



ASHESI UNIVERSITY

**ASSESSING THE FEASIBILITY AND POTENTIAL CONTRIBUTIONS OF
CASHEW AS A CASH CROP FOR RURAL FARMERS IN NORTHERN REGION: A
CASE STUDY OF SAWLA-TUNA-KALBA DISTRICT IN THE NORTHERN
REGION OF GHANA.**

By

Timothy Baebaar Bagbuuro

Undergraduate Thesis submitted to the Department of Business Administration, Ashesi
University College. Submitted in partial fulfillment of the requirements for the award of
Bachelor of Science Degree in Business Administration

Supervisor: Dr. Stephen Armah

April 23, 2019

POTENTIAL CONTRIBUTION OF CASHEW FARMING

ACKNOWLEDGEMENT

First and foremost, I am grateful to God for His mercies, guidance and favors bestowed on me throughout the period of this undergraduate thesis. May His goodness be celebrated.

Without hesitation, I wish to express my profound and unqualified appreciation to my supervisor; Dr. Stephen Armah for nurturing me throughout this journey. His consistent feedback was instrumental to the success of this thesis.

I also wish to express my deepest sense of gratitude to the following lecturers: Dr. Enyonam Kudonoo and Dr. Kwami Justina Morris for offering valuable feedback in various ways which help shape the outcome of this study.

Finally, I appreciate the efforts of my research assistants: Mr. Stephen Gyato; Mr. John Nelwelle and Erica Chireh for their relentless effort. May the Almighty God bless you abundantly.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

DECLARATION

I hereby declare that this undergraduate thesis is my original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: _____

Candidate's Name: Timothy Baebaar Bagbuuro

Date: 23/04/2019

I hereby declare that the preparation and presentation of this undergraduate thesis was supervised in accordance with the guidelines on supervision of undergraduate theses established by Ashesi University College

Supervisor's Signature: _____

Supervisor's Name: Dr. Stephen Emmanuel Armah

Date: 23/04/2019

POTENTIAL CONTRIBUTION OF CASHEW FARMING

ABSTRACT

In the Northern part of Ghana, most people engage in agriculture as their main source of earning a living. Farmers in the north of Ghana produce mainly food crops such as yams, millet, Guinea-corn and maize which contributes little to their income levels. On the other hand, local farmers in the southern part of Ghana produce cash crops especially cocoa in addition to food crops. This differences in crops production have created a persistent income disparity among farmers in the north and those in the southern part of Ghana.

The research sought to assess the potential contribution of cashew production in the northern part of Ghana as a cash crop through a case study in the Sawla-Tuna-Kalba District. The study revealed that on average, a cashew farmer in the study area could earn above GHC 2,000 per harvest during the cashew season. This would be enough to improve their income levels. Also, the most pressing challenges faced by cashew farmers include the following: labor unavailability; unstable cashew prices; land scarcity, lack of capital for investment, bush fire, and theft. Lessons from the cocoa sector that could be integrated into the cashew value chain include regulation of cashew by COCOBOD; technology such artificial pollination, mass spraying and the use of machines for spraying; and finally, agriculture extension services

To resolve these challenges, the MoFA at the district level should be provided with resources to train more agriculture agronomists. Social enterprises such in the form of microfinance could be established to provide cashew farmers with credit facilities.

Key Words: Cashew, Cocoa, Sawla-Tuna-Kalba District, Northern Region, Agriculture

POTENTIAL CONTRIBUTION OF CASHEW FARMING

LIST OF ACRONYMS

Acronym	Meaning
FAO	Food and Agricultural Organization
SSA	Sub-Saharan Africa
GDP	Gross Domestic Product
NGOs	Non-Governmental Organizations
SADA	Savannah Accelerated Development Authority
ADF	Agricultural Development Fund
S.T.K District	Saw-Tuna-Kalba District

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Table of Content

ACKNOWLEDGEMENT	i
DECLARATION	ii
ABSTRACT	iii
LIST OF ACRONYMS	iv
List of Figures	viii
List of Tables	ix
CHAPTER 1: INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	2
1.3 Research Objectives	6
1.4 Research Questions	5
1.5 Relevance of the Study.....	6
1.6 Over View of the Chapters Ahead	7
1.6.1 Methodology.....	7
1.6.2 Literature Review	7
1.6.3 Data Analysis.....	8
1.6.4 Conclusion and Recommendations	8
CHAPTER 2: LITERATURE REVIEW	9
2.1 Introduction	9
2.2 The General benefits and contribution of cashew plantation.....	9
2.3 The cashew industry in Ghana	10
2.4 The cashew industry in Tanzania	13
2.5 The cashew industry in Nigeria.....	14
2.6 The Challenges of Cashew Farming in Ghana.....	15
2.7 The Cocoa production value chain and marketing strategy in Ghana.....	17
2.9 Technology in cashew farming	19
2.10 Some recommended policies.....	21
CHAPTER 3: METHODOLOGY	23

POTENTIAL CONTRIBUTION OF CASHEW FARMING

3.1 Introduction	23
3.2 Research Design	23
3.2.1 Primary Data.....	24
3.2.2 Secondary Data.....	24
3.2.3 Study Population.....	24
3.3 Description of Sample.....	25
3.3.1 Place of Study.....	25
3.3.2 Sample Size:.....	26
3.3.3 Sampling Technique.....	27
3.4 Data Collection	28
3.4.1 Data Collection Instruments.....	28
3.4.2 Data Collection Procedures	28
3.5 Data Analysis and Interpretation of Results	29
3.6 Ethical Consideration.....	29
CHAPTER 4: DATA ANALYSIS AND DISCUSSION	30
4.1 Introduction	30
4.2 Demographic Distribution of Farmers	30
4.2.1 Demographics by Gender	30
4.2.2 Age distribution of farmers.....	31
4.2.3 Years engaged in cashew farming	32
4.2.4 Educational level of farmers.....	33
4.2.5 Size of the cashew farmers	33
4.3 Responses to the research questions	35
4.3.1 Research Question 1: What are the potential challenges inherent in the production, storage, transportation, marketing and export of cashew from Northern Ghana?	35
4.3.1.1 Labor unavailability.....	37

POTENTIAL CONTRIBUTION OF CASHEW FARMING

4.3.1.2 Unstable cashew prices.....	37
4.3.1.3 Land Scarcity.....	38
4.3.1.4 Lack of access to capital for investment.....	39
4.3.1.5 The effect of bush fire as a challenge to cashew farmers.....	40
4.3.1.6 Theft.....	41
4.3.17 Farm Maintenance Cost.....	42
4.3.2 Research Question 2: What are the potential contributions of cashew as a cash crop to rural farmers in the Northern Region?	42
4.3.2.1 Improve farmers income level and other economic activities.....	42
4.3.2.2. The positive effect of cashew on the environment.....	44
4.3.3 Research Question 3: Which aspect of the cocoa production value chain could be adapted to improve the sustainability of cashew production in the Northern Region?	44
4.3.3.1 Regulation of cashew by COCOBOD.....	45
4.3.3.2 Technology.....	46
4.3.3.3 Agricultural extension services.....	48
4.3.4 Research Question 4: Could cashew farming be a feasible commercial cash crop for farmers in Sawla-Tuna-Kalba in Ghana’s Northern Region?	48
CHAPTER 5: CONCLUSION	50
5.1 Introduction.....	50
5.2 Conclusion.....	50
5.3 Business Opportunities for Social Entrepreneurs.....	55
5.4 Policy Recommendations.....	56
5.5 Recommendations for Further Studies.....	58
5.6 Limitations of Research	58
Reference	60
Appendix.....	71

POTENTIAL CONTRIBUTION OF CASHEW FARMING

List of Figures

<i>Figure 1:</i> Quantity of cashew nuts (tons) for major producing countries in 2016	11
<i>Figure 2:</i> A map of the Republic of Nigeria showing the major cashew growing areas.....	14
<i>Figure 3:</i> Cocoa production value chain in Ghana. Author’s construction, 2019	19
<i>Figure 4:</i> Map of Ghana showing the Sawla-Tuna-Kalba District.....	25
<i>Figure 5:</i> Age Distribution of farmers	32
<i>Figure 6:</i> Size of the cashew farms own by the respondents.....	33
<i>Figure 7:</i> View of cashew farm in Kulmasa. Photo: Author, 2019	34
<i>Figure 8:</i> A newly created cashew farm in Tuna. Photo: Author, 2019.....	35
<i>Figure 9:</i> Respondents ownership status of the cashew farms	39
<i>Figure 10:</i> Cashew fruits being discarded after removing the nuts. Photo: Author, 2019	40
<i>Figure 11:</i> A cashew plant burnt by bushfire. Photo: Author, 2019.....	41
<i>Figure 12:</i> A cashew plant in its first year of bearing fruits. Photo: Author, 2019.....	47

POTENTIAL CONTRIBUTION OF CASHEW FARMING

List of Tables

Table 1: Components of living standards in Ghana by regions.....	3
Table 2: Strategies used by previous governments to improve agricultural activities in the Northern Region.....	5
Table 3: Output of Cashew nuts with shells in Ghana from 1990-2016.....	13
Table 4: India's Imports of Raw Cashew Nuts in Metric Tons (MT).....	15
Table 5: Summary of sample size.....	27
Table 6: Pairwise ranking of challenges confronting cashew farmers in S.T.K District.....	36
Table 7: A summary of the findings of the study.....	51
Table 8: Pairwise ranking of challenges confronting cashew farmers in S.T.K District.....	53

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Statistics by the Food and Agricultural Organization (FAO) estimate that more than 60 percent of the world's population depends on agriculture for a livelihood (Zavatta, 2015). Thus, agriculture makes a substantial contribution to economic development across the world. As of 2018, 45 percent of the world's population lived in rural areas while 43 percent of Africa's population lives in rural areas (UN, 2018). Most of these rural folks are poor, hence depending on agriculture as their main source of earning a living.

According to the World Bank Report (2018) 450 million people in Sub-Saharan Africa (SSA) live in abject poverty, relying on less than \$1.25 per day. The link between rural dwelling and poverty seems to be true in Ghana. In fact, previous authors writing about Ghana have commented that "Poverty is a rural phenomenon in Ghana."

The 2018 World Bank report added that "the agricultural sector accounts for one-fifth of Ghana's Gross Domestic Product (GDP), employs nearly half of Ghana's workforce and it is the main source of livelihood for most of the country's poorest households...Agribusiness has a very high multiplier effect on employment, creating over 750 jobs for every additional US \$1million of output while the main export crop, cocoa accounts for 20-25 percent of total foreign exchange earnings" (World Bank, 2018). This suggests that investing in the agricultural sector could have a tremendous positive impact on the lives of millions of people, especially the poor.

It is important to recognize that unprecedented rural-urban migration in Ghana is depleting rural agricultural labor and shrinking the agricultural sector while propping up the informal service sector. Further, it is clear that the threat of increased urban poverty

POTENTIAL CONTRIBUTION OF CASHEW FARMING

characterized by inner-city poverty and slums demonstrates that rural poverty cannot be circumvented by simply migrating to the city. Rural-urban migration will not pull Ghana's poor rural north out of poverty. The problem must be solved at the source, in the north for the country.

1.2 Problem Statement

The Northern Region of Ghana is the biggest region in the country in terms of land size. The region has a total land area of 70,384 square kilometers. With population growth on the increase, poverty reduction has been a major challenge, and as a result, impede improvement in living standards at both national and regional levels across the country. At the regional levels, Cooke, Hague & McKay (2016) reported that the three northern regions (Upper West, Upper East & Northern Region) are the poorest regions in Ghana with the Northern Region being the worst, according to the Ghana Poverty and Inequality Report for 2016. The region has a population size of 2,445,061 and out of which, 44.15 percent are poor (Ghana Statistical Services, 2015).

In addition, a report by the Ghana Statistical Service (2014) shown in table 1 below revealed that the Northern Sector of Ghana, especially the Northern Region is less developed in terms of the following components of living standards: income level, rate of children education, rate of adult education, and rate of health insurance. The Northern region also suffers from outmigration of the most able-bodied to the south, increasing dependency ratios and concentrating poverty.

The Northern Region is last when it comes to both adult and children education or literacy rate. In terms of health insurance and average mean income, the region occupied the eighth and seventh positions respectively. Majority of dwellers are on the National Health Insurance Scheme in the Upper West Region due to their inability to afford or access private

POTENTIAL CONTRIBUTION OF CASHEW FARMING

health insurance. For the purpose of this study, much attention is focused on the rural dwellers in the northern part of Ghana and rural dwellers in the southern part of Ghana. Rural north refers to the rural dwellers in the Northern Region whereas rural south refers to rural dwellers in the southern part of Ghana.

Table 1

Components of living standards in Ghana by regions

Components of living standards in Ghana by regions				
Region/Living standard component	Children Education (%)	Adult Education (%)	Health Insurance (%)	Mean Income (GHC)
Western	87.4	78.6	66.2	22599.00
Central	83.6	70.7	47.4	12004.00
Greater Accra	92	86.2	58.3	16580.00
Volta	77	67.3	66.1	15451.00
Eastern	86.6	78	70	13074.30
Ashanti	87.9	80.2	74.1	23119.50
Brong Ahafo	78.9	67	82.2	14167.80
Northern	50.4	28.6	63.3	12281.40
Upper West	63.4	42.6	80.5	7240.50
Upper East	63.6	42.4	86	11977.50

Source: Ghana Statistical Service, 2014

Local farmers in the southern part of Ghana engage mainly in the production of cash crops especially cocoa in addition to food crops like cassava, yam, and maize. In the past, Ghana has been internationally recognized as the leading producer of cocoa during the 1970s but has lost the position due to a major decline in production as pointed out by Kolavalli & Vigneri (2011). Ghana is, however, still the producer of the most quality cocoa in the World, realizing the quality through complex marketing and traditional production arrangements (Armah, 2008)

The cocoa sector in Ghana offers a livelihood to over 700,000 rural farmers in the tropical belt (Kolavalli & Vigneri, 2011), thereby causing a massive migration of the population from the Northern Savannah Ecological Zone (Northern Ghana) to the Tropical Belt (Southern

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Ghana) to take advantage of the opportunities inherent in cocoa production. Currently, cocoa production takes place in six regions in Ghana namely the Ashanti, Brong Ahafo, Western, Eastern, Volta and Central Regions (Qiu, 2012)

Unlike their counterparts in Southern Ghana, rural farmers in the northern sector of Ghana do not have access to income from the production and marketing of a cash crop like cocoa. Cocoa cannot be grown in the northern part of Ghana due to unfavorable weather conditions such as high sunshine and low rainfall (Anim-Kwapong & Frimpong, 2004).

In comparison, rural farmers in Northern Ghana produce mainly food crops including maize, guinea-corn, millet and cassava (Boadu, Zereyesus, & Ross, 2015). This, therefore, over time, has created an income disparity between rural farmers in the south and those in the north. As a result, majority of the youth have migrated from the northern sector to the southern sector to engage in cocoa farming while others involve in such life-threatening activities including overcrowding in the cities in search of non-existing jobs, illegal mining (*Galamsey*) and, to the worst-case scenario, armed robbery.

