change strategies used by the producer organisation. This was done on a scale of 1-5 where: 1 = Strongly Disagree, 2= Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree. The effect of the strategies on farmers' productivity were examined using multiple linear regression analysis. The mathematical equation for the multiple linear regression is as follows:

$$y=\beta_0+\beta_1X_1+\beta_2x_2+\beta_3x_3+\beta_4x_4+\ldots+\beta_{12}x_{12}+\varepsilon$$

where; y = *dependent Variable*

β_1X_1= *Regression coefficient* (β_1) *of the first independent Variable* (X_1)

B_o = *y-intercept (constant)*

ε = *error* (Uyanik & Guler 2013).

The correlation between the certified organisation strategies system in place and farmers' adaptation to the strategies was also examined using Pearson correlation analysis. This was calculated as follows:

$$r = \frac{\sum_i (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_i (x_i - \overline{x})^2} \sqrt{\sum_i (y_i - \overline{y})^2}}$$

Where:

r= correlation coefficient

x= independent Variable

y=dependent variable

n= Sample size

Σ=Summation of all values

This was used to understand the relationship between the standards adopted by the members of the producer organisations and adaptation to climate change.

CHAPTER FOUR

RESULTS

Socio-demographic Characteristics of Respondents

Table 1 gives details of the socio-demographic attributes of the respondents in the Asunafo North municipality. Concerning gender, 61.7% were males while 38.3% were females out of the total respondents of 355. The control responses at Asutifi South District also recorded 56% males against 44% females out of 50 respondents.

Table1: *Socio-demographic characteristics of respondents*

Demographic Variable	Category	Asunafo North N=355 Frequency (%)	Asutifi South N=50 Frequency (%)
Gender	Male	219 (61.7)	28 (56.0)
	Female	136 (38.3)	22 (44.0)
Age (in Years)	18-28	43 (12.1)	0 (0.0)
	29-39	96 (27.0)	11 (22.0)
	40-50	88 (24.8)	11 (22.0)
	51 +	128 (36.1)	28 (56.0)
Level of education	MSLC	71 (20.0)	38 (76)
	Primary	18 (5.1)	0 (0.0)
	JHS	79 (22.3)	6 (12)
	SHS	61 (17.2)	0 (0.0)
	Certificate	8 (2.3)	6 (12)
	Diploma/HND	37 (10.4)	0 (0.0)
	Bachelor's Degree	66 (18.6)	0 (0.0)
	None	15 (4.2)	0 (0.0)

Table1: *Continued*

Demographic Variable	Category	Asunafo North N=355 Frequency (%)	Asutifi South N=50 Frequency (%)
Marital status	Single	72 (20.3)	0 (0.0)
	Married	248 (69.9)	43 (86.0)
	Divorced	17 (4.8)	2 (4.0)
	Widowed	7 (2.0)	5 (10.0)
	Separated	11 (3.1)	0 (0.0)
Length of farming	< 3years	12 (3.4)	0 (0.0)
	3-5 years	22 (6.2)	0 (0.0)
	6-10 years	74 (20.8)	6 (12.0)
	11-15 years	65 (18.3)	6 (12.0)
	> 15 years	182 (51.3)	38 (76.0)
Farmer farm size	1-5 acres	100 (28.2)	22 (44.0)
	6-10 acres	142 (40.0)	11 (22.0)
	>10 acres	113 (31.8)	17 (34.0)
Producer Organisation type	Certified producer	355 (100.0)	0 (0.0)
	Uncertified producer		50 (100)

Note: MSLC = Middle School Leaving Certificate, JHS = Junior High School, SHS = Senior High School

Source: Field data (2021-2022)

Majority of the farmers are above the age of 50 years. Over 36% and 56% of farmers fall within the age range of above 50 years at both Asunafo North and Asutifi South (control) respectively. About 27.0% fall within the ages of 29-39 and 24.8% were above the age of 40 years at Asunafo North whiles 22.0% each were recorded for ages of 29-39 and above the age of 40 at

Asutifi South. Also, in Asunafo North, majority (22.3%) of the respondents have obtained JHS as their highest level of education. As high as 95.8 % of respondents have had some level of formal education but only 18% completed bachelor degree. A fifth (20.0%) of the respondents have obtained their MSLC with only 2.3% as Certificate holders (Table 1). Again, majority of the respondents (90.7%) at Asunafo North and all respondents at Asutifi South have been working for more than five years. The respondent length of farming at both communities are presented in the Figure 2.

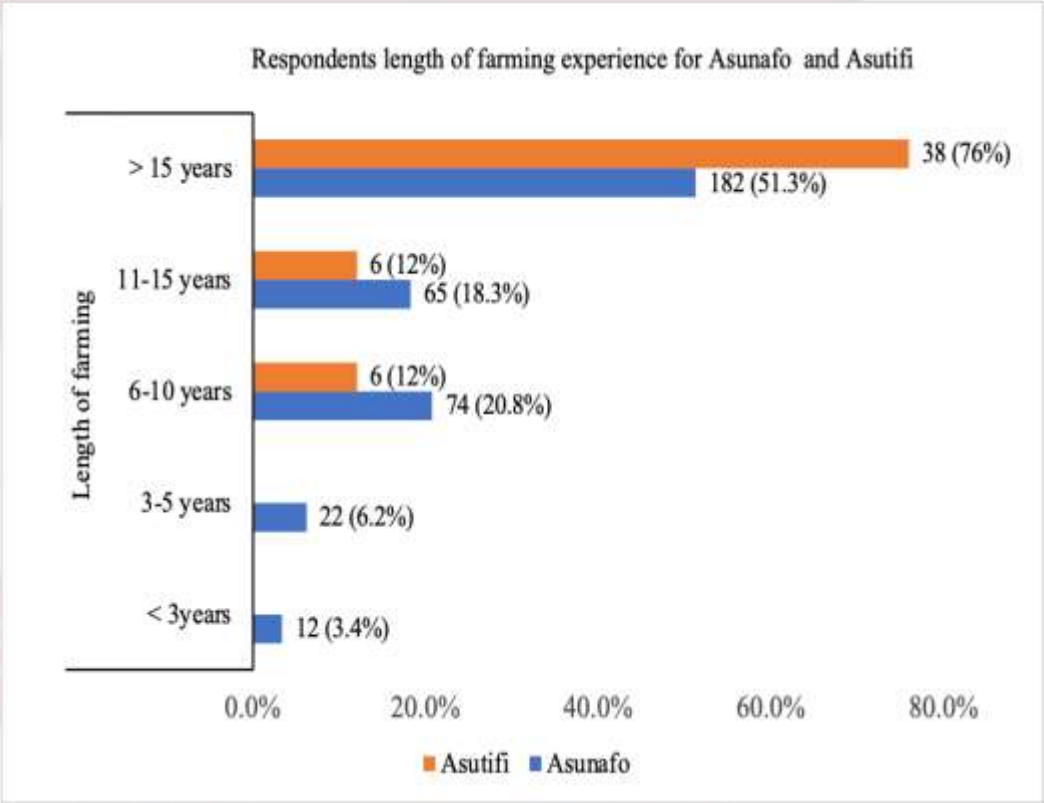

Figure 3: Respondent's duration of farming experience for Asunafo North and Asutifi South.

