



Project Tittle

**Dietary diversity and its effects on smallholder cashew farmers. A case study
in Sampa, Brong Ahafo Region of Ghana.**

**Research Project submitted to Van Hall Larenstein University of Applied Sciences in
partial fulfilment of the requirements for the award of Master Degree in Management of
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DEDICATION

This dedication is to my dear wife, parents, children Adeliade Esiape, Clara Esiape, Jonathan Esiape, Karen Esiape and my siblings Salomey and Divine who inspire me to work hard during the study programme.

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LIST OF ACRONYMS

ACi	African Cashew initiative
CDP	Cashew Development Project
CIAT	International Centre for Tropical Agriculture
FGD	Focus Group Discussion
GDP	Gross Development Product
GEC	Ghana Electoral Commission
GHS	Ghana Health Service
HDDS	Household Dietary Diversity Score
IIED	International Institute for Environment and Development
JNDA	Jaman North District Assembly
KI	Key Informants
MOFA	Ministry of Food and Agriculture
RCN	Raw Cashew Nuts
SLF	Sustainable Livelihood Framework

SUMMARY

The intake of nutrients from different food groups is associated with dietary diversity and is an important component of nutritional outcome. Smallholder cashew farmers in the Jaman North district of Brong Ahafo Region of Ghana are faced with nutritional deficiencies according to the health directorate of Jaman North district (GHS, 2017). The objective of the research was to investigate the influence of dietary diversity and its effects on smallholder cashew farmers in Jemera, a community in Jaman North in the year 2019. Data was collected on dietary diversity score using a 24-hour recall period as a reference point through the use of the HDD questionnaire developed by FAO (2011) for measuring. Thirteen food groups (13) were modified and used (ICMR (2012)).

Respondents for dietary diversity score and farmer interviewed were 22 in number. The study made use of purposive sampling. All smallholder cashew farmers were interviewed through the use of semi-structured questionnaires, focus group discussion and key informant for data generated. It was discovered that the community mean aggregate Dietary Diversity Score was 7.15 which is high compared to other studies conducted by De Cock et al. (2013) in South Africa Limpopo Province which was 4.5.

The results indicate that smallholder cashew farmers generate income from the nuts harvested which improves standard of living, however the dietary intake of the households was not as high as was expected. The reasons were that they preferred investing income generated from cashew more on children education, paying bills and building projects. But it was discovered that farmers had sufficient food to eat. Each individual household dietary diversity score was less than 1 in 22 farmers studied. The study revealed that with FAO categorisation of food groups into low, medium and highest, smallholder cashew farmers in the community were in the range of medium. This means households consume more than four to five food groups. The study concluded that socio-economic factors are one of the major factors affecting Dietary Diversity. It was revealed that types of staples produced after and before cashew production did not show significant difference for yam and cassava but maize was slightly different in terms of yield of 6.5 bags as against 8 bags per 100kg before and after cashew production.

It is therefore concluded that income is not the only mechanism for ensuring household diversity in diet taken.

CHAPTER ONE: INTRODUCTION

This chapter presents the brief background of the study and it highlights the research problem statement, the objectives and the research questions, it also focuses on the structure of the report.

1.1 Background

Ghana, a country on the West Coast of Africa, is one of the most thriving democracies on the continent (GEC, 2010). It shares boundaries with Togo to the east, la Cote d'Ivoire to the west, Burkina Faso to the north and the Gulf of Guinea, to the south.

The country's economy is dominated by agriculture, which employs about 40 per cent of the working population. The country is divided into 10 Regions of which the Brong Ahafo Region is the hub of cashew production zone in the state.

Cashew (*Anacardium occidentale L.*) is an economic tree crop that produces apple and nut which grows well in areas with annual total precipitation range of 1000-2000 mm (Sys et al., 1993). Cashew has, over the years, become the leading non-traditional export earner in Ghana's agriculture sub-sector, contributing \$196.7 million in 2016, according to the Ghana Export Cashew Promotion Authority (GEPA, 2016). Commodity markets were therefore established and liberalized, thus providing the opportunity for farmers to sell the raw nuts (Edward, 2016).

The Competitive Cashew Initiative (formerly: African Cashew Initiative – ACi) has been helping producers in Benin, Burkina Faso, Côte d'Ivoire, Mozambique and Ghana since 2009 to raise their yields and increase the quality of their produce. The knowledge of dietary diversity is a good indicator of people's broader nutrition in cashew growing areas. Dietary diversity is an important component of nutritional outcome associated with household or individual food availability and intake of nutrients from different food groups. Evans (2016) indicates that farmers involved in increased cashew cultivation in rural communities in the Brong-Ahafo Region benefited from the sale of Raw Cashew Nuts. The income generated from cashew helped to improve housing, provide access to food and enable parents to invest in the education and healthcare of children. Sibhatu and Qaim (2018) indicate that increasing production diversity may have positive effects on smallholder nutrition in specific situations. Despite improvements by the Department of Agriculture towards reducing hunger, malnutrition remains a crucial challenge in Jamera a community in Jaman north district (MoFA, 2017). In Ghana, there have been several development initiatives to promote smallholder diversification by introducing additional crop and livestock species with the intention of improving household nutrition. Increase in farm production cashew plus diversification is associated with an increase in dietary diversity (Ayenew et al., 2018). Cash cropping varies from region to region, depending on the needs of the farmers. Most often smallholder farmers employ mono-cropping

production of a single crop on a piece of land. The aim is strictly monetary, on the opposite extreme from subsistence-farming, which feeds the farmer and his family. The focus on cashew only can negatively affect the nourishment of a family in event of crop failure. According to IFPRI (2014), an estimated 2 billion people suffer from micronutrient and malnutrition, mostly due to low intakes of vitamins and minerals such as iron and zinc. Adequate human nutrition involves regular intake of a wide range of nutrients, some of which must be consumed on a frequent basis, even if in small quantities (WFP, 2007).

In smallholder cashew farming areas, nutritional deficiencies are not only the result of low food quantities consumed but also of poor dietary quality and diversity (Shibhatu et al, 2015). Jones et al. (2014) indicated that production diversity has the ability to influence the diversity of household diets, an important nutrition outcome associated with the nutrient adequacy of diets.

MoFA (2017) confines that, cashew for some time now has attracted higher market prices. It has been assumed that increased food production, reduces food prices, and increasing income of households would contribute to poverty reduction and improved nutrition (De Vries, 2012). Crop diversification on smallholder farms is often perceived as a promising strategy to improve dietary quality (Shibhatu et al., 2015). Higher farm production diversity significantly contributes to dietary diversity in some situations, but not in all. A qualitative study of crop diversification found out that dynamics in decision making and matrimonial inheritance influence household investments in nutritious crops grown for home consumption (Abel et al, 2012). Growing of food crops at the backyard are often considered one of the most diverse parts of the farm and agricultural system, sometimes containing more than 200 useful species (Eyzaguirre and Linares 2010).