Over the years, farmers in the north have been depending on crop farming, which is only seasonal as their source of income, from pre-colonial days to date. This has resulted in very little gains in income over time as the food crops are not cash crops. A related challenge embedded in this is the catastrophe of significant barriers in accessing ready markets. The government of Ghana and different Non-Governmental Organizations (NGOs) that operate in the region have used alternative strategies overtime to try to improve the livelihood of farmers and yet this did not yield any significant gains. One of such strategies is the Savannah Accelerated Development Authority (SADA) which has been criticized for being largely ineffective (Ghana News Agency, 2016). A possible reason for the impotence of the previous strategies that were used could be due

POTENTIAL CONTRIBUTION OF CASHEW FARMING

to a mismatch between the educational level of the farmers and the strategies employed. Table 2 below shows some of the strategies which have been used by previous governments and NGOs.

Table 2

Strategies used by previous governments to improve agriculture in the Northern Region

Name of Strategy	Year of Inception
Planting for Food and Jobs	2017
Savannah Accelerated Development Authority	2010
National Rice Development Strategy	2009
Fertilizer Subsidy Program	2008
Medium Term Agricultural Development Program	1991

Source: Author's own construction, 2019

A strategy that could be more effective will be the introduction of a cash crop in a manner like the cocoa from the southern part of Ghana to complement food-crop farming. Among various cash crops, cashew seems to be a cash crop that will perform well in the northern part of Ghana due to its high resistance to drought and sunshine which are the two predominant weather conditions in the north. Therefore, the entire production value chain of cashew could be restructured from the point of production and marketing, to the sales outlet so that farmers in the north will also have a year-round stream of income.

1.3 Research Objectives

The objectives of this study are stated as follows;

- To investigate the potential challenges inherent in the production, storage, transportation, marketing and export of cashew from Northern Ghana

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- To document the potential contribution of cashew as a cash crop to rural farmers in the Northern Region.
- To investigate the supply chain and marketing strategy of Ghana's cocoa sector in order to recommend strategies to improve the sustainability of cashew production in the Northern Region.
- To determine the feasibility of cashew farming as a commercial cash crop for farmers in Sawla-Tuna-Kalba in Ghana's Northern Region.

1.4 Research Questions

This research seeks to answer the following questions;

- What are the potential challenges inherent in the production, storage, transportation, marketing and export of cashew from Northern Ghana?
- What are the potential contributions of cashew as a cash crop to rural farmers in the Northern Region?
- Could the supply chain and marketing strategy of Ghana's cocoa sector be adopted to improve the sustainability of cashew production in the Northern Region?
- Could cashew farming be a feasible commercial cash crop for farmers in Sawla-Tuna-Kalba in Ghana's Northern Region?

1.5 Relevance of the Study

Most of the local farmers in the Northern Region of Ghana produce mainly food crops which do not contribute match to their income levels. Recently, cashew is one of the cash crops that is becoming popular in the region. This study seeks to examine the challenges inherent in the cash production value chain, the potential contributions of cash to the income level of rural farmers in the Northern Region and some of the lessons that could be borrowed from the cocoa

POTENTIAL CONTRIBUTION OF CASHEW FARMING

sector to make cashew production more sustainable. Since the Northern Region is the most underdeveloped region in the country, this study will enable policymakers in formulating strategies that will improve agricultural development in the region. The study will also identify business opportunities for entrepreneurs in the cashew industry.

Further, this study will contribute to the existing literature in cashew production especially in the Northern Region, Ghana, and Africa as a whole. Finally, other developing countries considering cashew production could also make use of the recommendations in this study.

1.6 Over View of the Chapters Ahead

1.6.1 Methodology

This chapter gives a systematic analysis of the process, procedures, and tools used in the study. It focusses on the type of study adopted, the sampling technique, sample size, data collection, and analysis procedures. The methodology served as a framework that guided the entire research process.

1.6.2 Literature Review

The literature review chapter looked at existing literature done in cashew farming such as the challenges, contribution of cashew as well as some technologies employed in cashew farming. Overview of Ghana's cocoa sector, as well as cashew production in some selected African countries, were also stated in the literature. The review showed gaps in the existing study for which the current study sought to fill.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

1.6.3 Data Analysis

In this chapter, the data collected from respondents is analyzed to be able to answer the research questions posted at the beginning of the study. The findings from the data analysis informed how cashew farming will improve rural farmers livelihood.

1.6.4 Conclusion and Recommendations

This chapter is a summary of the findings in the entire study. The chapter also gives recommendations which policymakers can use in deciding on strategies in the agriculture sector that can improve the living condition of farmers in the northern part of Ghana.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter summarizes the existing literature on cashew production to offer a better understanding of the subject matter. Broadly, the discussion elaborates on the general benefits and contributions of cashew to livelihood as well as the major challenges usually encountered by cashew producers. In addition, the literature explored some of the technologies used in cashew production as well as an overview of the cashew industry in some selected African countries.

The literature review also tackles the cocoa production value chain in Ghana from production, transportation, marketing to processing. The chapter is concluded with some recommended policies based on the findings from the literature reviewed.

2.2 The General benefits and contribution of cashew plantation

Several scholars have given various definitions of cash crops. Notably, Achterbosch, Berkum & Meijerink (2014) defined cash crop as a term referring to plantation crops such as cocoa, cashew, tea, cotton, tobacco, rubber, oil palm, and sugarcane. In addition, Barbier (2015) also gave a similar definition while reiterating the fact that cash crops are ultimately exported out of the producing country. These definitions gave a clear distinction between cash crop and food crop, with the latter being staples which are produced domestically such as cereals, tubers, roots, and pulse. The contributions and benefits of cashew are numerous as discussed below.

Monteiro et al (2017) conducted a study in Guinea-Bissau to find out the benefit of cashew to local farmers and concluded that the crop contributed immensely to the income level of rural farmers. The general cost incurred by farmers such as maintenance cost, labor cost, storage cost, and other expenses were found to be less than the return received by farmers hence indicating

POTENTIAL CONTRIBUTION OF CASHEW FARMING

positive contributions to rural farmers income levels. Further, Jøker (2003) also found that most farmers in Bennin engage in cashew farming purposely for its economic contribution.

Vande et al (2007) and Joker (2003) both testified in their studies that the cashew crop, apart from its revenue contributions, also curbs soil erosion hence improving soil nutrients and impacting the environment positively. The cashew plant is a perennial crop that grows to a height of 5 to 15 meters with a crown diameter of 12 to 14 meters (Kapinga, Kasuga, & Kafiriti, 2002) and stands firm in the ground as a result of its tap roots extending deep into the soil. The cashew plant, therefore, serves as a wind adsorber that prevents the wind from sweeping the bare ground which could lead to soil erosion. While contributing to soil conservation, the cashew plant supports wildlife and birds with its shade and fruits.

Soares et al (2013) further elaborated that the health benefits of cashew cannot be underestimated as far as the benefits of cashew are concerned. Thus, the cashew nut contains protein such as linoleic, palmitic and stearic fatty acids which were all found to be useful to the human body. The cashew nut is also consumed as food and it is known to contain nutrients which are proven to be healthy for the human body. In addition, Rico, Bulló, & Salas-Salvadó (2016) also found that the cashew nut contains approximately 21.3 g/100g of proteins, 20.5g/100g of carbohydrates while sodium content is estimated to be 144mg/kg. The cashew apple is as well eaten as food while the delicacy of the nut is incomparable.

2.3 The cashew industry in Ghana

Cashew (*Anacardium occidentale L*) is an evergreen plant that was brought to Africa by the Portuguese in the sixteenth century. India has been identified as the world's leading producer of cashew followed by other major producing countries such as Brazil, Tanzania, and Nigeria

POTENTIAL CONTRIBUTION OF CASHEW FARMING

(Kumar et al, 2012) and this has been illustrated in figure 1 below using the 2016 data for raw cashew nuts produced by each country.

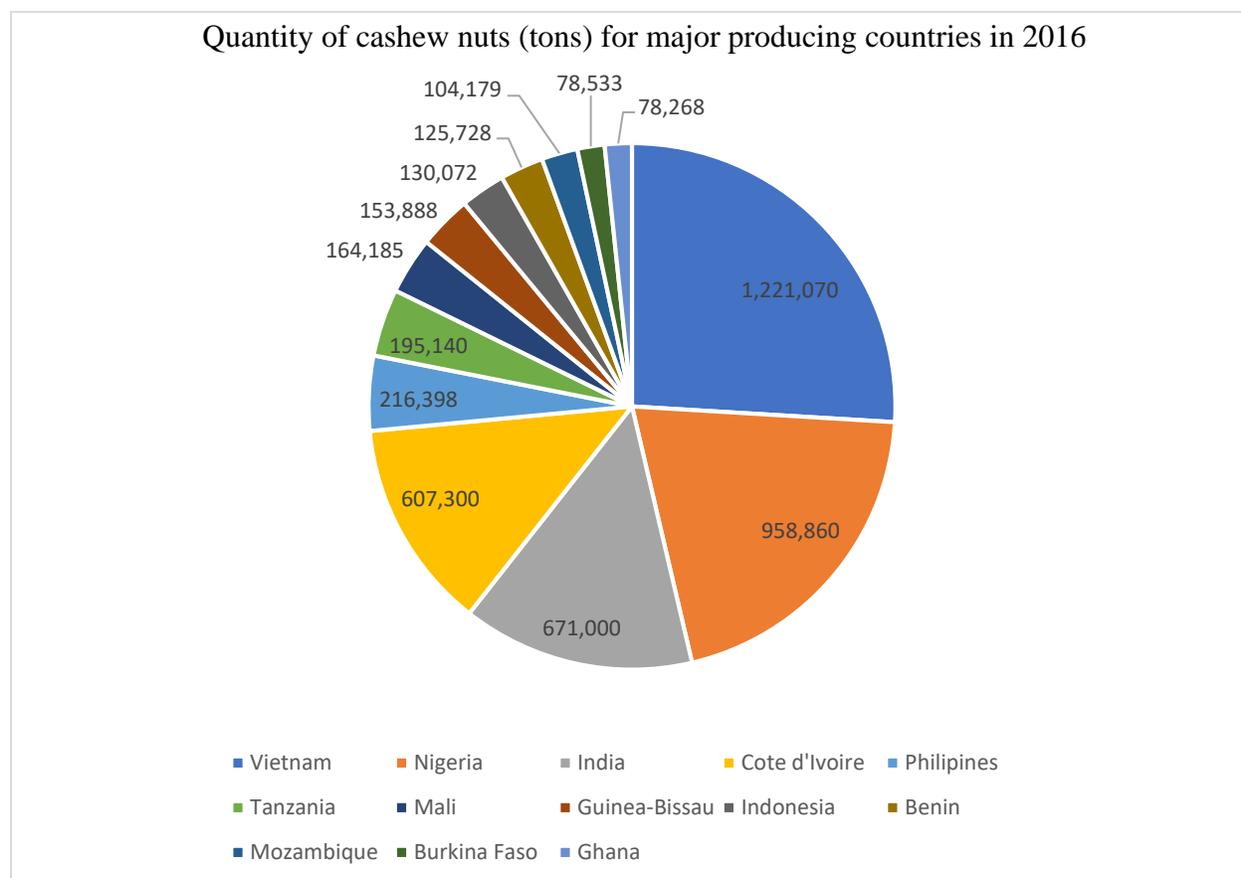


Figure 1: Quantity of cashew nuts (tons) for major producing countries in 2016

Source: FAOSTAT (2018)

Cashew production has been growing rapidly in Ghana which attracted the attention of the Ministry of Agriculture and other stakeholders as the crop is now deemed lucrative in the international market. This shifted the attention of policymakers in top ministerial positions of government in their attempt to implement strategies that will improve the living standards of citizens who earn their living mainly through the agricultural sector.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Interestingly, cashew production started in Ghana in the 1960s, mainly in the Central and Greater Accra Region but was subsequently extended to the Upper West, Upper East, Brong Ahafo and the Northern Region (Frimpong, 2016). The cashew industry in Ghana faced several challenges in its initial stage especially between 1970-1980 as the development of government policies and strategies to manage the sector were still in the process. The cashew sector, however, got revived following the initiation of the Economic Recovery Program (ERP) by which cashew was recognized as a cash crop capable of contributing immensely to a sustainable livelihood.

Cashew has been considered as one of the most important tree-crops across the globe with world cashew production estimated at 750, 000 metric tons while current annual production in Ghana is estimated at 5,000 metric tons as compared to 15 metric tons exported from Ghana in 1991 (Agricultural Development Fund, 2000). In Ghana, cashew production is categorically based on smallholder venture with land cultivation ranging from 0.9 ha to 1.2ha. As estimated by the Food and Agricultural Organization Corporate Statistical Database, Table 3 shows the production of cashew in Ghana estimated in hectogram per hectare (kg/ha). According to the Agricultural Development Fund (ADF), Ghana currently has an estimated land area of 18,000 ha employed in cashew production which is spread across the country. Meanwhile, there is the possibility to expand cashew production to cover 100,000 ha by the year 2020 (Agricultural Development Fund, 2000)

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Table 3

The output of Cashew nuts with shells in Ghana from 1990-2016

Year	Output in hg/ha	Year	Output in hg/ha
1990	4800	2005	5577
1991	5063	2006	5763
1992	5103	2007	5215
1993	5080	2008	4231
1994	5000	2009	4576
1995	5106	2010	4978
1996	5000	2011	4390
1997	5769	2012	5333
1998	5498	2013	5316
1999	5353	2014	5882
2000	5329	2015	5882
2001	5257	2016	5501

Source: FAOSTAT (2018)

2.4 The cashew industry in Tanzania

Tanzania has been one of the major cashew producers in Africa. The cashew industry in Tanzania was at the verge of collapse during the 1970s but made a remarkable recovery in the 1980s following an economic reform that incorporated exchange rate adjustment and trade liberalization (Mitchell, 2004). Thus, cashew has become an invaluable cash crop in Tanzania, hence, making economic contribution rising from £1 million to approximately £3 million during the 1970s (Tsakiris, 1967). Since the 2000s, lower prices received by local farmers have been a headache and a disincentive which led to the dwindling of production to 104, 000 tons annually between 2005 and 2014 (Nkonya & Cameron, 2015). However, the introduction of the Warehouse Receipt System in 2008 allows farmers to sell their products to the Tanzania Cashew Board that sets prices for cashew. Subsequently, observations by Nkonya & Cameron (2015)

POTENTIAL CONTRIBUTION OF CASHEW FARMING

indicated that production only fluctuated between 72000 tons and 99 000 tons from 2011 to 2012.

2.5 The cashew industry in Nigeria.

Nigeria became the fourth largest producer of cashew in early 2018 with Nigeria's cashew nut production previously being 220,000 metric tons in 2017 while the World's production for the same year was recorded as 2.1 million (Durodola, 2018). Cashew production in Nigeria started in the late 15th century. Adeigbe, Olasupo, Adewale, & Muyiwa (2015) pointed out that the cashew sector in Nigeria is such an important industry because it provides income for about 50, 000 farmers while employing approximately 55,000 people down its value chain. The southern and middle belt in Nigeria is more concentrated in terms of cashew production as seen in figure 2 below. As also observed in Ghana, cashew production in Nigeria is predominantly smallholder farmers.