Source: Field data (2021-2022)

Certified Cocoa Producer Organisations Strategies to Promote Climate Change Adaptation

This section seeks to understand the strategies within certification schemes of certified cocoa producer organisations that promote climate change adaptation. Respondents rated the level of agreement strategies of certified cocoa producer organisations to promote climate change adaptation. Twelve climate change adaptation strategies classified based on the producer organisation standards for evaluation (Fairtrade International, 2021; Rainforest Alliance Sustainable Agriculture Standard, 2022) were each rated on a 5-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. This rating criteria was deemed very important and provided clearer picture about the perceived importance associated with the strategies of certified producer organisations to climate change adaptation services among the sampled population. All the 12 adaptation strategies recorded mean 3.35 out of 5, which is a positive remark. The mean response of the 12 adaptation strategies recorded from the respondents are shown in Figure 4.

Respondents from the Asunafo North community mentioned that certified cocoa producer organisations provide cocoa seedlings for cultivation. No respondent disagree that the provision of seedlings was not important. From the likert scale 1-5, the mean ratings for the farmers benefiting from improved cocoa seedlings for cultivation was 3.69 (SD = 0.52) (Figure 4). This mean ranking clearly shows that Asunafo North farming communities view certified cocoa producer organisation strategies with respect to the provision of cocoa seedlings effective and important.

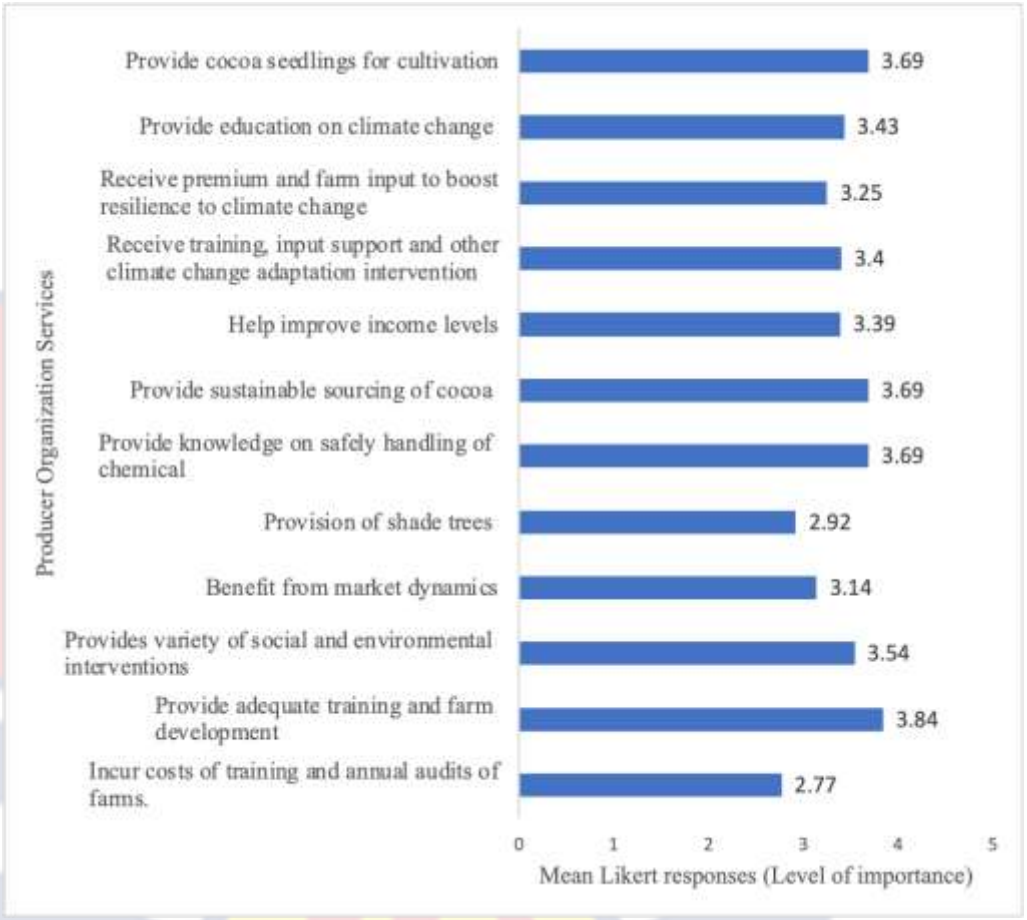

Figure 4: Mean rating of respondent responses toward the effectiveness of cocoa producer organisation strategies to climate change adaptation on 5-point Likert scale.

Source: Field data (2021-2022)

The respondents also attest that certified cocoa producer organisations provides important education and training on climate change and adaptation measures. For these reasons, respondents rated above average for all the indicators related to education and training to effectively adapt to climate change impacts. From the five-likert scale, the mean responses whether respondents enjoy trainings and farm development from certified cocoa producer organisations was 3.84 (SD = 0.44), education on climate change was 3.43 (SD = 0.55), and respondent knowledge on safely handling of chemical inputs was 3.69 (SD = 0.52). It was clearly recorded that most

respondents are assured of sustainable sourcing of their cocoa as a result of their membership of the certified cocoa producer organisation 3.69 (SD = 0.52). These respondents also claimed to have benefited from the organisations on a variety of social and environmental interventions (3.54 (SD = 0.55). Furthermore, the study revealed that certified cocoa producer organisations have helped most respondents to improve their incomes over the years (3.39 (SD = 0.54).