People access to nutritional information are key determinants of dietary diversity in many contexts. The exposure to behaviour changing on types of training on diversity and production of nutritious food are also key determinants of interest (CRS production guide, 2017).

1.2 Research Problem

There is potential that lies in cashew production for generating income which households could benefit to raise income to meet a required dietary diversity. Cashew production is an economic tree nut crop which has tremendous benefit to smallholder farmers in Jaman north district. Despite the economic value of the crops providing enough income to farmers and their ability to afford the needed diverse food groups, this is not happening according to GHS (2017), and keeps leading to malnutrition.

Lack of knowledge on dietary diversity of smallholder cashew farmers by the department of Agriculture makes it difficult for the Department to make policy on micronutrient and malnutrition problems affecting smallholder cashew farmers. According to Allen. According to Allen (2008), monotonous diets based on

starchy staples lack essential micronutrients which contribute to the burden of malnutrition and micronutrient deficiencies.

1.3 Research Objective

The purpose of the research is to investigate the underlying causes of dietary diversity amongst smallholder cashew farmers to recommend the Department of Agriculture for policy change on the appropriate interventions.

1.4 Research Question

Main research question

What is the influence of cashew production on dietary diversity amongst smallholder farmers in Jaman north district?

Sub-questions

1. How is the household dietary diversity score of smallholder cashew farmers in Jaman north district?
2. What are the socio economic factors that influence dietary diversity amongst smallholder cashew farmers?
3. What food crops were previously produced and consumed by smallholder cashew farmers?
4. What food crops do smallholder cashew farmers produce and consume now?
5. How much cashew nut was sold by smallholder cashew farmers in the previous season?
6. What percentage of the income from sales of cashew goes into household food purchase?

1.5 Report Structure

This report is organized into six (6) chapters. Chapter one (1) is the introduction of the study and comprises the background information of the study in the selected study area, problem definition, research objective and research questions. Chapter two indicates the literature review focusing on dietary diversity, socio economic factors affecting dietary diversity and conceptual framework to the study of smallholder cashew farmers in Jaman north district in Bono Region. Chapter three (3) discusses the study area, research design/strategy, methods used in data collection during the field research and the sources of data., sampling techniques, data analysis, ethical issues and limitations. The results of the findings are presented in chapter four (4). The results of the findings are discussed in chapter five in relation to the literature review. Chapter 6 of the report constitutes the conclusion and recommendation for MOFA and other stakeholders.

CHAPTER TWO: LITERATURE REVIEW

This chapter reviews the literature relevant to the study in line with its objectives. The chapter is organised as follows, definition of concepts and conceptual framework of the study. It also includes description of socio economic factors affecting dietary diversity. This gives room to recognise previous knowledge and guide the researcher into discovering new things in the study and add to the limited knowledge and compare findings in chapter 5.

2.1. Key Concept Explanation

Crop diversification

Crop diversification is a key strategy in agricultural production carried out by smallholder farmers because of the opportunities it offers for managing risk and heterogeneous production conditions, as well as increased income generation it allows through market participation (Romina, 2010). Diversification is defined as on-farm or farming-related activity. A diversification strategy is when farmers combine other agricultural or non-agricultural activities with their farm business (Meike et al., 2016).

Dietary diversity

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods and is considered as a proxy indicator for nutrient adequacy or micronutrient intake of diet of individual (FAO, 2011).

Dietary Diversity Score

DDS is defined as the number of food or food group consumed by an individual or household inside the home over a reference time period. The recommended reference period is the last 24-hour recall. Food grouping can be different according to the objective putting emphasis on energy dense or micronutrient rich foods. Thus the total sum of different food groups consumed by a study participant (Swindale and Bilinsky, 2006 and FAO, 2011). Food grouping varies from 5-16 depending on the purpose of the study.

Social economic factors

Socioeconomic factors are lifestyle components and measurements of both financial viability and social standing (Mecleod, 2018). The study defines social economic status as proxy indicators and ownership of assets example source of income, level of education etc.

Food consumption/Production trends

These are practices related to food intake, choice made, food preparation and production of specific food types of study participants.

Food sufficiency and food security

Food sufficiency may mean being able to produce enough to feed the population, but in reality, it simple means being self-sufficient for the staple. Dar (2016) indicates that being food secure is not the same as self-sufficient for staple food. Food secure does not equate to having enough local production of a certain staple for a country's population. For this study, food sufficiency means having access to food on a daily basis.

2.2 Effects of household dietary diversity among farmers

According to World Bank (2007), a positive relationship between farm production diversity and dietary diversity is possible, because much of what smallholder farmers produce is consumed at home. Dietary diversity can be measured at the household or individual level through the use of a questionnaire. Most often it is measured by counting the number of food groups rather than the food items consumed (FAO, 2016). Small-scale production (for both crops and livestock) enhance access to a diverse food consumption at the household level, thereby improving the dietary diversity of smallholder households (Habtamu et al., 2018). Increased in growth of agriculture intensification, and productivity growth can contribute to improving food security and reduction of poverty (Thirtle, 2003).

Farm production specialization, into non-food 'cash crops' may be accompanied by reduced dietary diversity. However, if the diversity of foods from own-production is not compensated for with market purchases, food security may be affected. Shibhatu et al. (2015) indicate that majority of poor people are smallholder farmers, therefore diversifying production on these farms is perceived as an important approach to improve dietary diversity. Diversified diet is associated with a number of improved outcomes in areas such as birth weight, child anthropometric status, and improved hemoglobin concentrations (Neumann et al., 2002).

Sibhatu et al (2018) highlighted that the diversity of food and agricultural systems is a question of scale. The studies reviewed here refer to diversity at the individual farm level. At higher scales (villages, districts, provinces, communities, etc.) sufficient diversity is important because affordable access to diverse foods from the market requires that somebody produces these foods. The study further stressed that if efficient markets for a wide range of products exist, food systems will become more diverse, even without every farmer having to maximise diversity on his or her individual farm (Sibhatu et al., 2018). Foley et al. (2005)

argued that population growth and changing dietary preferences are increasing the global demand for livestock products and feeds. The increase in population and higher demands for other commodity crops is likely to shift the attention of such price increase in products impacting positively or negative to one another.

The household dietary diversity score consists of a simple count of food groups that a household has consumed over the preceding 24 hours. FAO (2011) confine that data collected on the household is analysed to provide information on specific food groups of interest. The household dietary diversity score (HDDS) is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods (FAO, 2011). Burney (2012) indicates that poor storage facilities in the rural areas of the developing world account for the same level of nutrition quality and dietary diversity in off-seasons.