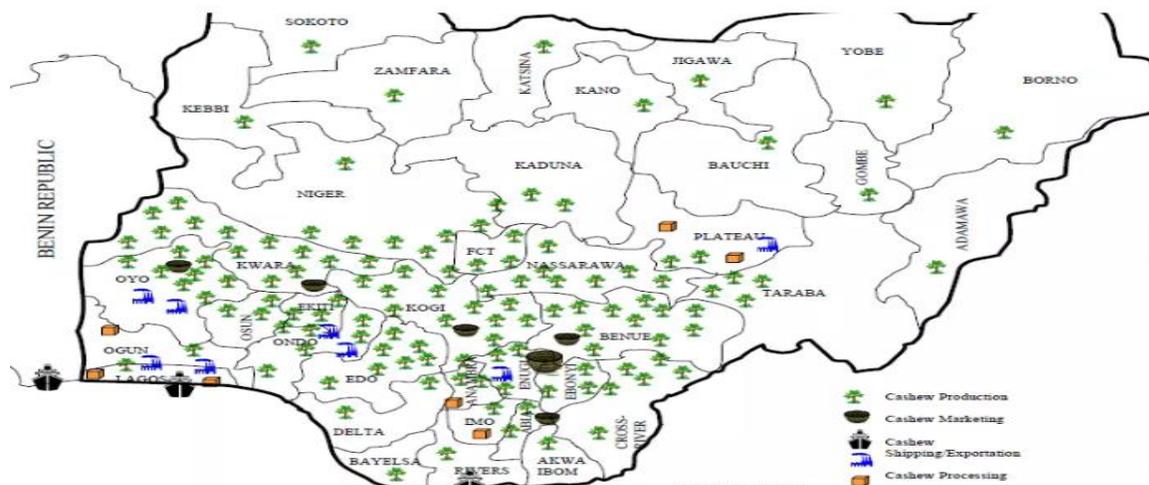


Figure 2: A map of the Republic of Nigeria showing the major cashew growing areas

Source: Chemonics International Inc (2002)

POTENTIAL CONTRIBUTION OF CASHEW FARMING

In terms of trade, India has been the largest buyer of cashew nuts from Nigeria followed by Brazil and Vietnam respectively. Table 4 below shows the number of raw cashew imports by India from other parts of the world. The data indicated that the total quantity of cashew nut imported from West Africa alone constituted 49% meaning that there is a high demand for raw cashew in the international market.

Table 4

India's Imports of Raw Cashew Nuts in Metric Tons (MT)

	1993/94	1996/97	1999/00	Per Annum (%)
West Africa	51,482	61,260	110,000	49%
East Africa	80,219	88149	109400	17%
Asia	59,000	52,155	10760	
Other	621	11,288	12,523	
Total	191322	212852	242683	12%

Source: Chemonics International Inc (2002)

2.6 The Challenges of Cashew Farming in Ghana

Land acquisition has been one of the major bottlenecks of participants in the agricultural sector in Ghana especially in cashew production where a vast land is needed for the cultivation.

Yaro (2009) elaborated that the acquisition of land in Africa is still spearheaded by the customary tenure system that is controlled by both well structured social and cultural rules hence giving rise to equal land access by families and clans.

In the typical Ghanaian traditional culture, ownership of land rests mainly in the domain of first settlers who are grouped into families, clans, and royals and this could be traced back to

POTENTIAL CONTRIBUTION OF CASHEW FARMING

the very origin of civilization (Donnelly, 2014). The land is such an invaluable resource which could result in wars and various social unrest if ownership is not legally acquired.

There are two broad categories of land ownership in Ghana which are; customary land and public land ownership (Sittie, 2006). Customary lands refer to lands in the possessing of skins, stools, clans, and families which are controlled by the head of the family or the chief. On the other hand, lands that are entrusted in the hand of the government for public use are referred to as public lands. This complex nature of land ownership in Ghana poses a great challenge to cashew producers who have to own lands through either grant or purchase from customary landowners.

In the study of Uwagboe, Adeogun & Odebode (2010), they identified two major knowledge gaps in the challenges of cashew production being lack of access to capital and unavailability of storage areas. Cashew farming by nature is labor intensive especially during harvesting and processing. In addition, the juvenile stage of cashew seedlings requires the use of weedicides to control the weeds as well as the use of pesticides to improve the flowers and fruits' quality. However, local farmers find it difficult to have access to credit facilities from financial institutions. The inadequate capital for farmers usually leads to low production capacity which does not contribute significantly to the income growth of rural farmers. Lack of storage areas on the other hand usually results in damage and above all, reduction in quality of the cashew kernels.

Catarino, Menezes, & Sardinha (2014) in their study found out that the spread of pests and diseases coupled with lack of technology to control pests (Mole, 2000) remained a major

POTENTIAL CONTRIBUTION OF CASHEW FARMING

challenge to rural cashew producers while the effect of biodiversity and fire regimes are yet to be assessed.

The cashew species is prone to the attack of several pests and diseases for which three dangerous pests stand out among the list: the stem borer, the trunk, and root borer, and finally the stem girdler (Catarino, Menezes, & Sardinha, 2014). Pests and diseases control has been a challenge due to the high investment farmers have to make to control pest in the light of credit facilities unavailability. These pests identified were found to have a serious threat to Nigeria's cashew production (Adedeji, Anikwe, & Hammed, 2008)

Furhter, Nhantumbo, Takeshita, Uaciquete, & Miura (2017) in their study conducted to find out the intensity of farmers adoption to new technology, found that many farmers do not have access to agricultural extension services which was a major challenge. Similarly, Anik, & Salam, (2014) also found a positive correlation between extension services and the output in onion production in Bangladesh which could also be helpful in the cashew production sector. Extension officers play such a vital role in the agricultural value chain because they teach farmers the best practices to adopt in their farms that will yield good productivity. The extension officers also teach farmers about recent technological innovations in the agricultural sector.

2.7 The Cocoa production value chain and marketing strategy in Ghana.

In 1876, Tetteh Quarshie brought cocoa into the then Gold Coast from Fernando Po (Equatorial Guinea) (Essegbey & Ofori-Gyamfi, 2012). Since then, cocoa evolved over the years and finally became the top cash crop in Ghana. Ghana was the leading producer of cocoa in the world between the period of 1911 to 1976 but lost the position due to a major decline in cocoa production (Darkwah & Verter, 2014, pp 296). Cocoa currently contributes about 30% of

POTENTIAL CONTRIBUTION OF CASHEW FARMING

foreign earnings to Ghana's economy (Emmanuel & Qineti, 2018, pp 1) which has attracted government interest to reorganize the entire value chain of the cocoa sector through the establishment of the Ghana COCOBOD.

The Ghana Cocoa Marketing Board (COCOBOD) is the major government institution that oversees the production, quality assurance, and marketing of cocoa through its subsidiaries. Established in 1947, the COCOBOD was rehabilitated in 1987 through the Cocoa Sector Rehabilitation Project which was funded by the World Bank (World Bank, 1987). Through this project, the COCOBOD was restructured and reorganized by reducing its size to ensure effective operations. The Quality Control Company and the Cocoa Marketing Company were created as subsidiaries of the COCOBOD to spearhead the quality control and cocoa marketing divisions respectively. In addition, the COCOBOD implements government policies in the cocoa sector such as price determination and buying of cocoa beans from local farmers.

Cocoa production in Ghana is mainly predominantly smallholder farmer base. These local farmers would sell the cocoa beans to either the office of COCOBOD or Licensed Buying Companies who set up their buying centers in major cocoa producing areas. The Licensed Buying Companies would eventually sell all the cocoa beans purchased to COCOBOD which is the main institution responsible for exporting cocoa out of the country by predetermining prices with the international market. COCOBOD is a monopsony purchaser of cocoa in Ghana (Armah, 2008). The above sequence formalizes the entire value chain of cocoa which allows rural farmers to enjoy premium prices. Figure 3 illustrated the cocoa value chain in Ghana starting from production to the point of export.

POTENTIAL CONTRIBUTION OF CASHEW FARMING



Figure 3: Cocoa production value chain in Ghana. Author's construction, 2019

2.9 Technology in cashew farming

The impact of technological advancement has been felt in all spheres of life and more importantly in agriculture. The use of technology in cashew production has contributed significantly to the entire cashew production value chain, ranging from spraying to harvesting and processing of the cashew nuts. Although technology has been identified to have a positive impact on agriculture, some farmers still resist its implementation (Ojolo, Olatunji, & Orisaleye, 2015). Additionally, this interaction between humans and machines is what Ojolo, Olatunji, & Orisaleye (2015) referred to as ergonomics. Knowledge of ergonomics helps designers to create technological devices which workers could easily adopt. Also, a study by Chou & Hsiao (2005) indicated that anthropometry is a core and research area in ergonomics that attempts to measure

POTENTIAL CONTRIBUTION OF CASHEW FARMING

the human body dimensions and other physical features. In this regard, anthropometry data is considered as relevant data in ergonomics because it could be used in determining the physical dimensions of the equipment, demarcation of workspaces and application to product design.

Agriculture has gone through a period of continuous artificialization and domestication of crops which have experienced the application of several technologies when it comes to planting cultivation. Among these agricultural technologies is grafting. Grafting is an agricultural term which involves the natural or deliberate joining of parts of plants together to maintain vascular growth and continuity between the two plants (Mudge, Janick, Scofield, & . Goldschmidt, 2009). Similarly, Loehle & Jones (1990) explained grafting as the joining of two parts of a plant at the point of contact which might not necessarily be a complete unification of the two vascular parts. Grafted seedling is one of the most common technologies that has been discovered especially in cashew farming. According to Mudge et al (2009), the following enumerates the benefits of grafting:

- Vegetative propagation: since the origin of grafting, vegetative propagation has been its major use. The technique is used to propagate species of plants that could not otherwise be propagated asexually. This is possible because the vegetative offspring otherwise known as the ramet is assured to be identical to the scion donor tree in terms of genetical characteristics
 - Avoidance of juvenility: usually, cashew plants grow as juveniles before they become capable of flowering. Throughout the period of the seedling to the point of bearing flowers, the resources needed to care for the plants could be economically undesirable. Farmers can avoid the juvenile stage through grafting.
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

As far as the use of technology in cashew production is concerned, a recent study by Kolhe (2009), revealed that the tractor mounted hydraulic lifter has been discovered as a modern sophisticated machine that helps farmers in spraying, harvesting, and pruning of the cashew plant. Without this machine, farmers could perform harvesting mainly by using a machete, harvesting knife, and climbing of the cashew tree to hand-pick the fruits. These methods mentioned above are labor-intensive and time-consuming which does not improve productivity. In addition, Thiyagarajan (2018) pointed out that the mechanization of fruit harvesting has become necessary since it will avoid the risk of injury associated with the use of commercial labor. Therefore, the tractor mounted hydraulic lifter is one of the current developments in the cashew sector.

Further, the findings of Ojolo & Ogunsina (2007) were implemented in the development of a village level cashew nut-cracking device which does not use any mechanical energy in its operations. This device has been used by many rural cashew farmers to shell their cashew nuts. Prior, cracking of cashew nuts used to be mainly the traditional methods which involve the use of a harmer or a cutting knife. These traditional methods are not only labor intensive but also usually result in the brokerage of the cashew kernels that can cause price reduction in the market. However, the development of the cashew nut cracking machine has simplified the work of local processors as well as improved the quality of processed nuts.

2.10 Some recommended policies

The review above revealed numerous challenges confronting the cashew sub-sector across the world and especially in Ghana. This, therefore, calls for relentless effort and pragmatic measures to be taken as a pre-requisite to curbing these challenges to enable rural cashew producers to enjoy the full benefits of their toils. For cashew producers to enjoy higher income through an increase in cashew prices, Mole (2000) suggested that there should be a liberalized market coupled with enough rural infrastructure that will reduce transaction

POTENTIAL CONTRIBUTION OF CASHEW FARMING

cost to traders, exporters and local processors. Liberalization of the cashew market will lead to a competition which will push prices up. For this to work effectively, there is a need for institutions that will help disseminate information about available price options to cashew producers.

Also, Wongnaa & Awunyo-Vitor. (2013) suggested the need for the government, Non-Governmental Organizations and investors to provide investments in the cashew sector so that cashew producers can have access to fundings and credit facilities to enable them to increase their production capacities. Because of the high investment needed in cashew production, rural producers usually find it difficult to meet both local and international demand due to lack of capital. This goes on to affect cashew nut processors as raw kernels are not available hence reducing the benefits that could be realized in the entire cashew production value chain.

Further, the literature reviewed showed that there has been a consistent growth in demand for cashew nuts, especially in the international markets. Meanwhile, local production in most areas still depends on the traditional methods of employing intensive labor in the cashew production process. This does not only increase the cost of production but also reduces productivity. Productivity in the cashew sector could be enhanced through disseminated technologies in cashew-nut crops coupled with effective extension services that will enable local farmers to efficiently adopt such technologies into their farming practices (Ibrahim, 2015).

POTENTIAL CONTRIBUTION OF CASHEW FARMING

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The study aimed to assess the feasibility and potential contribution of cashew as a cash crop for rural farmers in the Saw-Tuna-Kalba District (S.T.K District) in the Northern Region of Ghana. Both descriptive and exploratory approaches were adopted in the study. Descriptive research enables the researcher to do an in-depth study of the characteristics of an individual, groups or a situation and how frequent certain phenomenon occurs (Dulock, 1993). On the other hand, exploratory research helps the researcher to do an in-depth study and thus get a full understanding of the problem at hand (Manerikar & Manerikar, 2014). With this approach, cashew farmers got to share their experiences. The rest of the chapter describes the research design, the place of study, sampling technique, sample size, and the research limitations.

3.2 *Research Design*

The design of this study employed a mixed method research approach. The qualitative component of research relies on the meanings of participants' experiences by exploring how people describe and metaphorically make sense of their own experiences (Vanderstoep & Johnston, 2009). The qualitative research approach will enable the researcher to explore the processes cashew farmers go through by doing a grand narrative of their cashew production experiences with regards to the benefits, challenges and the impact cashew production has on the environment. On the other hand, quantitative data were also gathered for analysis so as to be able to quantify the contributions of cashew to the participants' income levels and also make a comparison across communities. Therefore, the study is best described as mixed method research since it made use of both qualitative and quantitative data. In addition, both primary and secondary data were also used for the study.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

3.2.1 Primary Data

The study adopted both descriptive and exploratory approaches, therefore, it mainly made use of primary data. Primary data is described as a unique and original data which the researcher obtained from sources including observations, questionnaires, surveys and interview (Ajayi, 2017). In this study, primary data is collected mainly through interviews and administering of questionnaires to cashew farmers in the study area.

3.2.2 Secondary Data

Secondary data, on the other hand, is referred to as data collected by someone in the past for some other purposes (Ajayi, 2017). Secondary data was gathered from sources such as news reports, books, journals, government reports and websites to get an in-depth understanding of cashew farming in Ghana and other locations. The literature review, for instance, revealed findings of other studies which is compared to this current study

3. 2.3 Study Population

Conventionally, Sawla-Tuna-Kalba District has a population of 99,863 with 86% of the inhabitants being rural dwellers (Sawla-Tuna-Kalba District Assembly, 2015). As a result, agriculture becomes the major source of livelihood for most people in the catchment areas of the district. Presently, not all the communities in the district are producing cashew because cashew farming is a new development which is gaining grounds in some sections of the district. As a result, the population for this study includes all the cashew farming communities in the S.T.K District as well as the officials from the District Office of Agriculture and that of the Ghana COCOBOD.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

3.3 Description of Sample

3.3.1 Place of Study

Figure 4 below is the map of Ghana with the arrow at the top left-hand side of the map indicating the location of the S.T.K District in the Northern Region. The district shares borders with Cote D'Ivoire to the west, Bole District to the south, West Gonja District to the East and Wa West District to the north.