However, some respondents expressed moderated ranking for some of the strategies though the mean mark was still a positive remarks to the services of the certified producer organisations for the following questions "Respondents are more environmentally sound with many more shade trees as a result of the training by certified cocoa producer organisations 2.92, (SD = 1.23)", "Certified cocoa producer organisations take care of the costs of our training and annual audits of our farms 2.77 (SD = 0.85)", and "Certified cocoa producer organisations have helped farmers with the provision of cocoa seedlings and shade trees 2.72 (SD = 0.91)". These moderate responses from the respondents indicated the need for the certified producer organisations to strengthen the act of providing more services and education on the importance of shade trees cultivation. More detailed responses by the respondents on the effectiveness of certified cocoa producer organisations climate change adaptation strategies at Asunafo North is showed in Table 2.

Table 2: *Nature of certified cocoa producer organisations climate change adaptation strategies at Asunafo North*

Producer organisation Services	Asunafo North Community						
Likert Scale	1	2	3	4	5	Mean	SD
Provides adequate training and farm development	0	0	1	14	85	3.84	0.44
Provides knowledge on safely handling of chemical	0	1	3	28	68	3.69	0.52
Provide sustainable sourcing of cocoa	0	0	0	30	70	3.69	0.52
Helps improve cocoa seedlings for cultivation	0	0	0	30	70	3.69	0.52
Provides education on climate change	0	0	0	56	44	3.43	0.85
Help improve income levels	0	0	0	59	41	3.39	0.55
Receive training, input support and other climate change adaptation intervention	0	0	15	30	56	3.40	0.54
Receive premium and farm input to boost resilience to climate change	0	0	15	44	41	3.25	0.77
Benefits from market dynamics	0	0	15	55	30	3.14	0.73
Provision of shade trees	0	26	0	30	45	2.92	0.69
Incur costs of training and annual audits of farms.	0	11	15	59	15	2.77	1.23
Provides variety of social and environmental interventions	0	0	0	44	56	3.54	0.55

Note: 1 = Strongly Disagree, 2= Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree, $\bar{x}$ = Mean score, and SD = Standard Deviation.

Source:Field data (2021-2022)

Strategies Adopted by Farmers That Influence Climate Change Adaptation

Research question two seeks to assess how effective the standards have been towards enabling them to better adapt to climate change. Participants were asked to indicate their level of agreement on the effectiveness of the provision in the standards to climate change adaptation using a three Likert scale of 1-3 where, 1 = High, 2 = Medium, and 3 - Low. Respondents were asked on whether the strategies of the certified producer organisations influence their adaptation measures to climate change.

Table 3 shows that based on the effectiveness of the provision of standard to climate change adaptation at the community, participants expressively agree (high) on the following" "Protection of natural resources (forest, forest reserves, water bodies and other protected areas) 2.16 (SD = 0.35)", "Income diversification through additional livelihoods as a means of climate change adaptation. 2.16 (SD = 0.35)", "Prevention of environmental pollution. (Disposal of agrochemical containers, no burning 2.15 (SD = 0.37)", "Soil nutrient and water management 2.08 (SD = 0.64)" and "Enhancing member access to early warning signals 2.06 (SD = 0.45). However, the following practices were ranked low by the participants; existence Planting or leaving economic shade trees on cocoa farms 1.96 (SD = 0.50)", "Environmentally friendly land preparation practices 1.67 (SD = 0.83)", and "Ensuring member access to improved cocoa seedlings 1.66 (SD = 0.67)". These mean ranking shows that all the study area respondents regard the strategies by the certified producer organisation to influence climate change adaptation at Asunafo North.

Table 3: *Strategies adopted by farmers that influence climate change adaptation at Asunafo North*

Strategies adopted by farmers that influence climate change adaptation	Asunafo North Community				
Likert Scale	1	2	3	Mean	SD
Protection of natural resources (forest, forest reserves, water bodies and other protected areas).	0	11	89	2.16	0.35
Income diversification through Additional livelihoods as a means of climate change adaptation.	0	11	89	2.16	0.35
Prevention of environmental pollution. (Disposal of agrochemical containers, no burning.	0	13	87	2.15	0.37
Soil nutrient and water management	0	11	89	2.08	0.64
Enhancing member access to early warning signals	0	24	76	2.06	0.45
Training or member education on Climate Change	0	25	75	2.06	0.45
Planting or leaving economic shade trees on cocoa farms	0	37	63	1.96	0.50
Environmentally friendly land preparation practices.	25	28	48	1.67	0.83
Ensuring member access to improved cocoa seedlings	14	51	35	1.66	0.67

Note: 1 = Low, 2 = Medium, 3 = High, $\bar{x}$ = Mean score, and SD = Standard Deviation.

Source:Field data (2021-2022)

How Producer Organisations Standards Influence Farmers' Adaptation to Climate Change

Research question three seeks to determine the correlation between producer organisation strategies and the adaptation of climate change in the study area. The study applied Pearson Correlation to understand the relationship between producer organisations and members' standards adopted and adaptation to climate change by the farmers. Furthermore, hierarchical multiple linear regression analysis and stratified by the level of education and length of farming experience being entered. The hierarchical multiple regression analysis has been adopted to understand the causal relationship on whether participants' experience of the strategies adopted affects their performance in farming.

The correlational analysis shown in Table 4 has revealed that producer organisations and members' standards statistically and positively relate with farmers' adaptation to climate change (r = 0.67, p < 0.001). However, the correlation coefficient of 0.670 shows that the relationship between producer organisations and members' standards and farmers' adaptation to climate change is moderately strong. To further understand the causal relationship among the variables, the findings as presented in Table 5 show that cocoa producer organisations significantly predict farmers' adaptation to climate change at the study area (β = .728, p < .001). Moreover, producer organisations and members' standards accounted for 54% variance in explaining farmers' adaptation to climate change (F = 73.53, p < .001).