2. 3 Influence of socio economic factors and other factors affecting diet intake

Socioeconomic status is a major determinant of a healthy diet in high and middle income countries like Ghana. However, other studies have indicated that high socioeconomic status may be associated with dietary pattern and diet quality in low income countries (Marianne et al., 2017). Studies have shown that an increase in dietary diversity is associated with socio economic status of household and food security (Marianne et al. 2017; Hoddinot 2017; Hoddinot and Yohannes 2002). Production diversification remains a vital strategy for farm household to meet dietary needs. Study shows that differential effects of food prices on the household dietary diversity can be affected by food consumption (Echer, 2018) Ochieng et al (2017) argue that female headed household has low dietary diversity compared to male headed households. Production of leafy vegetables plays key role in improving the dietary diversity of women. Gender and education of the household head in food preparation couple with nutrient training are considered important influencing factors informing the importance of vegetables (Ochieng et al., 2017).

Increasing farm production diversity can come at a potential high cost to farmers sacrificing profits that are associated with commercialization production, and specialization agriculture (Dillon and Barrett, 2017). Market accessibility affects dietary diversity. However, study conducted suggests that geographic distance from the farm household to the closet market is considered one of the indicators that can better reduce market access to contribute to dietary diversity (Sibhatu et al., 2015).

Habtamu et al. (2018) argue that postharvest production diversity has great influence on dietary diversity. This indicates that the effects of diversity and dietary diversity varies across seasons. However, there is always a decline in the diversity of food stuff that is consumed at lean seasons periods. Production diversity at the farm household contributes to improving House Dietary Diversity, which is always the case

for post-planting (Habtamu et al., 2018). At the household level, dietary diversity is usually considered as a measure of access to food. Social, cultural and economic mediators. A study conducted by Chwenya and Eyzaguirre (1999) states that cultural preferences determine the consumption of certain traditional foods or the loss of importance food group.

According to Herforth (2010), choices of dietary diversity are shaped by psychological and social cultural factors. Crops purchase of nutritional importance foods is contributed by agrobiodiversity income of women.

2. 4 Cash crop production and its effects on smallholder farmers in Ghana

The cashew business environment in Ghana has really improved tremendously in recent years with demand for raw nuts increasing. This has created ready markets and improvements in farm-gate prices (Ghanaweb, 2019). The development has given birth to numerous functional farmer associations, processing plants and traders linked to the industry. Govereh and Jayne (2003) argue that income raised from market production can be used to purchase inputs for food crop production, thus increasing productivity and consequently increase food availability.

In a household with different individuals, household resource allocation may be driven by one individual, the household head, or it may be a result of a negotiation process between different individuals notably a husband and wife, based on their preferences.

Cash crops are an essential part of sustainable intensification, as income generated with cash crops provides farm households with a means to save and invest in a more productive farm. Changes from food crop production to full dependence on cashew homogenous cash crop impact on livelihoods and natural environment (Termudo and Abrantes, 2014).

2. 5 Livelihood assets to food security and farm intensification

A conceptual framework to guide SLF as a future approach to agriculture and the agri-food sector focus is on the role of agriculture, and agro-industry can play in supporting inclusive economic growth and poverty reduction. Napoli (2011) Study refine that food insecurity should not concentrate exclusively on countries considered poor from an income perspective alone and that clear links between income and nutrition cannot necessarily be drawn. This assertion gives a clear indication of how stakeholders could help to improved cash crop production in most communities of Ghana. Evans et al. (2015) indicate that cashew as a tree crop is regarded as man individual property to be passed on to the generation which differed from communal land tenure. Women and young people contribute significantly to farm hands in plantation crop production. However, women and girls are likely to lose out since they depend on food crops for food and income (Evans et al., 2015). According to CIAT (2011), cashew crop has the potential of reducing poverty

among the rural folks in Ghana and Cote d'Ivoire. Majority of agricultural lands in the Brong Ahafo region of Ghana is dependent on shifting cultivation in recent years (Evans et al., 2015). Berry (2009) argue that higher income may influence access to education and enhance people bargaining power to buy food. However, cashew cultivation tends to diminish the lands available to food crops revealing both advantages and tradeoff for rural communities. Termudo and Abrantes (2014) argue that farmers who were previously self-sufficiency in food production are now dependent on the income of the cashew for food supply. However, highly dependent on the single crop has much influence on the stability of food crops.

2. 6 Market demands and economic value of cashew (income) to smallholder farmers

Low-income countries should build industrialization strategies diversifying into processing commodities (Christopher, 1999). Despite the positive indicators, there are a plethora of challenges starting at the development of the cashew industry. Cashew kernels are excellent nutritive supplements owing to their unique combination of proteins (21 %) fat (47.50 %) carbohydrates (18-20%) minerals, vitamins and dietary fibre. The kernel finds place from tasty dry nuts, sweet dishes to a range of confectionary products all over the world (Desai, 2010).

TABLE 1: RAW CASHEW NUT PRODUCTION FIGURE FOR GHANA BETWEEN 2015-2017

Country (Ghana)	RCN Production Tonnes (2015).	RCN Production Tonnes 2016	RCN Production Tonnes 2017	Changes from 2016 vs 2015
	80,000	85,000	87,000	30,000

Source- MoFA- 2018.

Between 2015 to 2017 there has been tremendous increased in the raw cashew exported from Ghana. This indicates that cashew has great potential for generated income for the country. According to ACi (2014), the global demand for cashew will continue to grow from over 2 million tonnes of Raw Cashew Nuts (RCNs) from 2012-13 to over 3 million tonnes in 2019-20.

Changes from self-food sufficiency to the reliance of single cash crop of homogenous cashew production influence both the natural environment and livelihood of people (Marina and Abrantes 2014).

In cashew producing environment, the micro climate in the surrounding environment is also been affected due to the total tree cover of the plant. Brandon (2012) reveals that cashew plays a very important role in the economic, environment and cultural spheres of life. Basically, cashew has influence on the household livelihoods strategies as a result of necessity, opportunity at global, national and regional economies.

TABLE 2: CASHEW EXPORTATION FROM JAMAN OF NORTH DISTRICT OF BRONG AHAFO REGION OF GHANA CASHEW

Year	Qty in bags	Qty in tonnes
2016	150,390	12,532.50
2017	369,026	30,759.14
2018	1,041,481	86,790.08
2019 (figures as at-June)	830,377	63,875.15

Source Jaman North District Assembly-2019.

The figures indicate total raw cashew nuts exported from Jaman north district. The statistic indicates that with the number of cashews exported from the country, Jaman north produces a greater percent of the national export. The production of cashew in the district compared with the national export figures from the Ministry of Agriculture- attest to the district potential in the cashew industry. In the year 2017 tonnes of 30,759.14 raw cashew nut was conveyed from the district alone as against national export figures of 87,000 tonnes. In 2019 as at June 63,875.15 tonnes of raw cashew nut left the district for export (JNA, 2019).