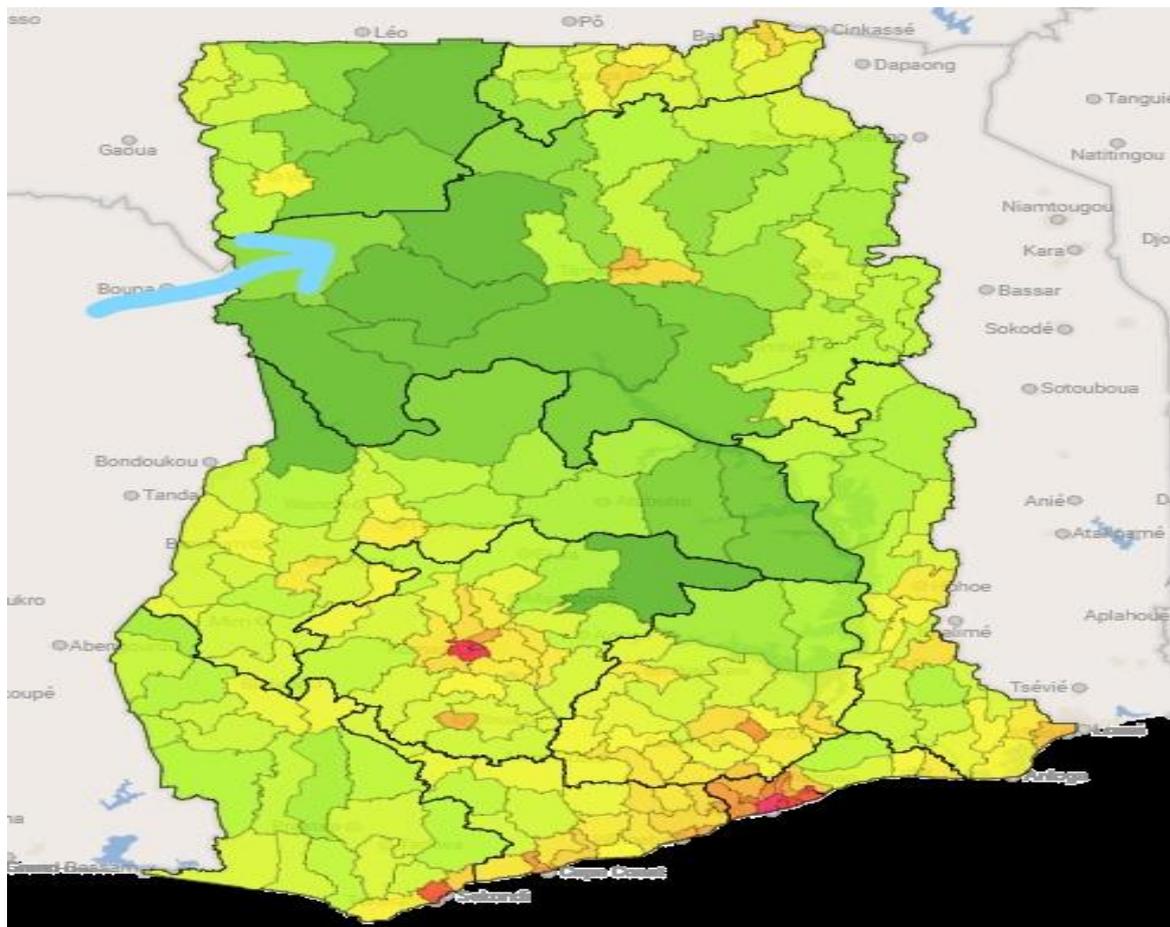


Figure 4: Map of Ghana showing the Sawla-Tuna-Kalba District

Source: Ghana Statistical Service, 2014

Sawla-Tuna-Kalba District has a population of 99,863 with 86% of the inhabitants being rural dwellers (Sawla-Tuna-Kalba District Assembly, 2015). As a result, agriculture becomes the major source of livelihood for most people in the catchment areas of the district. Currently,

POTENTIAL CONTRIBUTION OF CASHEW FARMING

cashew production has become a trend in the Northern Region, especially in the Sawla-Tuna-Kalba District. Some of the popular communities in the District where cashew farming has started for the past five years include Kulmasa, Gindabou, Nyoli, Yipaala, Tuna, and Soma. Primarily, farmers in the district usually engage in the production of cereal crops such as maize, millet, yam, guinea-corn, beans, and soya beans purposely for consumption as well as income generation.

3.3.2 Sample Size:

In qualitative research, a small sample size of 10-20 is ideal for the researcher to penetrate into the social life of participants beyond appearance and unearth meanings about the problem being studied (Crouch & McKenzie, 2006). However, when it comes to exploratory research where the researcher uses a nonprobability sampling technique, a sample size of 20-150 is considered as a representative sample (Daniel, 2012). Recently, cashew farming has become a new development in the S.T.K District. A prior visit to the district by the research revealed that on average, 20-25 farmers in each community engage in cashew farming. For this study, a sample of 75 cashew farmers from five cashew producing communities was engaged in the study. Based on this estimate, the researcher is able to gather enough data by including at least 15 farmers from each of the five cashew producing communities to form part of the sample. This gave a sample size of 75 as indicated in table 5 below.

In addition, three officials from COCBOD were also interviewed. These officials were the Manager and two other Heads of the research department of COCOBOD. Their insights helped the researcher to have a better understanding of which lessons from the cocoa production value could be adopted into the cashew production value chain to make it more sustainable which is one of the main objectives of the study.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Table 5

Summary of the sample size

Name of community	Data Collection Instrument	Sample Size	Number of Respondents	Response Rate
Kulmasa	Questionnaire	10	10	100%
	Interview	5	4	80%
Gindabou	Questionnaire	10	10	100%
	Interview	5	5	100%
Yipaal	Questionnaire	10	10	100%
	Interview	5	4	80%
Nyoli	Questionnaire	10	9	90%
	Interview	5	5	100%
Tuuna	Questionnaire	10	10	100%
	Interview	5	3	60%
Total		75	70	93%

Source: Field Data, (2019)

3.3.3 Sampling Technique

Nonprobability sampling design is used in the study. In nonprobability sampling, members of the population do not have an equal chance of being selected to participate in the sample (Vanderstoep & Johnston, 2009). Both snowballing and purposive sampling techniques were used for selecting the sample. These two sampling techniques were used because purposive sampling allowed the researcher to select participants who would provide information that is relevant and detailed to the research questions while snowballing would enable the researcher to rely on other participants to determine respondents with similar characteristics who should be included in the study. Cashew farmers were the participants of this study. At most one person was selected from each household since participants from the same household were likely to possess similar traits.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

3.4 Data Collection

3.4.1 Data Collection Instruments

Structured interview technique was used to enable the researcher to asked specific questions to get an in-depth understanding of how cashew farming has benefited the participants so far and some of the major challenges inherent in cashew farming. Since interviews in qualitative research are not ideal for large sample size, questionnaires were adopted as part of the data collection instruments. Questionnaires made it possible for many participants to be involved in the study and provided data on quantitative variables such as income levels; gender distribution in cashew farming and amount of raw cashew nuts harvested per season which the results could be generalized. The questionnaires included both closed-ended and open-ended questions. When open-ended questions are used, it erodes the bias that could occur as a result of suggesting responses to participants (Reja, Manfreda, Valentina, & Vehovar, 2003). On the other hand, closed-end questions allowed the researcher to detail responses to a specific research question hence making it easier to compare responses across participants.

3.4.2 Data Collection Procedures

The data collection commenced on 20th December 2018 and end on 10th January 2019 which is exactly four weeks interval. Kulmasa was the first community to be visited since it is in the middle of the other communities. Kulmasa was succeeded by Gindabou, Tuna, Nyoli and finally Yipaala. This order of visiting the communities was considered due to the proximity of the communities to one another. During the data collection, respondents were interviewed both at home and in the cashew farms based on their availability. Also, the questionnaires were administered through an interview-based method where the researcher read and explained the questions to the respondents who cannot read and understand the questions themselves due to insufficient formal educational.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

3.5 Data Analysis and Interpretation of Results

The study used pairwise comparison, graphical analysis, and content analysis techniques to analyze the data collated. These methods were considered appropriate since both qualitative and quantitative data were gathered for analysis. Content analysis involves reducing the data especially in a summative content analysis which deals with the counting and comparisons, finding of keywords, followed by the interpretation of the underlying content (Hsieh & Shannon, 2005). Responses from the interviews and the open-end questions were put into categories by identifying keywords that run through the various responses. Afterward, themes were developed from the categories which were then used to write the grand narratives about participants experiences in cashew production over the years. Quantitative data collated through the questionnaires were analyzed using tables, graphs, and charts.

3.6 Ethical Consideration

The research ensured anonymity. Thus, participants are not to be disclosed in any form. To ensure this, each participant's questionnaire had been coded with a serial number so that people outside the research will not be able to identify the respondents.

Also, voluntary participation was adhered by the researcher through the seeking of participants' consent before their participation in the research. Since it is voluntary, participants would have the right to exit the study at any time they deem it so.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This aspect of the research focuses on the results from the structured interviews for both rural farmers and officials from the Ghana COCOBOD. As stated in the methodology section, farmers from five cashew producing communities in the Sawla-Tuna-Kalba District were involved in the study. These communities include Tuna, Kulmasa, Nyoli, Gindabo, and Yipaala. Tuna is quite close to Sawla, the district capital, and it is well known due to the intensive cashew production within and around its surrounding communities. The results for this chapter are presented in the order of the various subtopics being discussed. Thus, the discussion covers the demographic distribution of the cashew farmers, responses to the four research questions, challenges confronting cashew farmers in the Sawla district and recommendations to the challenges from both the local farmers and the officials' perspective.

4.2 Demographic Distribution of Farmers

The demographic distribution of the cashew farmers is important because it gives a better understanding of the stories of the research participants and how this might influence the results of this study. The main demographic data discussed under this section include the gender of the farmers, age, years engaged in farming activities, educational level of the farmers and sizes of their farms.

4.2.1 Demographics by Gender

From the study, the researcher observed that most of the cashew farms in Kulmasa, Yipaala, Gindabou, and Nyoli were owned by males. The women occasionally went and helped the men. The women do not own farms even though most women were usually seen in the cashew farms during the visit. The men are considered to be the head of the house with women only assisting and therefore, ownership of the farms is entrusted onto the men.

Cashew is harvested twice in a year; from January to March and subsequently from May to

POTENTIAL CONTRIBUTION OF CASHEW FARMING

June. During either harvesting season, both men and women engaged in the harvest since it is labor intensive. The bumper harvest takes place during the January-March season. Men hardly engage in the May-June harvest because, "*we have to return to the farms to clear the land for the planting of food crops*", as explained by one of the participants. This is the major raining season for which every farmer usually takes advantage of.

However, few women in the Tuna community own cashew farms while a majority of them also assisted their husbands. Even though the women assist in the harvesting of cashew, they alternatively engage in the processing of the raw cashew nuts into cashew kernels. These processed kernels are consumed as a dessert while some are sold in the market for income.

Many women engage in the management of cashew farms in Tuna due to various reasons. The Tuna community is a fast-advancing business area as it is closer to Sawla, the district capital. And most men are businessmen who hardly have time to visit their farms, hence the women act on behalf of the men. Subsequently, some of the men go for the hunting of bush beat especially during the dry season at which time cashew is harvested.

4.2.2 Age distribution of farmers

Among all the farmers interviewed, none of them was below 18 years. 45 percent of the respondents were between 36-50 years of age as indicated in figure 5 below. The age distribution revealed that most of the aged people are willing to go into cashew farming than the younger ones. When one of the respondents above 30 years was questioned why he started cashew farming, he replied, "*cashew is a lifetime cash crop which I can depend on when I am old and cannot more go to the farm.*" The respondent further added that his children will also inherit the cashew farms after his demise. The youngest respondent was 20 years from the Yipaala community. Though children were seen in some of the farms at the

POTENTIAL CONTRIBUTION OF CASHEW FARMING

time the researcher visited the farms, they were merely helping their parents to gather the harvested cashew fruits.

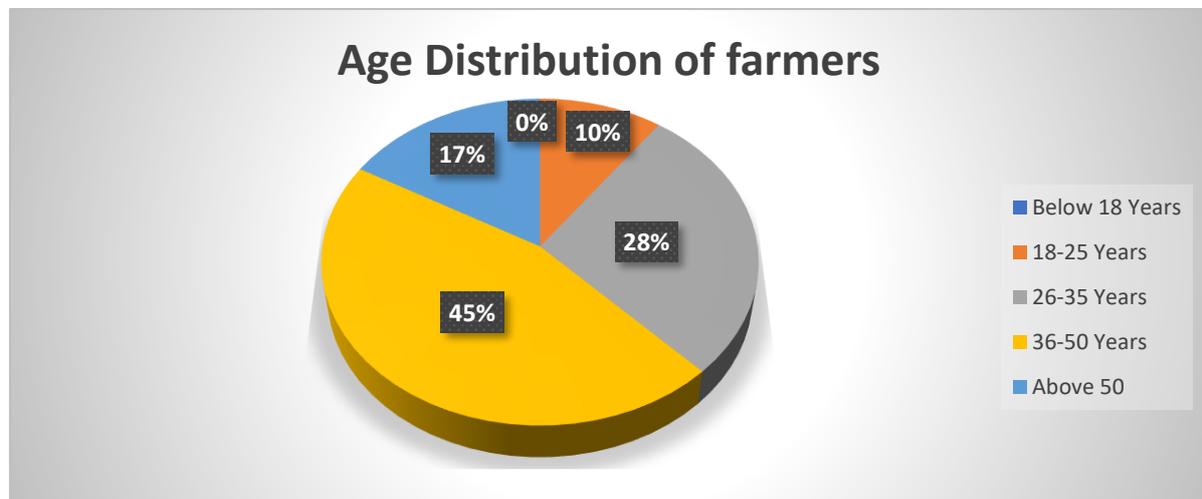


Figure 5: Age Distribution of farmers

Most of the young people in the district were either in school, doing other business or resort to illegal mining (Gallamsey) operation since most of the youth considers agriculture to be a sector where they cannot earn fast and quick money.

4.2.3 Years engaged in cashew farming

From the data gathered, it was determined that the average number of years that the farmers engaged in cashew farming was 15 years. Even though cashew farming is currently becoming popular among the farmers, fewer of them have older cashew plants. This suggests that the majority of the farmers previously did not consider cashew farming as a commercial business. Most of the farmers used their land for producing food crops including beans, maize, yam and guinea corn rather than planting cash crops.

Moving forward, almost 90% of the respondents stated how they are going to double up their efforts into the production of cashew. When they were interrogated why, one of the farmers stated *"I will even stop the farming of all other crops and concentrate on my cashew farm so that I can farm on a large scale. Also, I will be able to depend on the cashew when I*

POTENTIAL CONTRIBUTION OF CASHEW FARMING

grow old since I do not have any retirement plan". This is an indication that henceforth, most of the farmers intend to farm cashew into the unforeseeable future.

4.2.4 Educational level of farmers

Most of the farmers regretted not having any kind of formal education. They believed that education is the only weapon that could be used to break the backbone of poverty. As a result, majority of them have their children in school.