Table 4: *Correlation between producer organisations and members' standards and farmers' adaptation to climate change*

	1	2
Producer organisations and members standards	-	.670**
Farmer's adaptation to climate change	.670**	-

**. Correlation is significant at the 0.01 level (2-tailed).

Source:Field data (2021-2022)

Table 5: *Hierarchical Multiple Linear Regression with cocoa producer organisation's strategies as a predictor of farmers' adaptation to climate change*

Variable	Model 1			Model 2		
	B	*SE B*	B	*B*	*SE B*	β
(Constant)	2.918***	.186		1.588***	.158	
Length of farming	-0.063	.072	-0.067	-0.055	.050	-0.059
Level of education	-0.070	.045	-0.121	-0.155	.031	-0.270
Certification strategies				0.600***	.041	0.728
R^2		.026			.535	
F		2.53			73.53***	
ΔR^2					.509***	

Note: *p<.05, **p<.01, and ***p<.001

Source:Field data (2021-2022)

In Table 6 is the level of significance of cocoa producer organisations' strategies for farmers' adaptation to climate change in Ahafo Region. From the results of responses, it is shown that there was statistically significance at

different level of influence (mean difference) for all cocoa farmers' adaptation practices on climate change at p-value of 0.000 (p<0,05) and respective t-values. This implies that cocoa farmers' organisations' adaptation practices had positive influence on climate change mitigation in Ahafo Region

Table 6: *Significance analysis of cocoa producer organisations strategies for farmers' adaptation to climate change*

One-Sample Test						
	Test Value = 2					
Variable	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Protection of natural resources (forest, forest reserves, water bodies and other protected areas)	53.557	354	0.000	0.890	0.86	0.92
Establish organisational structures to ensure monitoring and training of farmers/members on climate change adaptation practices	52.799	354	0.000	0.887	0.85	0.92
Prevention of environmental pollution (Disposal of agrochemical containers, no burning)	49.383	354	0.000	0.873	0.84	0.91
Soil nutrient and water management	23.342	354	0.000	0.777	0.71	0.84
Enhancing member access to early warning signals	33.533	354	0.000	0.761	0.72	0.81
Training or member education on Climate Change	33.022	354	0.000	0.755	0.71	0.80
Planting or leaving economic shade trees on cocoa farms	24.455	354	0.000	0.628	0.58	0.68
Environmentally friendly land preparation practices	5.377	354	0.000	0.234	0.15	0.32
Ensuring member access to improved cocoa seedlings	6.150	354	0.000	0.217	0.15	0.29

Source:Field data (2021-2022)

Challenges Associated with Members of the Asunafo North Cocoa Producer Organisation

Even though respondents in Asunafo North are members of a certified cocoa producer organisation, they seem to face some challenges in their climate change adaptation process. From the survey, it was realized that most of the respondents complained of some challenges (Figure 4). About 63.6% of the respondents listed expensive farming inputs (cutlasses, spraying cans, fertilizers, and pesticides) as the most important challenge (Figure 4).

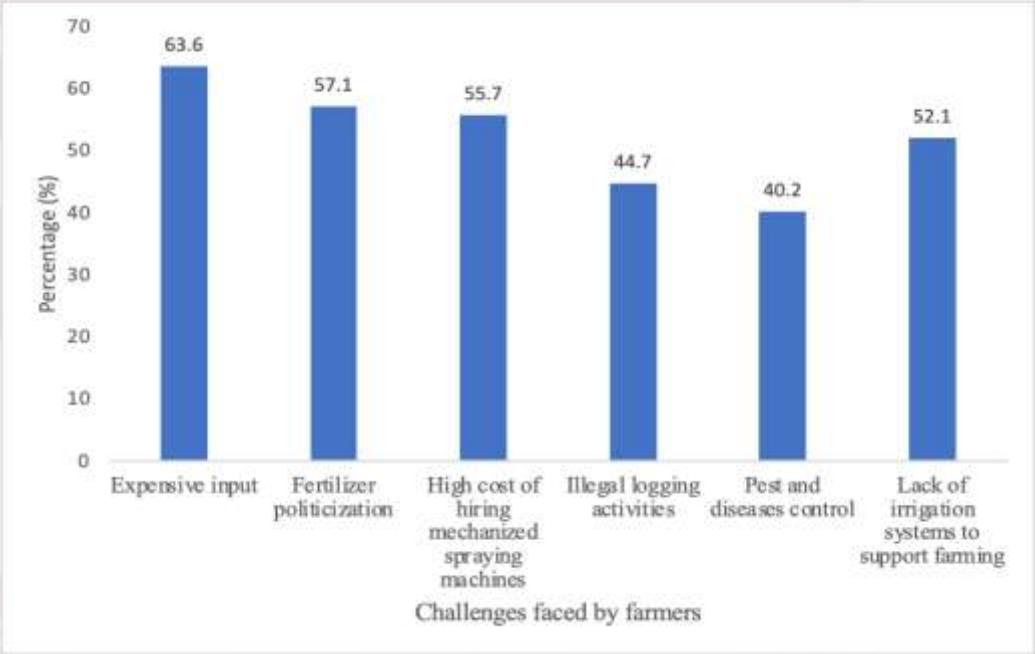

Figure 5: Challenges farmers face in their climate change adaptation process.

Source:Field data (2021-2022)

About 57.1% of the respondents listed the politicization of fertilizer distribution to respondents as the second important challenge (Figure 4). Respondents claimed that fertilizer from the government do not get to the right farmers and in some cases, they get less than what they deserve according to

the farm size. In addition, 55.7% of the respondents said the cost of hiring mechanized spraying machines to equip them to spray several hectares of cocoa farms is a hindrance for them to adopt frequent spraying of farms against pest and diseases. Another challenge was lack of irrigation systems to support their farming activities. Illegal logging activities was also cited by respondents one of their challenges. They complained that the chainsaw operators destroy their farms in the quest to log tree in the farm and they are sometimes issued threats of death from the operators in their attempt to stop them. Pest and diseases control was not left out as some of the respondents pointed out that pest and diseases infestation has risen and most of them do not get what they used to due to this challenge and also spends a lot on their control.

Challenges Associated with Members of Asutifi South Cocoa Producer Organisation (Control)

Inadequate information on climate change adaptation measures was a challenge to the Asutifi South respondents as 98% of the respondents attested to this. According to the respondents, they do not get a full understanding of the need to implement certain strategies on their farm and therefore fear the risk of losing more than what they could predict. Almost all the respondents (97%) reported lacking knowledge on Climate Smart Agriculture (97%). This makes it difficult for them to make decisions on changing their existing strategies or adopting new ones.

Restricted information, skill, information and particular climate change institution to require on climate variability and change ssues was a

challenge to applying adaptation measures by the Asutifi south respondents Almost all the respondents (97.3%) stated that they do not benefit from climate adaptation interventions like additional livelihood skill development and support as well as early warning information system. The respondents also said they do not get any premium from the sale of their produce which could be used by their organisation in acquiring extra inputs for them.