2.7 Intra-household dynamics in the cashew industry

The research focuses on the effects of cashew production on small holder farmers in Ghana. Cashew provides a great source of income and food security for small scale producers and low income farmers especially women group (IIED, 2004). In Mozambique study indicates that women work in whole range of sections in the cashew industry including peeling, stereotyping as women's work. USDA (2014) studies indicates that men are responsible for generating and managing income for the household, while women are responsible primarily for domestic affairs in cashew production.

The study conducted in cashew and shea production by Verina et al (2015) in Ghana and Burkina Faso indicates how income is distributed depends on whether the product comes from a cultivated tree and if it was a joint, household or individual activity. Women are capable of raising awareness among traditional leaders to improve participating in decision making process in the value chain. Women are seen as the one responsible for selling the cashew apple in some traditional setting in Ghana. According to Verina et al (2015) both sexes use the incomes from selling raw and processed products to meet family needs, men tend to spend more on family education and assets, women more on food. Women in cashew processing groups earn substantially higher income. Dendena (2014) argues that women account for up to 95 % of

the labour force in cashew industry. However, they receive low wages and are subjects to poor working conditions.

Ellis (2012) argues that the relationship between man, women and natural resource management is considered as complex, very diverse according to the pressures on people livelihoods. In many Africa society, tree ownerships by women is not permissible. However, women are allowing to utilize the products that are owned by men counterparts (Ellis, 2012).

2. 8 Land systems in Ghana

Ghana, as a country, has a peculiar land tenure system, which is a very complex one. The system of land acquisition reflects the unique traditional political organizations, socio-cultural differences and attributes of the various tribes, clans and families who through wars conquer and gained ownerships of land (Ministry of Lands and forestry, 2003). However, the current situation allows people to have access to land ownership through direct buying from prospective land owners with proper processing and documentation.

Land tenure refers to the way land is held or transferred while land tenure (ownership) security refers to whether the land holder perceives that land could be expropriated or not (Matchaya, 2008).

In Ghana, the land is allocated and transferred among households in a community and within households who have access to and control of land are based in part on marriage and inheritance laws and practices. Linor et al. (2015) study conducted indicates that insecurity of the land tenure systems is the primary cause of low productivity, poverty and lack of development in Ghana agricultural system.

Land legislation and policies in Ghana appear to be gender neutral. However, they tend to affect women adversely in their implementation because of women's peculiar socio-economic position and the cultural context in which they are applied (Dowuona-Hammond, 2001). Recent policies and drive towards women empowerment have been canvassed by successive governments, traditional norms appear to be one of the entrenched obstacles to access and control over land resources. To a large extent, access and control to productive resources are determined by male centred kinship institutions that have evolved out of patriarchal ideologies. Thus whether women are located in patrilineal or matrilineal cultures it is the men in their families who more or less preside over the allocation of resources owned by the family (Aryeetey, 2002).

Wider variation in women access and control over land resources in urban and rural areas do exist in some situations notwithstanding the limitation of land access to the female. In urban areas where access to land is determined more by market forces traditional norms and customs break down and there are virtually

no restrictions on women access to land. No law exists to prevent women from purchasing or renting land if they have the money to do so (Aryeetey, 2002). Customary law governs daily life in practice and does differentiate on the basis of gender. Communal land tenure is common, with chiefs governing community lands and determining the acquisition of rights to and transmission and disposition of interest in land. Customary owners serve as spiritual heads and advisors to chiefs on land issues (Verina et al., 2015).

In rural areas, financial empowerment is the primary limitation that hinders women from breaking away from the traditional stranglehold. Thus even though except for some limited traditional areas gender systems generally guarantee rights of access to resources, but it is giving control and ownership of those resources which create problems and perpetuate gender inequality (Aryeetey, 2002). A wider range of outcomes in the assessment of quality of evidence on women right and level of agreement was higher for bargaining power and decision making on consumption. However, the authors also argue that women right for land was on uneven though there was fairly evidence from greater amount of people (Ruth et al., 2019). Market opportunities pave way for land use by stimulating people behaviour of undermining good governance in forest resources due to price increase in commodities. This is assumed to have great effects on the limited land used in the environment.

2.9 Conceptual framework

The conceptual Framework presumed that smallholder cashew farmers with increased in cashew production may leads to higher income which can affect dietary diversity and increase intake of food for good health in the household. But at the household level socio economic factors could have influence on diversified food intake consumed by the smallholder cashew farmers. Factors such as income , education and head of the family in the household can affect food diversity. With increased in income farmers could also invest in other food crop production alongside the cashew production to create diversity in the household.

The decision of how much diverse food groups to access is triggered by power dynamics which exist in household of smallholder farmers. The head of the family in household is considred a key factor in family setting.

The assumption of cashew production increasing income enhance purchasing power to access different food group, greatly influence dietary intake in the households. According to Berry (2009), higher income could influence education of individuals which can further reflect in the micronutrients needed for healthy growth. Sibhatu *et al* (2015), indicate that majority of poor people are smallholder farmers, therefore diversifying production on these farms is perceived as an important approach to improve dietary diversity.

Jones et al. (2014) indicate that farmers who purchase food from the market might consume a more diversified diet. However, there might be other factors which could determine either increased income leads to increase dietary quality. Hoddinot and Yohannes (2002) studies have shown that an increase in dietary diversity is associated with socio economic status and household food security.

It is therefore hypothesised that farmers with high cashew productivity may have better opportunities which may reduce most of the ill health associated with micronutrient deficiencies.