While some of the respondents mentioned how cashew farming has helped them to take care their families, others too stated how they have been able to raise capital from the sales of their cashew nuts to start other businesses. One of the respondents said, *"it was the sales from my cashew farm that I used to start my provision shop and also paid my children's school fees."*

With few of the respondents attaining secondary education, they had blamed the lack of education to be the last straw that broke the camel's back. Thus, the source of all their predicaments.

4.2.5 Size of the cashew farmers

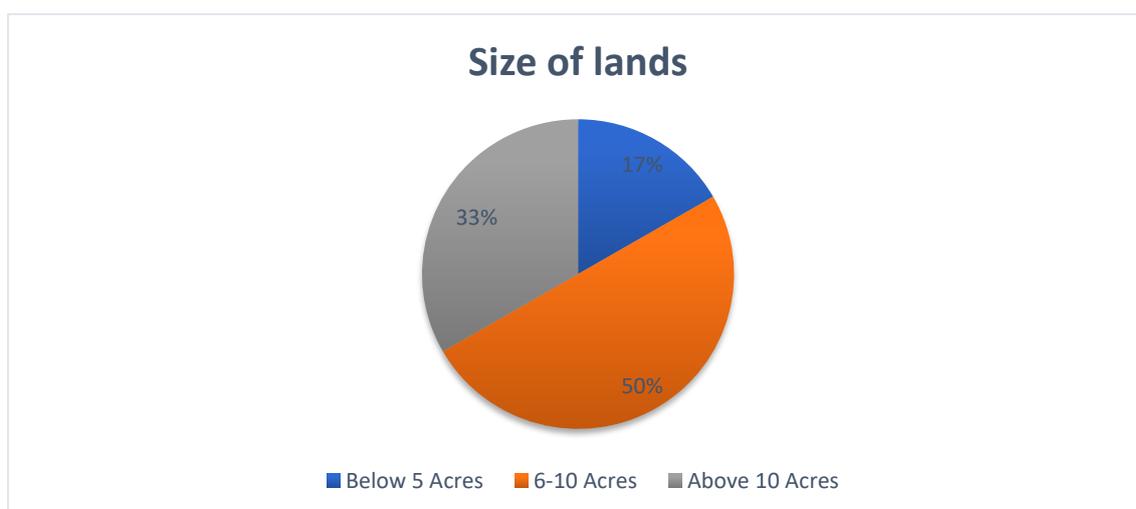


Figure 6: Size of the cashew farms own by the respondents

POTENTIAL CONTRIBUTION OF CASHEW FARMING

From Figure 6 above, it is observed that 50 percent of the respondents use a land size ranging between 6 to 10 acres, 33 percent of the farmers have their farm sizes above 10 acres while 17 percent farm below 5 acres. Even though most of the farmers wish to farm more than they currently do, they found it difficult to expand their farms due to the scarcity of the land. In the Yipaala and Tuna communities, for instance, most farmers have already created boundaries with no rooms for one to expand his farm. As a result, most people venturing into cashew has no choice but to convert their older farms plots into the cashew farms. Figure 7 below is a typical cashew farm in Kulmasa.

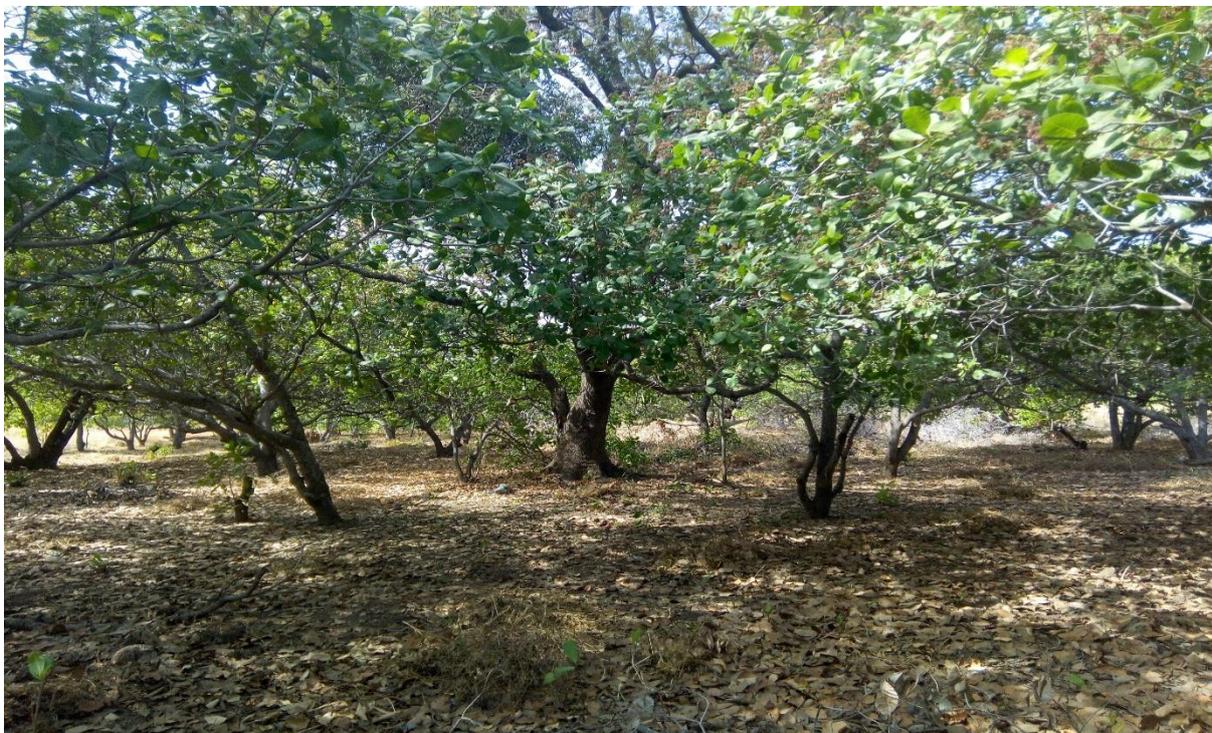


Figure 7: View of cashew farm in Kulmasa. Photo: Author, 2019

Figure 8 below is a full view of a plot which has just been converted into a cashew farm. To do so, the farmer simply plants cashew seedlings into the crops during a particular farming season. By the time the crops are ready for harvesting, the cashew had grown into young cashew plants in their second year. Henceforth, the farmer relocates or rotates to a different area to farm his food crops while the cashew plants continue to grow into big trees.

POTENTIAL CONTRIBUTION OF CASHEW FARMING



Figure 8: A newly created cashew farm in Tuna. Photo: Author, 2019

4.3 Responses to the research questions

4.3.1 Research Question 1: What are the potential challenges inherent in the production, storage, transportation, marketing and export of cashew from Northern Ghana?

There are several challenges embedded in cashew farming in the Sawla-Tuna-Kalba District. The research participants mention some of these challenges which include the availability of labor; scarcity of land; unstable cashew prices; bush fire; capital; and theft.

To get an in-depth understanding of the major challenges confronting cashew farmers in the Sawla-Tuna-Kalba District, the respondents were asked to state which of following problems: viability of labor, unstable cashew prices, land scarcity, availability of capital, bush fire and theft were most prevalent than the rest. Availability of labor was assigned 1, while unstable cashew prices, land scarcity, availability of capital, bush fire were assigned 2,3,4,5,

POTENTIAL CONTRIBUTION OF CASHEW FARMING

and 6 respectively. Table 6 below shows the pairwise comparison of the various challenges that were mentioned by the respondents. The rankings depicts the perception of respondents with regards to which challenge is more intense.

Table 6

Pairwise ranking of challenges confronting cashew farmers in S.T.K District

	1	2	3	4	5	6	7	Total	Rank
1	X	0	0	0	1	1	0	2	5 ND
2		X	1	1	0	0	0	4	3 RD
3			X	0	1	1	0	5	2 TH
4				X	1	1	1	6	1 ST
5					X	0	1	1	6 TH
6						X	0	4	3 RD
7							x	3	4 TH

Note: 1=Labor availability, 2=Unstable cashew prices, 3=Land Scarcity, 4=Capital for investment, 5=Bush fire, and 6= Theft, 7= Farm Maintenance Cost

From table 6 above, it is observed that cashew producers in the Sawla-Tuna-Kalba District consider capital for investment (4) to be the most serious challenge and it is rank 1st since most of the respondents lamented bitterly about how they usually search every nook and cranny to get access to financial support which they could invest in their cashew farms but their efforts are always in vain. The second most pressing challenge after capital is land scarcity (3) and this was rank 2nd followed by unstable cashew prices (3). Most respondents voiced the unreliable cashew prices as one of the disheartening issues in the cashew production value chain due to the existence of middlemen who buy the cashew nuts at very low prices from the local farmers and in turn sell them at higher prices to other Cashew Buying Companies. Farm maintenance cost (7), Labor availability (1) and Bush fire (5) were

POTENTIAL CONTRIBUTION OF CASHEW FARMING

ranked 4th, 5th, and 6th respectively. The above challenges raised by the farmers are discussed in detail below.

4.3.1.1 Labor unavailability

Agricultural activities, in general, are labor intensive especially during the seasons of harvesting cashew. In all the communities visited, about 90 percent of the respondents have their children in school, leaving no one to assist them in their farms. Some of the participants said their children usually have to take a break from school during the peak of cashew harvesting seasons so that they would help them in the farms.

Subsequently, most of the respondents spoke about how they usually express the willingness to employ the young men in their communities so that they could help them. This is usually felt on deaf ears. This is simply because most youth do not patronize farming as a means of making money as they wish to either engage in illegal mining activities or have migrated to the cities of Kumasi and Accra to hustle for a livelihood.

4.3.1.2 Unstable cashew prices

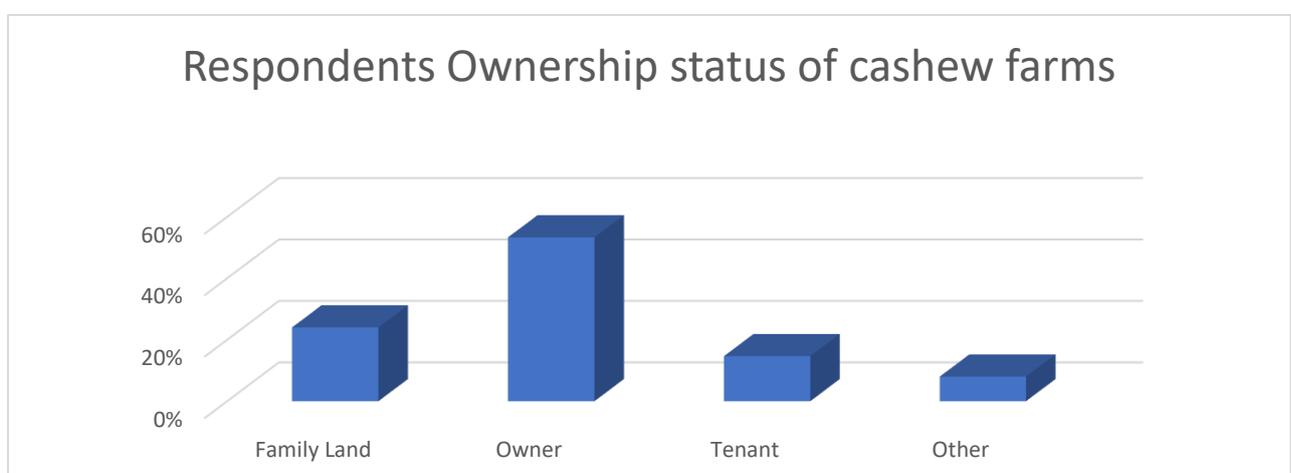
Fluctuating cashew prices have been one of the headaches of the cashew farmers in the Sawla-Tuna-Kalba District. From the side of the participants, the service of middlemen is employed by Cashew Buying Companies to usually purchase the raw cashew nuts from the farmers at a lower price and subsequently sell them at a higher price to these Cashew Buying Companies. According to an Official from the Ghana Cocoa Board, he said, "*the unstable price of cashew is due to the fact that cashew is a non-regulated cash crop*". This means that cashew is not adapted to the current portfolio of cash crops under the management of COCOBOD. As a result, anybody who enters the market usually determines the price to purchase cashew from the farmers. This price instability does not allow the cashew farmer to correctly predict his cash flow as they cannot tell which direction prices are likely to take in the following seasons.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

4.3.1.3 Land Scarcity

Ownership of land, in general, is a major issue as far as agriculture is concerned since agricultural activities are land intensive. As shown in Figure 9 below, above 50 percent of the participants own their cashew farms. This means that they are solely entitled to all the proceeds from the farms. On the other hand, 24 percent of the respondents were farming on family lands, while tenants and others being 15 percent and 8 percent respectively.

Depending on the ownership status, management of the farm could be quite complex. If it is family land, for instance, the head of the family manages and enjoys the proceeds from the farm. In numerous circumstances, family lands could lead to various misunderstandings if some of the family members are unhappy about the management of the land. Some of the respondents lamented bitterly for farming their cashew on family lands. They further stated their intentions of leaving their current communities to go to different locations where they could have access to arable lands. Such decisions followed were considered after experiencing various degrees of misunderstanding among aggressive family members who felt that they do not enjoy a fair share of the family lands. From figure 9 below, it is observed that above 50% of the respondents own their cashew farms while close to 30% of the respondents' farm on family lands.



POTENTIAL CONTRIBUTION OF CASHEW FARMING

Figure 9: Respondents ownership status of the cashew farms

4.3.1.4 Lack of access to capital for investment

Cashew farming is not only labor intensive but also capital intensive. Participants regretted about how the lack of capital for investing in their farms affected their yields in the previous years. According to the respondents, most of the activities they undertake in the farms require the use of capital. This ranges from hiring labor, buying chemicals for spraying the cashew trees, and haulage of the cashew nuts from the farms to their houses. Moreover, the lack of access to capital was blamed heavily on the absence of Cashew Farmers Associations in their various communities. The farmers were convinced and could explained themselves beyond peradventure that these farmer associations could grant them the credibility to access financial support in the form of loans from financial institutions. This is because most financial institution are very reluctant in giving credit facilities to individual farmers for the fear of default.

In one of the cashew farms at Kulmasa, a respondent mentioned how he needed financial support so that he could purchase machines that could process the cashew fruits into fresh fruit juice for sale. Figure 10 below shows some cashew fruits being discarded after the nuts are being harvested. Without such financial support, his idea became fruitless and a mere nightmare. Usually, farmers had to discard the cashew fruits after removing the cashew nuts as shown in figure 10 below.



Figure 10: Cashew fruits being discarded after removing the nuts. Photo: Author, 2019

4.3.1.5 The effect of bush fire as a challenge to cashew farmers

According to some of the respondents, bush fire is their major worry during the dry season. In terms of raining pattern, the Northern Region of Ghana has only one raining season which starts in early April and ends in late September. Apart from this period, the rest of the year is characterized by an intensive harmattan, prolonged drought and a burst of heavy sunshine. These weather conditions make all the grasses dry up during the dry season and ready to be burned with the little sense of fire. One of the respondents said, *"I have to be sleeping on my farm just because of the bush fire. If fire drop in the cashew farm I might not be able to harvest cashew for the next two years"*. Figure 11 below shows some cashew plants burnt by a bush fire.