Table 7: *Summary of the challenges of the certified and non-certified producer organisation*

Asutifi South Producer Group (Control)	Asunafo North Certified Producer Organisation
Inadequate funds to support farmers with inputs apart from what the government supplies.	Difficulty in ensuring compliance to the standards by all members due to geographical spread and low literacy status of members
Services such as community nurseries to augment government's seedling provisions also lacking.	Relatively high cost of compliance to the standards which mostly involves building organisational structures, training thousands of farmers on the various modules and farm inspections.
Inability to generate enough funds to support their members with farm inputs or other climate smart interventions.	Compliance to standards such as 'non-encroachment of protected areas' demands that the organisation undertake GPS farm mapping which is very expensive as it involves thousands of farms.
Not able to engage in the development of community infrastructure e.g.: clinics, schools, police stations, teacher's quarters, boreholes, community centres etc.	Members are inclined to use agrochemicals in land preparation as against slashing without burning due to high labour cost involved in the later.

Source:Field data (2021-2022)

Table 7: *Continued*

Asutifi South Producer Group (Control)	Asunafo North Certified Producer Organisation
No access to any private sector cocoa sustainability program Organisation and their members are not involved in national level consultations on issues affecting cocoa farmers such as Cocoa and Forest initiative, National Climate Change Discourse or Living Income issues	

Source:Field data (2021-2022)

CHAPTER FIVE

DISCUSSIONS

Demographic Characteristics of Respondents

This study found the disparity between male and female cocoa farmers. There male farmers were about two-thirds whereas the female farmers were about one-third. This reflects the gender inequalities in almost all aspects of society. The gender gap in the agricultural industry globally is severe. Despite women comprising almost half of the agricultural force in developing countries, women-run farms produce 20-30% fewer yields than male-run farms. The Food and Agriculture Organisation (FAO) maintains that this disparity is directly linked to gender-specific challenges. These barriers include lack of access and rights to land, insufficient agricultural training, inadequate working conditions, ingrained gender roles and economic bias, among others. With these challenges, women are unable to reach their highest economic potential (Kuusaana *et al.*, 2013).

Majority of the farmers surveyed in this study were relatively old. Using the United Nation definition for youth (15 – 24 years), most of the farmers are way past their youthful years. There is insufficient youth participation in the agricultural sector (Mangal, 2009) even though this class of people is the most productive of any society as it contains people in the prime of their lives physically and mentally. Despite the many strategies adopted by the Government of Ghana and other stakeholders to attract youth to the agriculture sector, most young people in Ghana shy away from farming because perceptions that farming is tedious, underpaid work traditionally done by older generations. Promotion of the participation of the youth in modern

agriculture as a viable career opportunity for the youth and as an economic and business option. Farmers had considerable farming experience with majority having farmed for more than five years. Farmlands also ranged from small to large in terms of acres, reflecting the land ownership or farm sizes in the country.

Majority of the farmers were certified producers of cocoa. This means that, majority of the farmers belong to certain agriculture groups that certifies their agricultural products in exchange of using certain sustainable environmental and social farming practices as well as other compliance indicators. This certification will signal to potential conscious direct consumers of the products or consumers of food processing companies that, the products were produced through better practices and may be inclined to patronize such products.

Aside from affecting the climate of a region, climate change can have great impacts on agriculture especially cocoa production since a change in climatic factors such as rainfall and temperature can affect the growth and even the yield of crops. Agricultural processes are known to be heavily dependent on land and other natural resources which are sensitive to climatic stress. The study participants in this study mentioned that the change in climate over the years has led to a decrease in the yield of cocoa. This is in line with the study done by (Schlenker & Lobell, 2010; Ojo & Sadiq, 2011) where they stated that the annual yields of major staple foods as well as cocoa production decrease as a result of climate change. To buttress this point, Fuhrer (2003), stated that agriculture mainly the growth and yield of crops have been negatively affected by the impact made of climate change, which is

even more pronounced for cocoa since it is a very drought-sensitive crop (Carr & Lockwood, 2011). In Brazil, a study showed that drought caused high cocoa tree mortality (15%) and severely decreased cocoa yield (89%) (Gateau-Rey *et al.*, 2018). Therefore, in the face of threatening environmental change due to climate change, adaptation strategies are key to help reduce the vulnerability of society.

Strategies Used by Producer Organisations in Promoting Climate Change

In last few decades, the attention for environmental and social issues has increased and the environmental concern has been recognized to come along economic and social change within a holistic approach. As a consequence, responsible behaviour is supported and encouraged at different levels (consumers, producers, civil society) and implies different fields of action. Referring to firms, the higher environmental pressure they face has often pushed them to modify the business strategy, and a growing number of companies have embraced environmental and social sustainability policies by improving energy efficiency and resource use and waste reduction. The extent to which that happened is notably different from one sector to another but, also within the same sector, business models can vary according to firms' driving motivations and environmental orientation (Hartmann, 2011).

This study revealed that, famers viewed the strategies of certified producer organisation on climate change adaptation favourably. This confirms the literature suggesting that POs are getting more involved in the adoption of environmentally friendly practices on farms, although this is not originally a core role of CPOs. For example, a review across the EU found that, among the

225 POs surveyed in the crop, beef and veal, and olive oil sector, more than 60% of the respondent POs provided their members with promotion and assistance in applying environmentally friendly practices, an almost similar level to those who indicated a role in the stabilisation of producer prices.

The key indicators in assessing the contribution of certified cocoa producer organisations' measures to climate change adaptation (Fairtrade Climate Standard, 2020; Rainforest Alliance Sustainable Agriculture Standard, 2022) were; farmers/members are assured of sustainable sourcing of their cocoa as a result of their membership of the certified cocoa producer organisation (Cooperative Union); farmers enjoy training and farm development from certified cocoa producer organisations, farmers know more about safely handling chemical inputs with the help of certified cocoa producer organisations, farms are more environmentally sound with many more shade trees as a result of the training by certified cocoa producer organisations, farmers benefit from improved cocoa seedlings for cultivation, certified cocoa producer organisations take care of the costs of training and annual audits of farms, farmers benefited from market dynamics by selling our products at good prices, farmers get additional premium and farm input to boost their resilience to climate change, certified cocoa producer organisations have helped farmers improve their incomes over the years, farmers have benefited from variety of social and environmental interventions for families and farms, farmers have frequent education on climate change from organisation.