Conceptual frame work for smallholder cashew farmer

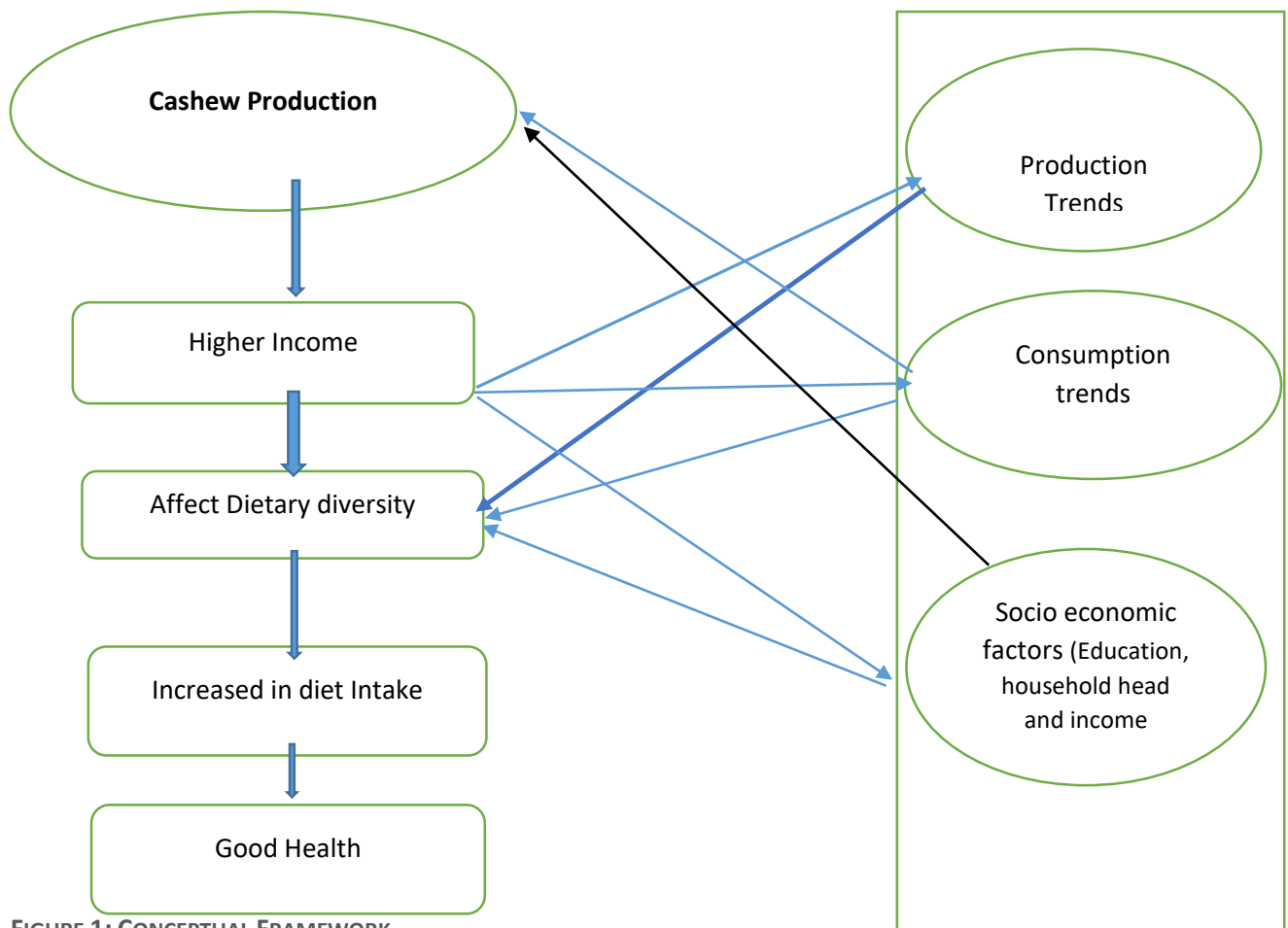


FIGURE 1: CONCEPTUAL FRAMEWORK

(Source: Author, 2019).

CHAPTER THREE METHODOLOGY

The chapter describes the methodology that was used in the study. It includes a description of the study area and research design, which covers sampling procedures, sample size, data collection, data analysis, limitation of the study ethical issues, triangulation, validity and reliability of data.

3.1 Description of Study Area

Sampa is a town in the Brong-Ahafo Region of Ghana, on the border with Côte d'Ivoire. It is the capital of Jaman North District and was formerly the site of a slave market. It is the biggest border town in Ghana with a population of over 26,000. It is the principal town of the Nafana ethnic group. The language of the people is Nafaanra. The major cash crop produced by the people is Cashew (GSS,2010). Jamera a village in Jaman north district was purposely selected due to peculiar geographical characteristics in the district. The site is rain-fed farming areas, characterized by smallholder cashew farmers with high levels of undernutrition (Das *et al.*, 2014). Below is the map of the study area.

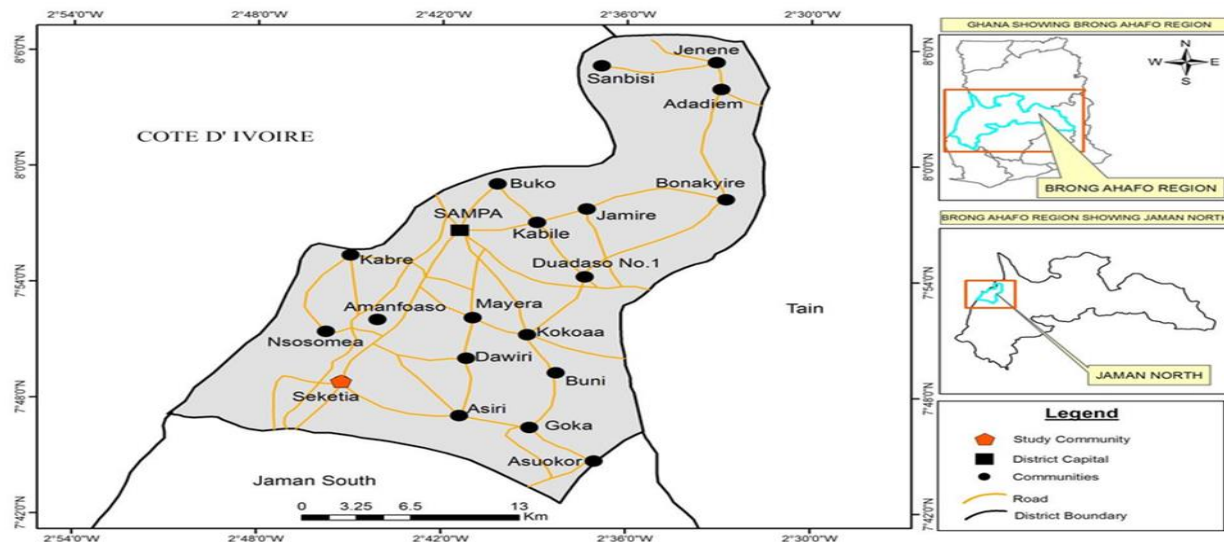


FIGURE 2: MAP OF STUDY AREA

SOURCE -(DISTRICT ASSEMBLY JAMAN NORTH, 2019)

3.2 Justification of Study Area

The area of the research was taken into consideration based on the fact that it is the major cash crop for the people in Jaman north district in the Brong Ahafo Region of Ghana. The Region falls in the middle belt of the ecological zone of the country which is noted for extensive cashew production. The area was also chosen because there was a database of smallholder cashew farmers list available at the community and department of Agriculture which informed the decision of the study.

3.3. Research Design/Strategy

The research is a case study which involves qualitative approach in which the researcher relies on the views of participants; asks broad, general questions; collects data consisting largely of words (or text) from participants; describes and analyzes these words for themes, and conducts the inquiry in a subjective manner. Both secondary and primary data was generated to answer the research questions.

The research makes use of secondary data through desk study by professionally collecting information from books, articles and journals. The following search engines such as greeni, google scholar and science direct was used. The review of materials guided to design the conceptual frame work, key concepts of the topics, dimensions and indicators of the research. Upon the basis of the conceptual framework, research questions and sub questions were formulated.

The major sources of data for the research work were primary data which were gathered from the respondents with a mix of techniques such as semi structured questionnaires (interviews) focus group discussions, key informant, observation and PRA tools such as ranking. The research used the FAO guidelines for measuring household dietary diversity FAO (2011).