POTENTIAL CONTRIBUTION OF CASHEW FARMING



Figure 11: A cashew plant burnt by bushfire. Photo: Author, 2019

The issues of bushfire is a worry to the cashew farmer because the cashew plant is very stimulating to the effect of fire. Therefore, the plant could easily die with the little burn by bushfire or would have to take years to revive itself before it could be productive gain. As at the time the researcher visited some of the farms at Yipaala, the farmers were busily constructing fire belts around their farms to avoid bush fire from entering their cashew farms.

4.3.1.6 Theft

It is unspeakable when some of the respondents were sharing their stories about how the issue of theft is making them lose income from their cashew farms. One of the participants said, *"I usually have to sleep in my cashew farm so as to prevent people from stealing the cashew nuts."* Despite the fact that cashew farmers invest all their time and effort in these farms, some usually have their cashew nuts stolen from their farms. Because of theft, some of the farmers could not quantify the number of bags of raw cashew nuts they harvest from their farms

POTENTIAL CONTRIBUTION OF CASHEW FARMING

4.3.17 Farm Maintenance Cost

From the five communities visited, one of the major expenses is the cost of weedicides and knapsack spraying machines which are used to spray the weeds. The average price of a bottle of weedicide was GHS 25. Approximately, four bottles of weedicide could spray an acre making a total cost of GHS 100 per acre. In totality, the average number of acres of cashew per farmer was twelve acres. This means that the farmer will have to incur GHS 1200 to spray the farm.

Apart from the weedicides, agricultural equipment used by the cashew farmers in the Sawla District includes knapsack spraying machines, cutlasses, Wallington boots, and hoe. All this farming equipment on average cost GHS 800. Most of the respondents said they only depended on their families as their source of labor due to the high cost of hiring labor, coupled with the lack of capital which has been a persistent challenge confronting all cashew farmers. In terms of only the explicit cost, a cashew farmer who owns twelve acres would incur approximately GHS 2,000 to maintain the farm in every farming season.

4.3.2 Research Question 2: What are the potential contributions of cashew as a cash crop to rural farmers in the Northern Region?

4.3.2.1 Improve farmers income level and other economic activities

In fact, there appeared to be a consensus ad idem among all the respondents who participated in the study with regards to how cashew farming has improved their living conditions over the years. Even though most of the participants said they also have other sources of income apart from the revenue generated from their cashew farms such as farming of groundnuts, beans, yam, maize and millet as well as doing other commercial business like selling of provisions shops; most of them put much attention on their cashew farms since they generate bulk income from selling the cashew nuts.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

In the Gyindabou community, for instance, a farmer gave an account of his income records from his cashew farm. In the last season, he harvested eight bags of cashew nuts and each bag was sold for GHS 800. This means that he was able to generate a revenue of GHS 6,400 from his farm. After deducting the maintenance cost from the total revenue, he was able to realize a profit of GHS 4,300 from his cashew farm during the last season. This is similar to the findings of Wongnaa & Awunyo-Vitor (2013) in the literature review. In their study, they found that cashew farmers in the Wenchi Municipality cashew farmers realized a positive net present value from their cashew farms. Hence, they concluded that cashew farming was a profitable commercial agricultural activity to the farmers. Also, Monteiro et al (2017) in their study conducted in Guinea-Bissau found that cashew was beneficial to rural farmers by improving their income levels.

Secondly, a farmer from Tuna who is one of the chief cashew farmers in the Sawla-Tuna-Kalba District also gave an illustration of his income from the cashew farms. He had close to 50 acres of cashew and he harvested 100 bags of cashew nuts during the last season. This implies that this farmer was able to generate a total revenue of GHS 80,000 from his farm. After deducting his farm maintenance expenses, he still had enough to invest in other commercial businesses such as buying a tractor which he used to plow other farmers' plots for a fee. There is no doubt about the fact that cashew farmers in the Sawla-Tuna-Kalba District earn substantial income from their cashew farms to lift them from abject poverty. With the current status of cashew production in the district, some cashew farmers earn monthly income from their farms which far exceeds the salaries of some government teachers at the basic level of education.

The contribution of cashew farming to the alleviation of rural farmers from poverty will be incomplete without testimonies from the horses own mouths. Thus, testimonies from some of the cashew farmers will suffice. Another respondents from Tuna who has been into

POTENTIAL CONTRIBUTION OF CASHEW FARMING

cashew farming for the past 15 to 20 years said, *“it is the revenue from my cashew farm that I used to build this story building which I have rented out to people. I have also been able to open large provision shops at the market square for my children and have employed some people in the community.”* In another spectacular scenario, a respondent from Kulmasa also testified as follows, *“if not because of my cashew farms, all my children would have dropped out of school. I have five children in school, but it is only the income from my cashew farms that are taking care of them. I will there encourage all the youths to start farming cashew.”*

4.3.2.2. *The positive effect of cashew on the environment*

The Northern Region of Ghana by definition of geographical features is characterized by limited access to rainfall coupled with severe sunshine. The region has only one raining season which only lasts for just four months in the entire year (from early April – Late Early September). By the time the researcher visited one of the farms in Nyoli in January, some young cashew plants were already wilting up due to the prolonged drought.

From the view of respondents, by virtue of cashew being perennial crop means that they would be able to contribute to the formation of rainfall in the region. Lack of severe rainfall invariably affects the yield from cashew because most of the plants shade off their flowers in the presence of severe droughts. In addition, the cashew plants develop taproots which able them to reduce soil erosion. As found in the literature, the study of Vande et al (2007) and Joker (2003) both testified in their study that the cashew crop, apart from its revenue contributions, also curbs soil erosion hence improving soil nutrients and impacting the environment positively.

4.3.3 *Research Question 3: Which aspect of the cocoa production value chain could be adapted to improve the sustainability of cashew production in the Northern Region?*

In order to recommend the right lessons from the cocoa sector which could be adopted in the cashew production value chain, the researcher needed to have a prior better

POTENTIAL CONTRIBUTION OF CASHEW FARMING

understanding of the entire cocoa production value chain. Therefore, three (3) officials from Ghana COCOBOD were involved in an in-depth interview. From their point of view, the structure of the cocoa tree and that of the cashew tree are quite similar. As a result, activities such as mass cocoa spraying and pruning, technology and regulation of cocoa could also be implemented in the cashew production value chain.

4.3.3.1 Regulation of cashew by COCOBOD

The respondent from Ghana Cocoa Board stated explicitly that cashew is an unregulated crop and needs to be adapted by COCOBOD. This means that cashew is not currently part of the portfolio of cash crops being regulated by COCOBOD. COCOBOD only regulates cocoa, coffee, kola, and shea. These crops especially cocoa has an advantage over crops such as cashew which is not regulated, and such advantages are not far-fetched.

In the first place, because cocoa is regulated, its prices are pre-determined by the marketing division of cocoa through forwarding contracts. With the forward contracts, COCOBOD could lock the prices of cocoa in the international market against price fluctuations. With this strategy, cocoa producers are guaranteed steady income all the time. In a similar fashion, prices of cashew could always be predetermined to save cashew farmers from the troubles of lower farm-gate prices. If cashew is also regulated like that of cocoa, it means that COCOBOD will supervise the entire cashew production value chain beginning from production, bagging, haulage and finally exporting it to international markets. The formalization of the cashew production value chain will enable cashew farmers to enjoy premium prices.

Subsequently, the research department of COCOBOD according to the Officials interrogated, is responsible for conducting research into all aspect of the regulated cash crops. The research department conducts research about pest and diseases, emerging technologies, chemicals as well as all possible measures of improving the quality of these regulated crops.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

This implies that if cashew is also regulated, the issue of pest and diseases which gives cashew farmers sleepless nights will be a thing of the past.

It was in furtherance of government's objective to improve the quality of cocoa in Ghana through diseases and pests control that the mass cocoa spraying program (MCSP) was initiated by the government in 2001 (Naminse, Fosu, & Nongyenge, 2011). The MCSP is a yearly exercise undertaken by the government and spearheaded by COCOBOD to ensure that cocoa farmers have access to free cocoa spraying. In addition, pesticides and weedicides are also distributed to cocoa farmers under the MCSP initiative.

According to the respondents from COCOBOD, *"the cashew sector would be added to the mass spraying program to help control pest and diseases if only it is regulated. The cashew plant is prone to several diseases including the powdery mildew, leaf and nut crust, and fruit rot. The cashew farmer alone will find it difficult to control these diseases and pests unless the government intervenes. This will only be possible if cashew is regulated"*

4.3.3.2 Technology

Artificial pollination is one of the recent technologies adapted in the cocoa sector. Artificial pollination refers to the biological or mechanical application of supplementary compatible pollen that has been previously collected (Pinillos & Cuevas, 2014). As stated categorically by Officials from the research department of COCOBOD, artificial pollination is being used to increase mass pollination of the cocoa plants which is capable of increasing yield as compared to the natural pollination. This could be applied by cashew farmers to improve flowering and pollination during fruiting. The picture below in Figure 12 shows a cashew tree in its first year of bearing fruits.



Figure 12: A cashew plant in its first year of bearing fruits. Photo: Author, 2019

Furthermore, the researcher also wanted to have a better understanding of the current machines and other technologies cashew farmers were using in their farms. But to his surprise, most of the cashew farmers said they do not use any machines in their farms either for the purpose of spraying pesticides or controlling weeds. Most of them still depended on only the traditional methods of farming such as the use of hoe and cutlass. But from the view of the respondents from COCOBOD, there are several machines being used in the cocoa sector which cashew farmers could also adapt to make their work easier.

These machines include the knapsack spraying machine which is mainly used to spray weeds instead of depending on hoe and cutlass which are labor-intensive and time-consuming. Among the list of other machines mentioned were also the engine spraying machine which has the ability to spread chemicals to the top of the plant thereby making it an efficient machine for pest control. Finally, was the pruning-saw which could also be used by cashew farmers to prune their crops so they could improve the rate of flowering and fruit-bearing.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

4.3.3.3 Agricultural extension services

As stated by the Officials from COCOBOD, agricultural extension services are one of the major activities undertaken in the cocoa sector which is also necessary for the cashew production value chain. In the process, officers from both the Ministry of Food and Agriculture (MoFA) at both the district and national levels usually engage with cocoa farmers throughout the year to teach farmers the best practices to adopt in their farms in order to ensure quality production of cocoa. Cashew farmers on the other hand also need such extension services in the cashew production value chain

4.3.4 Research Question 4: Could cashew farming be a feasible commercial cash crop for farmers in Sawla-Tuna-Kalba in Ghana's Northern Region?

To assess the feasibility of cashew becoming a dependable cashew crop in the Northern Region, a geographic analysis of the region will play a vital role in explaining such weather effect on agricultural activities.

First of all, the Northern Region of Ghana experiences only one raining season throughout the year with a prolonged drought from November to March. This impact of drought on agriculture is further complicated by the effects of harmattan in the Northern Region during the dry season (Breuning-Madsen, Awadzi, & Lyngsie, 2011). The harmattan is usually accompanied by a dried wind which makes plants wilt and die. Surprisingly, the cashew plant, unlike other perennial crops, rather bears its fruits during the dry season. When the researcher visited some of the cashew farms, he realized that the farmers just planted youth cashew seedlings during the last raining season. Even though the young cashew plants were looking miserable in the hot-scotching sun, the farmers had the hope that the plants would not die since cashew is highly resistant to drought.

When it comes to soil nutrients, the Ghana Climate Change Vulnerability Assessment Report by USAID (2011) indicated that the low soil organic matter and limited soil nutrients

POTENTIAL CONTRIBUTION OF CASHEW FARMING

are the major challenges to agricultural activities in Ghana especially in the Northern Region of Ghana. As the region is vulnerable to low soil qualities and fertility, decline rainfalls, recurring drought, overgrazing by animals, frequent bush fires, increasing temperatures, desertification and land degradation (USAID, 2011), the land only favors plants with tap root systems such as the cashew plant. This is because, during the dry season, perennial crops such as cashew are still able to attract water and nutrients beneath the earth.

When it comes to revenue generation, all the respondents gave positive testimonies about how their cashew farms have helped improve their income levels as well as improving other economic activities such as opening large provision shops, build houses for renting and establishing fueling stations which further generates revenues.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

CHAPTER FIVE: CONCLUSION

5.1 Introduction

This thesis sought to investigate the feasibility, potential contributions of cashew to the income levels of local farmers and the major challenges inherent in cashew production value chain in the northern sector of Ghana. The Sawla-Tuna-Kalba District in the northern Region was selected for the study. The researcher saw the S.T.K District to be deemed appropriate for the study due to the fact that the district has been characterized by cashew production in recent years. To get a better understanding of cashew production activities in the S.T.K District, cashew farmers in the district were engaged in various ways to solicit their views and ideas about cashew production in the catchment areas of the district. This chapter gave a conclusion on the findings of the study, some recommended policies as well as areas that have been recommended for further studies.

5.2 Conclusion

From the literature, statistics by the Food and Agricultural Organization (FAO) estimate that more than 60 percent of the world's population depends on agriculture for a livelihood (Zavatta, 2015). For Ghana, in particular, cocoa contributes immensely to the income levels of farmers in the southern sector of the country where cocoa is grown. The absence of cocoa and to the larger extent, the absence of any reliable cash crop in the northern part of Ghana has created an income disparity between farmers in the rural south and farmers in the rural north. With the current production of cashew gaining grounds in the northern part of Ghana, the question is whether cashew could be restructured to function like cocoa and thus serves as a cash crop that could help improve the income level of farmers in the rural north.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Based on this, the researcher sought to investigate the feasibility and the 4potential contributions of cashew to the income levels of local farmers and the major challenges inherent in cashew production value chain in the northern sector of Ghana by taking the Sawla-Tuna-Kalba District as a case study. The study revealed the major challenges confronting cashew farmers in the S.T.K District, the contribution of cashew to the livelihood of the farmers and some valuable lessons from the cocoa production value chain which can be implemented in the cashew industry to improve the sustainability of cashew production in the S.T.K District. These findings are summarized in Table 7 below.

Table 7

A summary of the findings of the study

Challenges confronting cashew farmers	Contributions of cashew to the rural farmers
<ul style="list-style-type: none"> • Labor unavailability: this limits cashew productivity as labor becomes more expensive • Unstable cashew prices: it reduces farmer income since the cashew farmer receives low farm-gate prices • Land Scarcity: it limits productivity since farmers cannot expand their farms • Lack of capital for investment: the absence of farmer groups and associations made it difficult for the farmers to have access to credit facilities. • Theft: Occasionally, farmers have their raw cashew nuts stolen from their farms • Bush fires: Bush fire is one of the greatest enemies of the cashew plant. Farmers are usually worried about the effect of bushfires during the dry season 	<ul style="list-style-type: none"> • Improve farmers income levels and other economic activities: It was found that close to 90% of the respondents usually gain positive net present value from the investments in their farms. • The positive effect of cashew on the environment: from the perspective of the respondents, the cashew plants contribute to rainfall this is invaluable since the Northern Region experiences one raining season throughout the year. The cashew plant also curbs soil erosion and thereby mains soil fertility.
Lessons that could be adopted from the cocoa industry into cashew production	
<ul style="list-style-type: none"> • Regulation of cashew by COCOBOD: if the cashew industry is regulated by COCOBOD, the sector could enjoy advantages such as predetermination of cashew prices, agricultural extension services, mass cashew spraying as done in the cocoa sector, and rigorous research on the various diseases hindering the plants. • Technology: Some of the technologies from the cocoa sector which could be adopted in cashew production include artificial pollination, knapsack spraying machine, the engine spraying machine, electronic hauling tractor, and the pruning saw 	

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- ***Agricultural Extension Services:*** cashew farmers need to be trained on the best farming practices that will result in quality production of cashew.