These strategies have been found to be integral to most environmental and social sustainability conscious CPOs (Duvaleix *et al.,* 2020). This means

that certified producer organisations play a crucial role in the adaptation to climate change. However, although responses were positive, some of the responses on the strategies, especially environmental soundness with many more shade trees as a result of the training, taking care of the costs of our training and annual audits of our farms and helping farmers with the provision of cocoa seedlings and shade trees received moderate responses. This indicates the need for the certified producer organisations to strengthening the act of providing more services and education on the importance of shade trees cultivation.

The study found that farmers enjoy training and farm development from certified cocoa producer organisations most appreciated among the respondents. Organisational literature in producer organisations reveals that the overall aim of forming certified farming base organisations or groups is to obtain the number and quality of farmers that are required to undergo training and education to enhance effectiveness (Ofori & Aryeetey, 2011). A myriad of studies has also established that there is a positive significant relationship between the type of producer organisations and farming willingness to adapt to their teaching methodologies (Syed & Jana, 2012; Gamage, 2014). The studies of Syed and Jama (2012) and Gamage (2014) revealed that when the right climate change adaptation strategies are taught well by the producer organisations, farmers are likely to deliver with a minimal challenge and enhance increase climate change adaptation.

How Producer Organisations Standards Influence Farmers' Adaptation to Climate Change

This study also assessed the strategies adopted by farmers that influence climate change adaptation. In the face of threatening environmental change due to climate change, adaptation strategies are key to help reduce the vulnerability of society (Bryan & Behrman, 2013). In this study, all the farmers made use of integrated pest management (IPM) as an adaptation strategy in mitigating the effects of pests due to climate change. In order to control cocoa pests, most farmers still rely on traditional integrated pest management (IPM) methods (Hellmich *et al.*, 2008).

This requires the use of not only chemical, but also a lot of other practices to help combat the pest attack. Also, most of the study participants used crop diversification as a strategy to mitigate the effect of the change in climate. In a study by (Shrestha *et al.*, 2018), farmers in South-East Asia also used the same crop diversification strategy where the number of rice farmers increased tremendously over the last decade in order to increase their income.

Most of them cultivated the rice together with other crops. One adaptation strategy used by majority of the study respondents was change in the cropping or planting season. The shift in cropping season is also due to the change in rainfall patterns due to climate change. During this time, the farmers also preferred improved varieties that can suit the current conditions of the climate. This is in line with the study by Shrestha *et al.* (2018), where the planting season supposed to be in May was shifted to June with the growing of new varieties known to be suitable for the present climate.

Countries in Southeast Asia have also seen a shift in their planting season and is basically based on the start of the rainy season (Arunrat *et al.*, 2017). Farmers of various crops also adopt strategy that improves the fertility of the soil in order to increase productivity. Most of the farmers in this study agreed to use several means to ensure that the fertility of the soil is either maintained or improved. Strategies that are used by farmers to improve the productivity of crops include the application of animal manure, application of compost and the use of crop rotation. Most of these adaptation strategies are used simultaneously in order to significantly reduce the risk posed by climate change in crop production (Van Touch, 2015).

Among Voluntary sustainability standards, four standards (UTZ Certified, Rainforest Alliance, Fairtrade and Organic) dominate and have increasingly been adopted by cocoa trading and chocolate manufacturing and retail companies as a way to achieve more sustainable practices in their operations and their supply chains. Combined, they certified a minimum of 1.2 million hectares and a maximum of 2.7 million hectares in 2013 (average 2 million hectares), mainly in the largest cocoa production countries in West Africa, Brazil, Peru, Honduras, Dominican Republic, Indonesia and Vietnam, (Lynch *et al*., 2014, International Trade Centre (ITC), 2015).

The study found that there was a positive significant relationship with farmers' adaptation to climate change. The regression analysis also reveals that producer organisation's standards predict farmers' adaptation to climate change. The current study findings support the existing literature (Macky and Johnson, 2000; Emerson, 2009; Shane, 2010; Becker *et al*., 2011). For instance, according to Dattner (2010), since producer organisations' standards

are guided by farmers' roles, there is an association between farmers' adaptation to climate change and the producer organisations standards to enhance productivity. Shane, (2010) also concurs with the finding that there is always a positive relationship between producer organisations' standards and adaptation to measures as a result of the fact that the farmer's duties are in connection with the increased profitability. For instance, The POs such as Fairtrade consider that an important value, which differentiates them from other farmers or organisations, is the protection and non-contamination of the environment.

Although they primarily associate this with organic farming, they also recognize that Fairtrade promotes conservation of the environment. The POs, which are also certified organic, consider that an important value that differentiates them from other farmers or organisations is the protection and non-contamination of the environment. Nevertheless, they also recognize that Fairtrade promotes conservation of the environment. This means that farmers perceive a positive link between the standards of CPOs and the adoption of climate change adaptation and mitigation measures. In a study in Tanzania, it was reported that although environmental standards are strict, they have followed them. They listed the requirements relating to the reduced use of agrochemicals and environmental care including the disposal of chemical containers, prohibition of certain agrochemicals, and prohibiting child labour (Nelson *et al.,* 2016). The board members also said that farmers have been trained not to wash containers in a public place or in a swamp where people or animals are taking water. Farmer members have been trained in the safe handling of agrochemicals.

Challenges to Climate Change Adaptation by Farmers

The principal challenge faced by farmers was expensive farm inputs, which they attributed the high cost of inputs to high cost of living in the country. Even though they are supported, some inputs that they buy from the open market put drain on their finances. Another major challenge mentioned was fertilizer/input politicization which prevents some of the farmers from accessing inputs supplied by the government. Sometimes the time they get those inputs do not help them as they tend to need them earlier.

The third challenge faced by the respondents cost of hiring mechanized spraying machines to equip them to spray several hectares of cocoa farms is a hindrance for them to adopt frequent spraying of farms against pest and diseases. Another cited challenge was lack of irrigation systems to support their farming activities. Due to erratic rainfall, cocoa trees (especially the young ones) tend to be stressed with lack of water and the lack of irrigation system prevents farmers from providing water for the trees. They complained of illegal chain saw operators felling down economic trees in their farms in their absence (mostly in the night) and destroying some of their cocoa trees in the process of transporting the felled trees. These finding were in line with the study of Akinnagbe and Irohibe (2014) in assessing the behavioural change of illegal chain saw operators.