Smallholder farmers list was provided by the community leaders and selection of farmers was purposive and randomly done through a written names on a piece of paper which was picked at random. Twenty two (22) farmers were selected and interviewed by both research assistants and the researcher for all the research tools used.

Dietary diversity was assessed based on the number of food groups consumed over a 24-hour recall period which serves as a proxy indicator for food access and quality. Data was analysed by the researcher and discussed based on the literature and conclusion and recommendation drawn by the researcher.

3.4 Sampling Unit and Techniques

Total sample size was to be used ($n = 40$) but at a point of the interview, both Household Dietary Diversity Score and semi-structured interview reached a saturated point and researcher advised the team to stop. The reasons were that there was no new variance showing in the data getting. House Dietary Diversity sampled size and Semi structure interview sampled was the same. 24- hours recall period was used for the HDD. The essence of 24-hour period was to make recall of previous food ate easy to recollect. This serves as a reference point. Farmers were selected through purposive sampling procedure. This was done to get expert view on issues of interest. The sample size was 22 smallholder cashew farmers comprising of 6 FGD held for two times, 1 key informant. Farmers randomly selected were picked from the list of both DDS and the Semi structured interviews as well FGD and key informant.

The questionnaires were in two fold comprising of DDS and semi structured interviews with a check list.

3.5 Selection and Training of Research Assistants

Three research assistants were recruited to assist in the study. They were selected from the Department of Agriculture to aid in data collection because respondents' houses were far apart from each other and researcher was to use few days for the raw data.

They were trained for two days and the third day was used for practical experience. The personnel were much involved in the DDS but mostly were guided by the researcher on the objective and procedure involved in data collection and how questionnaires are administered. Farmers were probed to get in-depth information from respondents and also to understand the basic confidentiality associated in research techniques.

The questionnaire was pre-tested before data collection. During the pretesting series, ambiguous and unclear questions were reframed before the actual data collection. The purpose of the pretest was to have a reliable question format and good wording and order. Consent was sought from the community leaders of the town through department of agriculture prior to the onset of the work.

3.6 Tools for data collection and procedures for measuring

3.6.1 Semi Structured Survey on Dietary Diversity Score

Dietary diversity survey was collected in the raining season in the month of July 2019. Two (2) days were used for the dietary diversity survey interview since some households selected were absent on the first day. Smallholder cashew farmers were purposively selected in the households and interviewed by the researcher and trainees. During the survey, women and those found prepared food or meals were asked to mention all foods and beverages they had eaten during the preceding 24-hours recall period (from the time they woke up the preceding day to the time the interview was conducted in a day period) including anything they ate outside the house if the household is found to have eaten outside. Mostly food eaten at the household level is used for DDS ICMR (2012). Thirteen food groups were used based on the existing FAO questionnaire sheet for Dietary Diversity Score. The food groups included *Cereals, pulse and legumes, Leafy vegetable, root and tubers, other vegetables, Nuts and oil seeds, Condiments and spices, Fish and other sea foods, Meat and poultry, Milk and milk products, Fat and edible oils, lastly Sugar*. HDDS is designed to reflect average household dietary diversity among all members of the household. *The total numbers of food group consumed by the household values from 1-13 and will be either "0" or "1"*. Based on the 13 food groups. A score of one was given to each household that consumed a specific food group while a household that did not consume a specific food group was given zero. Individual household scores were aggregated into DDS before the mean HDDS was generated. This gives a valid picture of the dietary diversity at the community level only. Though individual and household level were calculated.

3.6.2 Semi Structured Interviews

The research employed a semi structured interview to find out the socio economic factors influencing the dietary diversity of smallholder cashew farmers. This form was on the second sheet of the DDS questionnaires. Farmers were selected through purposive sampling procedure. Selection of farmers was done by researcher through farmer's lists provided by the local leaders on the same people interviewed under the DDS. Individual's smallholder cashew farmers were interview in the households. The randomization reduced the biasness associated with purposive sampling where the researcher base selection on his own judgement. The researcher asked both close and open questions from respondents to get in depth information. The reasons for semi structure interviews was that it gives room for questions to be asked in different ways but some are also in standard way. Farmers were made to rank the socio economic factors that affect dietary diversity amongst them. Cashew farmers were further asked to name the consumption trends before cashew production and after cashew production. They were asked food crops produced and consumed respectively. These questions were asked to know either introduction of cashew has impact on farmer's diversity. Smallholder cashew farmers were asked the number of cashew nuts obtained in the previous season. Some farmers were reluctant to give information on proceeds of farm produce with the fear of another person knowing how best or poor he/she is doing in the farming business. Upon probing, the right figures were given freely due to the team interpersonal relation and how closed researcher with the farming community. Smallholder cashew farmers were further probed to know the percentage of the share value of income that goes into food purchase

3.6.3 Key Informant

A lead farmer in the community was selected in consultation with the district agriculture extension officer as the key informant. This informant has an array of expertise and has been in the cashew industry since 1999 prior before cashew development project initiated by the Ghana Government. Series of questions such as eaten pattern of smallholder cashew farmers, socio economic factors influencing farmer's dietary intake and perception of farmers on the food security situation in cashew production area was posed to the lead farmer for his opinion. A key informant interview was conducted to obtain vital information about the community and other issues which could not be obtained during semi structure interview.



PLATE 1: SNAP SHOT TAKEN AFTER INTERVIEW WITH KEY INFORMANT

Source: Author, 2019

3.6.4 Observation

Observation was employed as method of data collection. Personal observation was conducted alongside the interviews and FGD with a check list prepared by the researcher. The observation was done on the types of food crops produced and consumed in the community. This was done to give the researcher a better understanding, the behaviours and major activities done in the community.

Participant observation also enables the researcher to collect both quantitative and qualitative data. There was some personal interaction with the community folks to understand why certain types of food crops were grown.

3.6.5 Focus Group Discussion

A focus group discussion was carried out by the researcher aided by the trained research assistants. This was done to ease the recording of discussions during FGD. Check list guide was used for the discussion for two times after all respondents had been interviewed. The participants in FGDs were a mix of people including opinion leaders and lead farmers who were randomly picked among those interviewed in the study. They comprised of 3 male and 3 female. This was done to elicit qualitative data that gave an in-depth understanding and provided complementary information to the quantitative findings. During FGD ranking was employed afterwards to obtain records of preferred food crops grown and consumed at the community.