In addition to the questionnaires administered, the researcher wanted to have an in-depth understanding of which of the major challenges greatly impact and retard the activities of cashew producers. Interviews were conducted to solicit the views of the cashew farmers in that regard. The results from the interviews were used to do a pairwise comparison for the major challenges hindering the farmers as shown below. From the interview results, most of the respondents did not hesitate to place emphasis on how the lack of capital for investing in their cashew farms had caused them a great disservice.

In all the five communities that were involved in the study, none of them had a cashew farmers association or any group of that kind. This made it difficult for the farmers to have access to financial support from financial institutions on an individual basis as this does not improve their creditworthiness. The challenge that was ranked second was the issue of labor unavailability. Naturally, cashew farming is labor intensive especially for the farmers with large farms. The issue of labor is further complicated by the fact that most of the farmers still relied on traditional methods of farming practices such as the use of hoe and cutlass. It was also found that the farmers also lack machines that could be used to spray the farms. Further, the peak season of cashew another time that labor is highly demanded. And meanwhile, the youths in these communities have migrated to the southern sector to engage in illegal mining (Galamsey) activities which could earn them quick income.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Table 8

Pairwise ranking of challenges confronting cashew farmers in S.T.K District

	1	2	3	4	5	6	7	Total	Rank
1	X	0	0	0	1	1	0	2	5 ND
2		X	1	1	0	0	0	4	3 RD
3			X	0	1	1	0	5	2 TH
4				X	1	1	1	6	1 ST
5					X	0	1	1	6 TH
6						X	0	4	3 RD
7							x	3	4 TH

Note: 1=Labor availability, 2=Unstable cashew prices, 3=Land Scarcity, 4=Capital for investment, 5=Bush fire, and 6= Theft, 7= Farm Maintenance Cost

By observation, the researcher found that most of the farmers usually threw the fleshy portions of the cashew fruits away after removing the nuts. When they were interrogated, it was found that they neither have the equipment that could process these fruits into some fruit juice which they could sell for more income. All these challenges could be resolve should they have access to capital.

Subsequently, the respondents also lamented bitterly about the unstable cashew prices they face in the market. Mostly, middlemen are employed by cashew buying companies to purchase the raw nuts from the farmers on low prices and eventually sold them to the companies for a margin. At the end of the day, the farmers' loose value on their produce. In an interview with officials from the Ghana COCOBOD, they said the price fluctuations in the cashew sector could be curbed if the cashew industry is regulated by COCOBOD. In that case, COCOBOD will be responsible for determining a fixed price at which cashew would be sold as similar to what is currently being done in the cocoa industry.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Concerning the lessons that could be adapted from the cocoa sector into the cashew sector to make it more sustainable, officials from the COCOBOD made mention of three major areas. First, the cashew industry needs to be regulated by COCOBOD. If this happens, the cashew sector would be able to enjoy some merits which include but not limited to the predetermination of cashew prices, the implementation of mass cashew spraying program by the government which has already begun in the cocoa sector and cashew research department.

Second, the area of technology is another aspect of the cocoa production value chain that could be integrated into cashew farming to make it more sustainable. These technologies include artificial pollination which has track records of high performance in the cocoa sector. In addition, machines such as the knapsack spraying machine, electronic tractor hauling machine, engine spraying machine and the pruning saw could all be used in the cashew sector.

Finally, agricultural extension services are also important for cashew farmers as it is for cocoa farmers. By employing the services of agricultural agronomists, cashew farmers could be taught the best practices that should be adapted such as when and how to apply fertilizer in their farms and more importantly, how cashew farmers could make use of both existing and potential technology in their farms.

In totality, the question of whether cashew could be a commercial cash crop for rural farmers in the Northern Region is worth asking. First and foremost, it was found that cashew farmers who own an average of ten acres of cashew plantation incur an average maintenance cost of GHC 1200. Given that selling price per bag of raw cashew nuts was found to be GHC 800 and each farmer could harvest approximately five bags of raw cashew nuts per acre, the investment made by the farmers in maintaining their farms generated a positive net present

POTENTIAL CONTRIBUTION OF CASHEW FARMING

value. This means that cashew producers could improve their income levels through the sales of their cashew nuts.

5.3 Business Opportunities for Social Entrepreneurs

Most of the challenges discussed in chapter four can be solved by the Government but it will take time to do so. Therefore, social enterprises and individuals can take advantage of these loopholes by providing solutions in the areas discussed below.

To begin with, social enterprises can provide extension services to cashew farmers in the region for a fee. Cashew farmers need information on variations in the farming season, raining patterns, fertilizer application techniques, emerging technologies, dangerous pests and diseases, and control mechanisms. As this information is not widely available, cashew farmers will be willing to subscribe to schemes for a specified period so that they could be provided with all the necessary information with regards to their farms but for a fee. One popular organization that is already into such services across the country is Farmerline Technology. In addition, these social enterprises can organize periodic training sessions for cashew farmers for which they can charge for their services.

Subsequently, when the researcher visited some of the cashew farms, he realized that most of the cashew farmers usually threw away the fleshy portions of the cashew fruits after removing the raw nuts. They do this because they do not have the technical know-how to process these cashew fruits into other useful products. One could establish a small processing factory that could process these fruits into fresh cashew juice which could be sold across the country. There is a market for such products because many people, especially the aged are health conscious and thus would prefer consuming fruit juice rather than carbonated drinks. In addition, the factory could also provide a warehouse that would serve as a storage facility for farmers who need spaces to store their cashew nuts. Fees could be charged for storing the

POTENTIAL CONTRIBUTION OF CASHEW FARMING

cashew nuts based on the period and the number of bags stored in the factory. These factories could employ some of the rural inhabitants to further reduce the unemployment rate in rural areas.

As the cashew plants grow into big trees, the farmers are required to clear the weeds in the farms consistently. Relying on labor is quite expensive and also not efficient. However, the use of a tractor to plow the land could be less costly, efficient and saves time. Meanwhile, farmers usually find it difficult to have timely access to tractor services especially in the beginning of the raining season. This implies that any social enterprise dedicated to the provision of quality tractor services will be in good business. Apart from the plowing, tractors are also used for hauling the raw cashew nuts from the farms to the house during the harvesting season. This is another area of business for which tractor owners can venture into.

Finally, social enterprises in the form of microfinance could also be established. During the research, one of the participants complain was how they struggle to save their money. Currently, some of them are put into groups of ten by an N.G.O known as ProNet Ghana. Each group is provided with a box in which they save their group contributions. They then open the box at the end of the year to share whatever they have contributed. This strategy is however not efficient because it does not provide credit facilities to the farmers. With microfinance opportunities, farmers could be given credit facilities with moderate interest rates so that farmers can benefit from the credit facilities. Another organization that provides financial support to farmers is One Acre Fund in East Africa.

5.4 Policy Recommendations

In order to resolve the challenges confronting cashew farmers in the Northern Region, there is the need for the government to intervene by first giving parliament the approval to enact an act that will allow COCOB to adapt cashew into its portfolio of regulated cash crops.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

As a result, the cashew sector could gain some benefits including predetermination of cashew prices by COCOBOD in the international market, subsidizing of farm inputs by the government for cashew farmers and finally, the government could finance research in the area of cashew production that will improve quality cashew production in the north.

Furthermore, the Ministry of Environment, Science Technology and Innovation through the Environmental Protection Agency needs to enact and enforce policies that will reduce the rate of bush fires in the Northern Region. Cashew plants lack resistance to fire and this has been one of the headaches of cashew farmers in the region. These policies could find people who are perpetrators of bushfires so as to serve as a deterrent to others.

Subsequently, the Ministry of Food and Agriculture (MoFA) in the Sawla-Tuna-Kalba District should be equipped with logistics so that more agricultural extension officers and agronomists could be trained in the districts. These extension officers and agronomists will be able to teach cashew farmers the best farming practice that could improve cashew productivity. Cashew farmers would be taught how to use new technology in their farms as well as how to control pest and diseases that attach the cashew plant.

In addition, the MoFA at the S.T.K District needs to coordinate the formation of cashew farmers associations in the various cashew farming communities. With these associations, participants will be able to gain some level creditworthiness that will enable them to have access to financial support from various financial institutions.

Finally, Social Enterprises need to be established in the Northern Region to help resolve some of the challenges facing the cashew farmers. For instance, social enterprises could provide farm inputs such as weedicides and fertilizer to the cashew farmers on credit so that they could pay back during the cashew harvesting season. One of such organizations which are currently providing these services is Tieme Ndo Enterprise. However, more such

POTENTIAL CONTRIBUTION OF CASHEW FARMING

organizations are needed to be able to reach out to many farmers. In addition, social enterprises in the form of microfinance could also provide farmers with credit facilities and charge a slightly lower interest rate on the loans so that farmers will be able to access and benefit from such credit facilities.

5.5 Recommendations for Further Studies

Further research could be done on the type of technology that could be implemented by cashew farmers to improve the productivity of cashew in the Northern Region. This is because most of the farmers still relied on traditional methods of farming which retards production.

Also, a study could be conducted on the role of social enterprises in taking advantage of the current disequilibrium within the cashew production value chain in the Northern Region of Ghana. Social entrepreneurs can create businesses out of the various challenges currently confronting cashew farmers in the region.

Further, a study needs to be conducted with regards to the nature and best location of a cashew processing factory in the Northern Region. The processing units will enable farmers to add value to their raw cashew nuts before sales so that they can enjoy higher prices on their produce

5.6 Limitations of Research

Most of the research participants had not attained formal education. As a result, the questionnaires were administered through an interview-based method where the researcher literary had to read and explain the questions to the respondents. This method can affect the quality of the data provided by the respondents.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Also, it was difficult to schedule meetings with the Heads of the various divisions of COCOBOD as they were usually not available due to other official duties. As a result, three managers from COCOBOD were able to take part in the study. More information could have been provided if more officials of COCOBOD had taken part in the research.

Even though this research is a mixed method, the research did not apply econometric tools such as multiple linear regressions in analyzing the data. A regression model could have suggested different findings especially the most pressing challenges confronting cashew farmers.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Reference

- Achterbosch, T., Berkum, S. v., & Meijerink, G. (2014). Cash crops and food security; Contributions to income, livelihood risk and agricultural innovation. *Wageningen, LEI Wageningen UR*, (University & Research center), LEI Report 2014-015, 57 pp.; 20 fig.; 3 tabs.; 60 refs.
- Ajayi, V. O. (2017). *Primary Sources of Data and Secondary Sources of Data*. Makurdi: Blue State University.
- Anim-Kwapong, G. J., & Frimpong, E. B. (2004). vulnerability and adaptation assessment under the Netherlands climate change studies assistance programme phase 2 (NCCSAP 2). *Cocoa Research Institute of Ghana*, 2, 1-30
- Adedeji, A. R., Anikwe, J. C., & Hammed, A. L. (2008). Cashew Nuts and Production Development in Nigeria. *American-Eurasian Journal of Scientific Research*, 3(1): 54-61: Retrieved from [https://www.idosi.org/aejstr/3\(1\)08/11.pdf](https://www.idosi.org/aejstr/3(1)08/11.pdf).
- Adeigbe, O., Olasupo, F., Adewale, B., & Muyiwa, A. (2015). A review on cashew research and production in Nigeria in the last four decades. *Journal of Scientific Research and Essays*, Vol. 10(5), pp. 196-209, 15 March 2015.
- Africa Development Fund, (2000). *Republic of Ghana Cashew Development Project Appraisal Report*. Ghana: Africa Development Fund.
- ANIK, A. R., & SALAM, M. A. (2014). Determinants of adoption of improved onion variety in Bangladesh. *Journal of Agriculture and Environment for International Development*, 109 (1): 71 - 88:
- Armah, S. E. (2008). *Explaining Ghana's Recent Good Cocoa Karma: Smuggling Incentive*
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Argument (No. 382-2016-22539).

Barbier, E. B. (2015). Cash Crops, Food Crops, and Agricultural Sustainability. *ResearchGate*.

Boadu, V., Zereyesus, Y., & Ross, K. (2015). *Agricultural Production Survey for the Northern Regions of Ghana: 2013-2014 Results*. Ghana: UNSAID.

Boadu, V., Zereyesus, Y., & Ross, K. (2015). *Agricultural Production Survey for the Northern Regions of Ghana: 2013-2014 Results*. Ghana: UNSAID.

Breuning-Madsen, H., Awadzi, T., & Lyngsie, G. (2011). Origin of Harmattan dust settled in Northern Ghana — Long transported or local dust? 167-68:

10.1016/j.geoderma.2011.07.026.

Catarino, L., Menezes, Y., & Sardinha, R. (2014). Cashew cultivation in Guinea-Bissau – risks, and challenges of the success of a cash crop. *Journal of Agricultural Science*, 72 (5) p.459-467.

Chou, J.-R., & Hsiao, S.-W. (2005). An anthropometric measurement for developing an electric scooter. *International Journal of Industrial Ergonomics*, Vol 35(11); 1047-1063:
Retrieved from
<https://www.sciencedirect.com/science/article/abs/pii/S0169814105000867>.

Cooke, E., Hague, S., & Mckay, A. (2016). *The Ghana Poverty and Inequality Report – 2016*. Ghana: UNICEF.

COCOBOD. (2014). *Ghana Cocoa Board 45th Annual Report and Financial Statements for th Year Ended 30 Sept 2014*. Accra: Cocoa Board.