According to Akinnagbe and Irohibe (2014), chainsaw operators destroy farms in the quest to log a single tree in farms and they sometimes issue threats of death from the operators in their attempt to stop them. Pest and diseases control was not left out as some of the respondents pointed out that pest and diseases infestation has risen and most of them do not get what they

used to due to during harvest and also spends a lot on their control. Some of them even has to cut down some of their cocoa trees which goes down to affect their productivity. Cocoa is profoundly sensitive to changes in climate. Climate change may modify the stages and rates of development of cocoa pests and diseases, modify host resistance and result in changes within the physiology of host pathogen/ pests' interaction, altering crop yields and losses. These changes affect socioeconomic variables such as farm income, livelihood and farm-level decision making (Buxton, 2020).

Low level of education on climate adaptation measures was a challenge to the Asutifi South respondents. This constitutes lack of capacity. Some of the strategies require training and these farmers lack the requisite training to help them execute the strategies. For example, even in the application of fertilizers to increase the productivity of the soil, there are things one must know in order to yield maximum results or get the expected benefit. This knowledge gap is normally bridged using extension officers who go round to educate the farmers on some techniques to use and how to achieve full results using those strategies.

The lack of information on the strategies to use is also another barrier considered to be impeding the use of adaptation strategies. According to Akinnagbe and Irohibe (2014), limited knowledge, expertise, data and specific climate change institution to take on climate variability and change issues is a major challenge to applying agricultural adaptation measures in Africa. Nearly all the respondent recorded to have missing information on Climate Smart Agriculture. This makes it difficult for them to make decisions on changing their existing strategies or adopting new ones. Almost all the

respondents stated that they do not benefit from climate adaptation interventions like additional livelihood skill development and support as well as early warning information system.

Some of the additional livelihood skills farmers acquire by virtue of them being members of a certified producer organisation are skills in snail farming, mushroom farming, bee keeping, soap making, food recipes, which help cushion them from the adverse effects of climate change. All the respondents said they do not have another source of obtaining inputs separated from what the government supplies. This is often the case since they don't get any premium from the sale of their produce which can be utilized by their organisation in obtaining additional inputs for them. All the cost of extra inputs they needed for their farming are bore by them. Apart from these peculiar challenges related to them, they all had other challenges like expensive input, fertilizer/ input politicization, high cost of hiring mechanized spraying machines, illegal logging, pest and diseases control and lack of water and the lack of irrigation system like their counterpart in Asunafo North Municipality. This supports the assertion of (Ekstrom & Moser, 2014), who indicated that barriers to adaptation strategies could be financial, attitudinal, institutional or political.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The main purpose of this study is to assess the contribution of certified cocoa producer organisations to climate change adaptation of cocoa. In order to achieve this objective, this study specifically sought out to identify the standard requirement within the certification scheme that promotes climate change adaptation, assess the strategies adopted by farmers that influence climate change adaptation, determine the correlation between these requirements and the adaptation of climate change in the study Region and to determine the challenges to climate change adaptation by farmers in the Ahafo Region. Certified farmers who went by the standard provided by their certification bodies were able to adapt to climate change. The members of the certified cocoa producer organisation have increased capacity to adapt to climate change than their non-certified counterparts.

Conclusions

This study examined how cocoa producer organisations contributes to climate change adaptation in Asunafo North Municipality of the Ahafo Region in Ghana by analyzing 405 responses gathered using questionnaires. The study identifies the standard strategies within the certification scheme that promotes climate change adaptation, assess the effective the strategies for climate change adaptation, determine the correlation between these strategies and the adaptation of climate change and determine the challenges to climate change adaptation by farmers. The study reveals that farmers enjoy trainings and farm

development from certified cocoa producer organisations to climate change adaptation ($\bar{x}$ = 3.84, SD = 0.44). The cocoa producer organisation had a positive statistical relationship with farmers' adaptations to climate change (r = 0.67, p < 0.001), significantly predicting climate change adaptation (β = .728, p < .001). In all, the study found that cocoa producer organisation certification accounted for 54% variance in explaining climate change adaptation measures (F = 73.53, p < .001).

Recommendations

Below are the suggested recommendations:

1. It is recommended that the cocoa producer organisations which are not certified should initiate plans to get their organisation certified to be able to adapt to climate change effect to enhance productivity as well as livelihood. This recommendation was made based on the survey where it was noticed that the certified producer organisations provide benefits such as funds to support farmers (in terms of inputs, financial aspect), early warning system information to plan their activities, training on Climate Smart Agriculture, as well as engage in the development of community infrastructure e.g.: clinics, schools, police stations, teacher's quarters, boreholes, community centers etc. that are lacking with farmers without a certified organisation.
2. The outcome of this study is also essential, hence major stakeholders like COCOBOD and other cocoa producer

organisations, should adapt it into their climate change adaptation reforms.

3. Moreover, the study further recommends that the stakeholders in the cocoa sector should provide training as well as quality but consistent education on climate change adaption strategies to cocoa farmers in Ahafo region as well as the nation at large.

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APPENDICES

Appendix 1**:** *Questionnaire*

Questionnaire for Individual Farmers

CSIR COLLEGE OF SCIENCE AND TECHNOLOGY

Questionnaire

Dear Sir/Madam,

I am a final year student of CSIR COLLEGE OF SCIENCE AND TECHNOLOGY pursuing MPhil. Climate and Natural Resource Management. In partial fulfillment for the award of the Master of Philosophy; I am writing on a topic: ASSESSING STRATEGIES OF CERTIFIED COCOA PRODUCER ORGANISATIONS FOR CLIMATE CHANGE ADAPTATION: A CASE STUDY OF THE AHAFO REGION OF GHANA. This questionnaire is to solicit information for the thesis and your response would be mostly welcomed. Any information given would be purposely used for the study and would be protected with utmost confidentiality.

PART ONE (Individual farmer response)

Personal Data

1. Gender: Male [ ] Female [ ]
2. Marital Status: Single [ ] Married [ ] Divorced [ ] Widowed[Separated[ ]
3. Educational background: MSLC [ ] Primary [ ] JHS[ ]SHS[ ] Certificate [ ] Diploma [ ] HND [ ] 1st Degree [ ] Masters[ ] Ph.D. [ ] None [ ]
4. Age group (in years) : ……..
5. Type of cocoa producer organisation: Certified producer [ ] Uncertified producer [ ]
6. How long have you been a farmer? :……
7. How many workers in your farm? ……..……
8. What is the size of your farm? ……

PART TWO

The contribution of certified cocoa producer organisations to climate change adaptation

To what extent do you agree with the following statement regarding the contribution of certified cocoa producer organisations to climate change adaptation? Scale: 1- Strongly Agree, 2- Agree, 3- Neutral 4-Disagree, 5- Strongly Disagree.