TABLE 3: SUMMARY OF SOURCES OF INFORMATION

Main questions	Sub questions	Methods used to get answers to the questions
What is the influence of cashew production on dietary diversity amongst smallholder farmers in Jaman north district?	How is the household dietary diversity score of smallholder cashew farmers in Jaman north district?	FAO HDDS questionnaire sheet 22 respondents (16 men and 6 Female)
	What are the socio economic factors that influence dietary diversity amongst smallholder cashew farmers?	Semi structured interviews 22 (16 men and 6 female) Focus group Discussions 3 men, 6 female 1 Key informant (male)
	What food crops were previously produced and consumed by smallholder cashew farmers?	Semi structured interviews/Focus group Discussions
	What food crops were previously produced and consumed by smallholder cashew farmers?	Semi structured interviews/Focus group Discussions
	What food crops were previously produced and consumed by smallholder cashew farmers?	Semi structured interviews/Focus group Discussions, Observation Key informant
	How much cashew nut was sold by smallholder cashew farmers in the previous season?	Semi structured interviews/Focus group Discussions
	What percentage of the income from sales of cashew goes into household food purchase?	Semi structured interviews/Focus group Discussions, Key informant

3.7 Analysis of Data

Descriptive narrative was used for the analysis of the research. The data collected from respondents was arranged in themes (age, gender, farm size etc.). Qualitative and quantitative data were generated from the semi structure interview and survey questionnaire.

Household Dietary Diversity Score was computerised through the calculation formulae developed by FAO. Editing and coding were done by the researcher before data entry. DDS was calculated by summing the number of food groups consumed in the household by respondents over the 24-hour recall period. The HDDS variable is calculated for each household. The value ranges from 0-13. Data were entered and analyzed using spreadsheet, percentages, table and graphs. Dietary diversity of 13 food groups which includes cereals, root and tubers vitamins A rich vegetable, flesh meat, pulses, milk and milk products, Oils and fats sweets and sugars, condiments and spices. Dietary diversity was then categorized as follows: - consumption of foods from ≤ 3 food groups was considered as low dietary diversity; consumption of foods from 4-5 food groups as medium dietary diversity, while consumption of food items from ≥ 6 food groups in 24 hours recall period was considered as high dietary diversity (FAO, 2007: Savy et al., 2005).

All other variables were also analysed by categorizing them into socio economic factors that influence the dietary intake of smallholder cashew farmers in the study area such as education, income and household head. Both production and consumption trends before and after cashew production were analysed.

The percentage of households that consumed plant foods rich in Vitamin A during the last 24-hour recall was calculated by the following formula.

A number of HH/Individuals that consumed vitamin A rich vegetables and tubers or dark leafy vegetables or vitamin A rich fruits/a total number of respondents expressed in percentage.

3.8. Ethical Consideration

In qualitative research, many ethical issues are likely to crop up. Sensitive issues and other cultural norms and traditions on taboo days were observed together with the farmers, without working against such sacred days. These norms are highly valuable in the rural settings of the research jurisdiction. As a researcher, there was the need to get an informant who briefed the team on such ethical considerations for smooth collaboration and communications with the elders and the people of the community (Eide, 2008). All information given by the respondents was treated confidentially because they knew each other. Researcher and team members were aware of the impact of the questioning on the participants, in order to decrease harmful effects on human subjects, the “reflexive approach” is recommended (Clarke, 2006).

3.9. Reliability, Validity and Triangulation

Triangulation is a method used by qualitative researchers to check and establish validity in the studies by analysing a research question from multiple perspectives to arrive at consistency across data sources or approaches. Through the period of the study focus group discussion, key informant discussion and semi structure questionnaires were all used as means of cross checking data obtained from respondents. The inconsistencies used of mixed designs should not be seen as weakening the evidence. The use of mix methods was to ascertain the reliability and validity of the data generated at the community. Multiple approaches to research are the best practical way of ensuring that the tool basket of techniques is utilised to capture different dimensions of the same phenomenon (Bryman, 2007). However, the sampled size were not total representation of smallholder cashew farmers in the community.

3.10 Limitation

At a point in the research, the researcher was down with severe malaria and had to break few days to seek for medication which slows down the work at the community since the researcher needed to be part of every event to acquit him with responses that were generated from the respondents. The data taken was not done solely by myself. There were three additional personnels who assisted me and it could in a way limit the data generated from the respondents. This limitations notwithstanding, do not undermine the findings of the study but should be considered as gaps for further literature contributions.

CHAPTER FOUR: RESULTS AND FINDINGS

This chapter looks at the general findings of the research.

4.1 Educational level and sex ratio of smallholder cashew farmers

Results from the research show that out of 22 people interviewed, 12 of them were found to have no education. It was further revealed that 3 of them had secondary education which comprises both (junior and senior secondary). Five (5) out of 22 respondents had post-secondary education thus tertiary and 2 had middle school education table 4. The results indicated that those with no educational background, 8 of them were male and 4 were female This shows that illiteracy rate for male was high compared to the female counterparts. However, for those people with post-secondary education 4 of them were female and 1 was male. From figure 3 the results revealed that the greatest number of smallholder farmers involved in cashew production in Jaman north district were male made of 73% with the female representing 27% figure 3.

TABLE 4: EDUCATION AND DEMOGRAPHIC CHARACTERISTICS OF SMALLHOLDER CASHEW FARMERS IN JEMERA COMMUNITY JAMAN NORTH DISTRICT

Education Level	Total Respondents	Percentages of Respondents (%)	Male	Female
No Education	12	55	8	4
Secondary	3	14	2	1
Post-Secondary	5	22	4	1
Middle School	2	9	2	0
	22	100	16	6

Source: (Esiape, 2019)

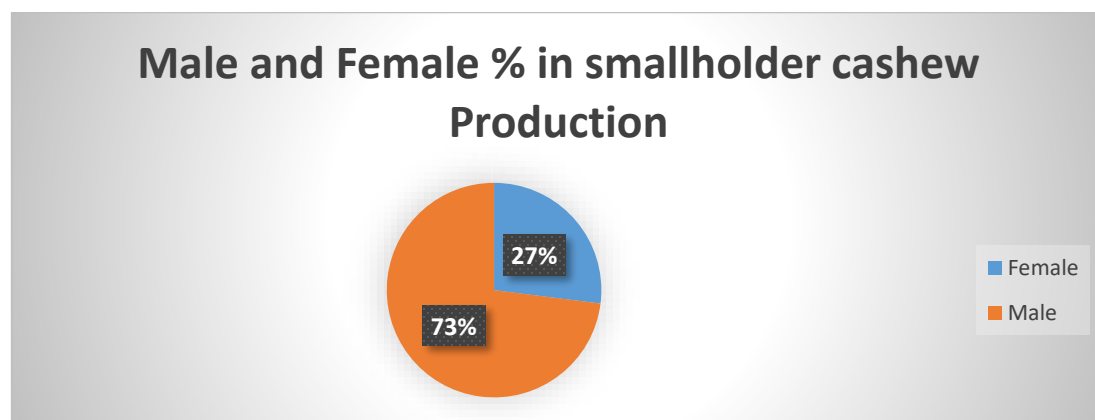


FIGURE 3:PERCENTAGE OF MALE AND FEMALE IN CASHEW PRODUCTION

Source- Semi structured interviewed (Esiape, 2019)

4.2: Farm size and relationship between DDS of smallholder cashew farmers in Jaman north district

The results indicated that the highest farm size was 8-10 acreages. With a total number of farmers sampled, 10 of them have farm size of 8-10 and 7 had 6-8 acreages table 5.