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- Crouch, M., & McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. *Social Science Information*, 45(4), 483–499. Retrieved from: <https://doi.org/10.1177/0539018406069584>.
- Darkwah, S. A., & Verter, N. (2014). An Empirical Analysis of Cocoa Bean Production in Ghana. *European Scientific Journal*, 10(16): 295-306.
- Donnelly, G. J. (2014). *Fundamentals of land ownership, land boundaries, and surveying*. Retrieved from: http://www.icsm.gov.au/sites/default/files/Fundamentals_of_Land_Ownership_Land_Boundaries_and_Surveying.pdf: Anzlic Committee on Surveying and Mapping.
- Durodola, A. (2018, October 10). *Nigeria is the 4th largest producer of Cashew in the world*. Retrieved from Ventures: <http://venturesafrica.com/this-entrepreneur-is-exploring-the-untapped-market-of-dried-fruits-in-nigeria/>
- Daniel, J. (2012). Choosing the Size of the Sample. In *Sampling Essentials: Practical Guidelines for Making Sampling Choices*. Thousand Oaks, 236-253: Retrieved from doi:<http://dx.doi.org/10.4135/9781452272047>.
- Dulock, H. L. (1993). Research Design: Descriptive Research. *Pediatric Oncology Nursing*, 10 (4); 154-157: Retrieved from <https://doi.org/10.1177/104345429301000406>.
- Emmanuel, B., & Qineti, A. (2018). *COCOA PRODUCTION AND EXPORT IN GHANA*. The Corvinus University of Budapest.
- Frimpong, E. A. (2016, March 4). *THE STORY BEHIND CASHEW PRODUCTION IN GHANA*. Retrieved September 15, 2018, from Ghana Agricultural & Rural Development Journalist Association: <https://www.gardja.org/story-behind-cashew-production-ghana-2/>
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- Frimpong, E. A. (2016, March 4). *THE STORY BEHIND CASHEW PRODUCTION IN GHANA*. Retrieved September 15, 2018, from Ghana Agricultural & Rural Development Journalist Association: <https://www.gardja.org/story-behind-cashew-production-ghana-2/>
- FAOSTAT. (2018). *Production of Cashew nuts with the shell for Ghana from 1987-2016*. Retrieved from Food and Agricultural Organization Corporate Statistical Database: <http://www.fao.org/faostat/en/#data/QC>
- Ghana News Agency (2016, January 14). *SADA Develops a master plan*. Retrieved December 05, 2018, from <http://www.ghananewsagency.org/social/sada-develops-master-plan-99381>
- Ghana Statistical Services. (2015). *Ghana Poverty Mapping Report*. Ghana: Ghana Statistical Services.
- Ghana Statistical Services. (2014). *Ghana Living Standard Survey Round 6*. Ghana: Ghana Statistical Services
- Hsieh, H.-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Sage Publications*, 15 (9);1277-1288 :DOI: 10.1177/1049732305276687.
- Jøker, D. (2003). *Information about Cashew Nut (Anacardium occidentale)*. Danida Forest Seed Centre.
- Kapinga, F., Kasuga, L., & Kafiriti, E. (2002). *GROWTH AND PRODUCTION OF CASHEW NUT*. Tanzania: Encyclopedia of Life Support Systems.
- Kolavalli, S., & Vigneri, M. (2011). Cocoa in Ghana: Shaping the success of an economy. *Yes, Africa can: Success stories from a dynamic continent*, 201-218.
- Kumar, N., Ponnuswami, V., Jeeva, S., Ravindran, C., & Kalaivana, D. (2012). Cashew Industry in India – An Overview. *THE WORLD OF HORTICULTURE*, 52(1):27-33.
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- KOLHE, K. (2009). Design and development of tractor mounted hydraulic lifter for harvesting spraying and pruning of horticultural fruit trees. *International Journal of Agricultural Engineering*, 171-175. Retrieved from: http://www.researchjournal.co.in/upload/assignments/2_170-175-7.pdf.
- Loehle, C., & Jones, R. (1990). Adaptive Significance of Root Grafting in Trees. *Functional Ecology*, 4(2), 268-271. Retrieved from <http://www.jstor.org/stable/2389347>.
- LezCastro, F. G., & Coe, K. (2007). Traditions and Alcohol Use: A Mixed-Methods Analysis. *Cultural Diversity and Ethnic Minority Psychology*, 13 (4): 269-284.
- Mitchell, D. (2004, June). Tanzania's Cashew Sector: Constraints and Challenges in a Global Environment. *Africa Region Working Paper Series No. 70*, pp. 1-5.
- Mole, P. N. (2000). *Smallholder Cashew Development Opportunities and Linkages to Food Security in Nampula Province, Mozambique: Summary of Findings and Implications for Policy, Research and Extension Efforts*. MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT.
- MOFA. (2017). *PLANTING FOR FOOD AND JOBS*. Ghana: Ministry of Food and Agriculture: STRATEGIC PLAN FOR IMPLEMENTATION (2017-2020).
- Monteiro, F., Catarino, L., Batista, D., Indjai, B., & Duarte, M. C. (2017). Cashew as a High Agricultural Commodity in West Africa: Insights towards Sustainable Production in Guinea-Bissau. *Journal of Sustainability*, 40-48.
- Mudge, K., Janick, J., Scofield, S., & Goldschmidt, E. E. (2009). A History of Grafting. 437-443 Retrieved from <https://www.hort.purdue.edu/newcrop/janick-papers/c09.pdf>.
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- Manerikar, V., & Manerikar, S. (2014). RESEARCH COMMUNICATION: A Note on Exploratory Research. *A Peer-Reviewed Research Journal*, 17 (1): 1-2.
- Nkonya, N., & Cameron, A. (2015). *Analysis of price incentives for cashew nuts in the United Republic of Tanzania 2005–2013*. Rome: Food and Agriculture Organization of the United Nations.
- Naminse, Y. E., Fosu, M., & Nongyenge, Y. (2011). *The Impact of Mass Spraying Programme on Cocoa Production in Ghana*. Ghana: Department of Agricultural and Economic Extensions.
- Nhantumbo, A., Takeshita, H., Uaciquete, A., & Miura, S. (2017). Determinants of Adoption of Technologies for Cashew Production in Nampula, Mozambique. *Journal of Experimental Agriculture International*, 17(5): 1-11: Retrieved from http://www.journalrepository.org/media/journals/JEAI_51/2017/Sep/Nhantumbo1752017JEAI36035.pdf.
- Ojolo, S. J., Olatunji, O., & Orisaleye, J. (2015). Ergonomic evaluation of cashew nut shelling machine. *Journal of Agricultural Engineering*, 18(1): 167-179, Retrieved from https://www.researchgate.net/publication/301726446_Ergonomic_evaluation_of_cashew_nut_shelling_machine.
- Ojolo, S., & Ogunsina, B. (2007). Development of a Cashew Nut-Cracking Device. *Agricultural Engineering International*: , Vol(16; 1-10.
- Pinillos, V., & Cuevas, J. (2014). Artificial Pollination in Tree Crop Production. *Journal of Horticulture*, 239 - 276 (34): DOI: 10.1002/9780470380147.
- Qiu, W. (2012). *Ghana's regional development in economics, education and natural resources with a case study on customers preferences for household water treatment and safety products*. Massachusetts Institute of Technology.
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

- Rico, R., Bulló, M., & Salas-Salvadó, J. (2016). Nutritional composition of raw fresh cashew (*Anacardium occidentale* L.) kernels from a different origin. *Food Science & Nutrition* , 4(2): 329–338: doi: 10.1002/fsn3.294.
- Reja, U., Manfreda, K. L., Valentina , H., & Vehovar, V. (2003). *Open-ended vs. Close-ended Questions in Web Questionnaires*. Ljubljana University.
- Sawal-Tuna-Kalba Dist. Assembly (2015). *THE COMPOSITE BUDGET FOR SAWLA-TUNA-KALBA DISTRICT FOR THE FISCAL YEAR 2015*. SAWLA-TUNA-KALBA DISTRICT ASSEMBLY.
- Sittie, R. (2006). *Land Title Registration. The Ghanaian Experience*. Germany; Retrieved from https://www.fig.net/resources/proceedings/fig_proceedings/fig2006/papers/ps07/ps07_15_sittie_0848.pdf: Shaping the Chang; XXIII FIG Congress.
- Soares et al. (2013). Prevalent fatty acids in cashew nuts obtained from conventional and organic cultivation in different stages of processing. *Food Science and Technology*, 33(2): 265-270, Apr.-June 2013.
- Thiyagarajan, R. (2018). Design and development of a tractor mounted hydraulic operated ladder. *International Journal of Agricultural Engineering*, Vol 11 (1): 1-12; Retrieved from:http://www.researchjournal.co.in/upload/assignments/11_1-12.pdf.
- Tsakiris, A. (1967). Cashew Nut Production in the Southern Region of Tanzania. *East African Agricultural and Forestry Journal*, 32:4, 445-449, DOI: 10.1080/00128325.1967.11662160.
- United Nnation. (2018). *Table 2. Human Development Index Trends, 1990-2017*. United Nations Development Programme.
- USAID. (2011). *Ghana Climate Change Vulnerability and Adaptation Assessment*. Ghana: United States Agency fo International Development.
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Uwagboe, E., Adeogun, S., & Odebode, S. (2010). CONSTRAINTS OF FARMERS IN CASHEW PRODUCTION: A CASE STUDY OF ORIRE L.G.A OF OYO STATE, NIGERIA. *Journal of Agricultural and Biological Science*, VOL. 5(4); 27-30:

Retrieved

from:

http://www.arpnjournals.com/jabs/research_papers/rp_2010/jabs_0710_201.pdf.

Van De et al. (2008). Erosion and Nutrient Loss of Sloping Land under Intense Cultivation in Southern Vietnam. *Geographical Research*, 46(1):4–16: doi: 10.1111/j.1745-5871.2007.00487.x.

Vanderstoep, S. W., & Johnston, D. D. (2009). *Research Methods For Everyday Life: Blending Qualitative and Quantitative Approaches*. United States of America: Jossey Bass.

Wongnaa, C. A., & Awunyo-Vitor., D. (2013). Profitability analysis of cashew production in Wenchi municipality in Ghana. *Bots. J. Agric. Appl. Sci*, 9(1);19-28.

World Bank. (2018, September 14). *Agriculture, forestry, and fishing, value added (% of GDP)*. Retrieved September 15, 2018, from World Bank: <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=GH>

World Bank (2018) *Third Ghana Economic Update: agriculture as an engine of growth and jobs*

creation (English). Washington, D.C.: World Bank Group.<http://documents.worldbank.org>

[/curated/en/113921519661644757/Third-Ghana- Economic-Update-agriculture-as-an-engine -of-growth-and-jobs-creation](http://documents.worldbank.org/curated/en/113921519661644757/Third-Ghana-Economic-Update-agriculture-as-an-engine-of-growth-and-jobs-creation)

World Bank. 1987. *Ghana - Cocoa Rehabilitation Project (English)*. Washington, DC: World Bank. imitation-Project <http://documents.worldbank.org/curated/en/8903414>

[68257683477/Ghana-Cocoa-Rehab](http://documents.worldbank.org/curated/en/68257683477/Ghana-Cocoa-Rehab)

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Yaro, J. A. (2009). Customary tenure systems under siege: contemporary access to land in Northern Ghana. *GeoJournal*, Vol. 75, No. 2 (2010), pp. 199-214; Retrieved from <https://www.jstor.org/stable/41148375>.

Zavatta, G. (2015, November 9). *Agriculture Remains Central to the World Economy. 60% of the Population Depends on Agriculture for Survival*. Retrieved September 15, 2018, from Expo Milano 2015: <http://www.expo2015.org/magazine/en/economy/agriculture-remains-central-to-the-world-economy.html>

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Appendix

Interview Questions For Officials At COCOBOD

CONSENT FORM

I would like to ask your permission to be part of this research. This interview is intended for this research purpose only. The study seeks to understand the the feasibility, potential contribution and challenges inherent in the production of cashew in the Salwa-Tuna-Kalba District in the Northern Region of Ghana. Your participation is entirely voluntary, and you can decide not to complete the interview at any point in time. You are not exposed to any risk due to your involvement in this study.

The benefit for participating in this research is that, the findings will enable farmers in the Sawla District to learn various ways of improving their cashew production.

I will be asking for your opinions, thoughts, and experiences. You can ask me questions, skip any question or completely withdraw from the study at any point in time. Your responses will be anonymous and will never be linked to your identity. Thank you for your input.

This study and consent form have been reviewed by the Ashesi IRB for Human Subjects Research. For information, please contact the committee through irb@ashesi.edu.gh or my supervisor through searmah@ashesi.edu.gh .

Confirm your acceptance to participate in this research by providing your signature below.

Signature..... Date.....

POTENTIAL CONTRIBUTION OF CASHEW FARMING

Structured Interview questions for officials at Ghana Cocoa Board

1. Which office do you work at COCOBOD?

.....
.....
.....

2. How is the marketing and sales of cocoa done? What is the process involved in doing the marketing and sales of cocoa?

.....
.....
.....

3. How are the prices of cocoa determined?

.....
.....
.....

4. What is the role of COCOBOD in improving the production of cocoa in Ghana?

.....
.....
.....
.....

5. Which aspect of the cocoa production value chain could be integrated into cashew farming to make it sustainable?

.....
.....
.....
.....

6. What role can the government play in ensuring sustainable production of cashew in Ghana?

POTENTIAL CONTRIBUTION OF CASHEW FARMING

.....
.....
.....

7. Which aspect of technology in the cocoa value chain could also be adopted in cashew production?

.....
.....
.....

8. What other comments do you have in relation to cashew production in the Northern Region?

.....
.....
.....

9. Is it possible for COCOBOD to adopt cashew in its portfolio of cash crops?

.....
.....
.....

Structured Interview questions for farmers in cashew farming communities in Sawla-Tuna-Kalba District

- 1. Gender: Male Female
- 2. You may want to know the age. Old farmers may have different perspective from young farmers especially in relation to cashew farmers.....
- 3. For how long have you been engaged in cashew farming?
- 4. What is the size of your farm?
- 5. Which crops do you farm alongside the cashew

.....

POTENTIAL CONTRIBUTION OF CASHEW FARMING

6. How often do you harvest your crops for sale?
7. What quantities do you harvest and how much do you sell them for?
8. What inputs do you use in farming and how much do they cost?
9. Which type of technology are you using in your cashew production?
10. Why are you using this technology?.....
11. Have you heard about some other technologies used in cashew production?.....
12. If you had the means will you change to a different technology? Which one and why?
13. What job would you do apart from cashew farming, why or why not?.....
14. What challenges are you currently facing in the cashew production process?
.....
.....
15. How do you think your challenges can be addressed?.....
.....

Questionnaires for farmers in cashew farming communities in Sawla-Tuna-Kalba District

1. Gender: a. Female b. male c. Other
 2. Which category below includes your age?
a. below 18 b. 18-25 years c. 26-35 years d. 36- 50year e. above 50 years
 3. What is your level of formal education? a. No formal education b. Primary c. JHS d. SHS e. Tertiary
 4. What is your ownership status of the cashew Farm. a. owner b. Tenant farmer
c. Family land
 5. What is the size of your cashew farm? a. Below 2 Acres b. 2-5 Acres c. Above 5 Acres
 6. Is cashew farming your main source of income? a. Yes b. No
-

POTENTIAL CONTRIBUTION OF CASHEW FARMING

7. If no, state your main source of income

.....

8. Are you the breadwinner of your family?

a. Yes [] b. No []

9. If yes, how many people do you cater for?

.....

10. Rank the following in order of importance from 1 to 5, where 1 is the most important to you and 5 is the least concern to you.

Cashew farming provides employment []

Cashew farming positively affects the environment []

Cashew farming negatively affects the environment []

Cashew farming provides capital to support other investments []

Cashew farming improves living stands []

11. Considering the positive and the negative impacts of *cashew farming*, is the overall effect a gain to this community? a. Yes [] b. No [] 12. What do you think can be done to bring a balance between cashew farming and other economic activities?.....

.....

13. Is there anything else a researcher interested in *cashew farming* needs to know?.....

14. which of the following is a major challenge in cashew production?

a. Capital [] b. Storage facilities [] c. Technology [] d. Pest and Diseases [] e. Marketing []

15. How do you think these challenges could be tackled?

POTENTIAL CONTRIBUTION OF CASHEW FARMING

.....
.....
.....
.....

16. Do you have any farmer association for cashew producers in this community?

a. Yes [] b. No []

17. If there is such a farmer association available, would you like to join?

18. If Yes/No, explain.....

.....

19. How long have you been farming cashew? a. 1-5 years [] b. 5-10 years [] c. Above 10 years []

20. How many bags of the raw cashew nuts do you harvest on yearly basis?

a. Below 5 bags [] b. 5-10 bags c. above 10 bags [].