	Statement	**1**	**2**	**3**	**4**	**5**
9.	Farmers/members are assured of sustainable sourcing of their cocoa as a result of their membership of the certified cocoa producer organisation (Cooperative Union)					
10.	Farmers enjoy trainings and farm development from certified cocoa producer organisations					
11.	Farmers know more about safely handling of chemical inputs by the help of certified cocoa producer organisations					
12.	Farms are more environmentally sound with many more shade trees as a result of the training by certified cocoa producer organisations					
13.	Farmers benefit from improved cocoa seedlings for cultivation					
14.	Certified cocoa producer organisations take care of the costs of our training and annual audits of our farms.					
15.	Farmers benefited from market dynamics by selling our products at good prices.					
16.	We get additional premium and farm input to boost our resilience to climate change					
17.	We benefit from partnership with other local and international organisations in terms of training, input support and other climate change adaptation intervention					

18.	Certified cocoa producer organisations have helped farmers improve their incomes over the years.					
19.	Farmers have benefited from variety of social and environmental interventions for our families and farms					
20.	I have frequent education on climate change from my organisation					

21. Are there any other contribution of certified cocoa producer organisations to climate change adaptation in your locality?

.....

.....

22. What are some of the challenges you still face concerning climate change adaptation as a farmer…….

.....

This section asks information about climate variability and climate change, as experienced by the individual/household

23. Do you think there have been changes to the weather you experience now compared to what the community experienced 20 years ago? (If yes, continue. If no, go to Q26).

☐ Yes [ ]

☐ No [ ]

24. If yes, would you agree or disagree with the following statements:

	(1) Strongly disagree	(2) Disagree	(3) Neither agree nor disagree	(4) Agree	(5) Strongly agree
The rain season lasts Ion er					
When it rains it is more intense					
The rains are more unpredictable					

Overall there is less rain now than before					
It is hotter in the rain season than before					
It is hotter in the dry season than before					
The drier season lasts Ion er than before					

25. How do you know this?
    - Seen it for myself (l)
    - I've been told stories from others in village (2)
    - I've been told about this from those outside the village (3)(i.e. extension workers, NGOs...)
    - I'm not sure (4)
26. Effectiveness of the provisions in the standards with respect to climate change adaptation from farmers' view.

    This part affords farmers/member respondents the opportunity to assess the how effective the standards have been towards enabling them to better adapt to climate change.

	Adaptation strategy / coping measure	**Effectiveness** (high, medium, low
i.	Training or member education on Climate Change.	
ii.	Ensuring member access to improved cocoa seedlings	
iii.	Enhancing member access to early warning signals	
iv	Soil nutrient and water management	
v	Environmentally friendly land preparation practices.	

vi	Protection of natural resources (forest, forest reserves, water bodies and other protected areas).	
vii	Prevention of environmental pollution. (Disposal of agrochemical containers, no burning.	
viii	Planting or leaving economic shade trees on cocoa farms	
ix	Income diversification through Additional livelihoods as a means of climate change adaptation.	

QUESTIONNAIRE FOR PRODUCER ORGANISATION

CSIR COLLEGE OF SCIENCE AND TECHNOLOGY

Questionnaire

Dear Sir/Madam,

I am a final year student of CSIR COLLEGE OF SCIENCE AND TECHNOLOGY pursuing MPhil. Climate and Natural Resource Management. In partial fulfillment for the award of the Master of Philosophy; I am writing on a topic: ASSESSING STRATEGIES OF CERTIFIED COCOA PRODUCER ORGANISATIONS FOR CLIMATE CHANGE ADAPTATION: A CASE STUDY OF THE AHAFO REGION OF GHANA. This questionnaire is to solicit information for the thesis and your response would be mostly welcomed. Any information given would be purposely used for the study and would be protected with utmost confidentiality.

PART THREE: Producer Organisation (Union level response)

This part is meant to elicit response from the producer organisations / Cocoa Farmers group or Cooperative who are certified by the certification schemes since individual farmers are not certified. Per their certification standards, they are expected to put in measures at both

organisational and member levels to ensure compliance to standards including climate and environmental standards.

1. Name of cocoa producer organisation
2. Type of organisation/legal incorporation
   a) Cocoa farmer cooperative
   b) Cocoa farmer association
   c) Limited liability company
3. When was the organisation established?
4. How many legal members does your organisation have?
5. How many individual members(farmers) are in your organisation?
6. Membership categorization
   a) Number of males:
   b) Number of females:
7. What is the average farm size of the members?
8. What is the average production per hectare of the members?
9. What is the annual production outlook of the organisation over the past 5 years?

YEAR	QUANTITY OF COCOA PER TONE (mt)
2014	-
2015	-
2016	-
2017	-
2018	-

10. When was the organisation certified and what type of certification

Year of Certification …….

Type of Certification ……

11. What is the main source of funds for running the producer organisation and delivering services to members/farmers to enable them adapt to climate change?

- Member dues [ ]
- Share capital [ ]
- Premium from sale of certified cocoa [ ]
- Donors [ ]

12. Indicate the percentage contribution of these sources of funds to the overall operations of the certified farmer organisation.

Member dues [ ]
Share capital [ ]
Premium from sale of certified cocoa [ ]
Donors [ ]

13. Assessing the requirements in the cocoa producer/General standards of the certification body that addresses climate change adaptation. (Please state the standard for each point)

Climate Change Adaptation Practices	Standards Provision
a. Training or member education on Climate Change.	
b. Ensuring member access to improved cocoa seedlings	
c. Enhancing member access to early warning signals	
d. Soil nutrient and water management	
e. Environmentally friendly land preparation practices.	
f. Protection of natural resources (forest,	

forest reserves, water bodies and other protected areas).	
g. Prevention of environmental pollution. (Disposal of agrochemical containers, no burning.	
h. Planting or leaving economic shade trees on cocoa farms	
i. Establish organisational structures to ensure monitoring and training of farmers/members on climate change adaptation practices.	

14. Do you face any challenge for being certified?
    a) Yes [ ]
    b) No [ ]
15. If yes, what are the challenges?
    ……..
    ……..
16. Why are you not certified?
    ……
    ……
17. What challenges do you face for not being certified?
    ……
    ……