Results revealed that the majority of farm size for smallholder cashew farmers fall within 6-10 respectively with more of the farmers in the age group of 40-60 plus table 5.

The yield obtained from the result indicated that unit area of cashew production in 2018 farming season had the best yield compared to 2019 July season when the research was conducted. When asked why the poor yield was obtained respondent # 15 *"said last yield was good"*. In 2018, we had good rains and sunshine throughout flowering initiation and development hence the yield was better. *"I had a yield of 6 max bags from one acre and my wife also had 6.5bags from her field. But in 2019 rain was very poor we had a lot of "flowering abortion and kernel development was very bad."* The harvested nut had plenty immature kernels as a result of bad weather. This might have affected yield obtained during the period of data collection.

HDDS calculated for an individual household in table 5 indicates that 12 farmers had 0.32, 6 farmers had 0.36 and two of the smallholder farmers also had 0.23 and 0.27 respectively. Household Dietary Diversity is used to for community only. However, it could be used for IDDS.

Results obtained for the IDDS could not be correlated for the farm sized per unit area harvested for cashew nuts. This is because with 22 farmers sampled for the calculation of IDDS the results were far below 1 and therefore indicate low diversity for the individual's household. The aggregate HDDS for the study area was 7.2 table 6. During the focus group discussion farmers interviewed indicated that cashew nut revenue has made a changed in their life because most of their children are in private schools and others in the universities said by an opinion leader. Through the analysis of the Household Dietary Diversity Score, it was further revealed that individual household score was not given much indicators as proxy measured of being eaten enough micronutrient. But the community aggregate for the Households signifies that the community has some level of diversity in the food intake. The poor harvest obtained from Raw Cashew Nuts harvested in the year 2019 farming season prior to the data collection could have also accounted for low dietary diversity recorded for the individual households. On the whole farmers were seen haven enough to eat at the household level. The poor kernel development of raw cahew nuts might have affected individuals dietary score among smallholder cashew farmers. With poor harvest returns from the nut will be low and might not be able to get enough cash to reflect in the diversity of food group purchase.

TABLE 5: THE RELATION BETWEEN FARM SIZE AND IHDDS OF SMALLHOLDER CASHEW FARMERS IN JEMERA AT JAMAN NORTH DISTRICT

Age Group	Average Farm size	No of respondents	RCN Yield for 2018 season	RCN Yield of 2019 season	IHDDS	Frequency of IHDDS
30-39	2- 4	2	22	7	0.23	2
40-49	4-6	3	34	23	0.27	2
50-59	6-8	7	46	21	0.32	12
60-69	8-10	10	57	23	0.36	6
						22

Source-Field data (Esiape, 2019)

4.2 Factors Affecting Dietary Diversity and responses from respondents

Out of 22 people sampled from the list of dietary diversity score, it was found out that education, household head and income influence dietary intake of smallholder cashew farmers to some extent in Jamera a community in Jaman north district of Ghana table 6. The research revealed that 95% of the smallholder cashew farmers agreed that education strongly plays a key major role in the type of food taken by the households with only 5% indicating that, education does not play any role in the dietary diversity of smallholder cashew farmers diet. It was also revealed that education helps to balance the diet in the household through training received on nutrition.

Upon the research conducted, 59% of smallholder cashew farmer's households indicated that diet taken at the household is been influenced by the family head and 41 % indicated that, preparation of food eaten at household does not solely depend on the family heads (*Head of the household*). Some have the perception that consensus is build based on the preference of individuals in the household. However, the following responses were gathered from some of the farmers interviewed.

Respondent # 12 "Household head do not decide for the entire family but individuals decide what to prepared" Respondent # 7 " indicated that there is a general consensus between household on the type of food to consumed". "Mostly the heads decide but at the peak of the cashew season members in the household have enough funds to buy food for themselves."

Results gathered from the farmers indicated that cashew is a cash crop to them and its income is seasonal. Smallholder cashew farmers indicated that income has influence on the choice of food group eaten at the households table 6.

From the result, eighty-two percent (82%) of the households visited confirmed that income plays significant role in the dietary diversity of smallholder cashew farmers, whiles 18% also think that income generated from cashew production does not play any role in their diet table 6.

Farmers interviewed has this to say. Respondent # 8 and 10 *“During cashew season diet changes because we get money to buy whatever food that is preferred”. “Mode of eating changes when financial status increases”*.

Respondent # 3 revealed that, the standard of living increases during the peak of cashew harvesting. On the other hand, few famers have this to say. Respondent # 4 *“ income has no control on the diet taken but we eat what will prevent us from diseases”*. Respondent # 2 interviewed at the community also indicated that *“income does not affect the dietary diversity in the household”* table 6.

TABLE 6: SOCIO ECONOMIC FACTORS AFFECTING DIETARY DIVERSITY OF SMALLHOLDER CASHEW FARMERS

Factors affecting DD	No. of farmers responding (Yes) with reasons	Percentages	No. of farmers responding no with reasons	Percentages
Education	21	95%	1	5%
Household head	9	41%	13	59%
Income	18	82%	4	18%

Source- Semi structured interviewed (Esiapa, 2019).

4.3 Dietary diversity of smallholder cashew farmers in Jaman North District

The mean dietary diversity score of smallholder cashew farmers was 7.2 at table 7. HDDS value ranges from (0-13) is represented by yes or no, denoted by “1” or “0” on the HDD questionnaire sheet.

Food groups of 13 used in the research indicate common traditional food consumed by the small holder cashew farmers at each household level. Upon the result, it was noticed that Vitamin A rich vegetable, Vitamin A rich fruits and milk products were less taken by the household table 7. Other food groups were taken in large numbers by each household visited. Six food groups including cereals, white tubers and roots, dark green vegetables, fish (dried & fresh) oils & fats, condiments & spices are amongst the major food groups taken by household in the community. However, the following food groups such as flesh meats, eggs, (legumes nuts seeds) and sweets (honey & sugars) were next to the six food groups consumed by the small cashew farmers in Jaman North District table 7.

4.4 Percentage of the household that consumed Vitamin A rich vegetables or fruits

From table 7, households who consumed Vitamin A rich vegetables or fruits within the study area is less than 50%. Smallholder cashew farmer’s intake of essential food nutrients for healthy body maintenance is absolutely lower than other food groups indicated in table 7. Per estimation, only 4.5% out of the smallholder cashew farmers consumed food groups such as Vitamin A rich vegetables and fruits table 6 reference to the calculation formulae.

TABLE 7: DIETARY DIVERSITY SCORES OF SMALLHOLDER CASHEW FARMERS IN JAMAN NORTH DISTRICT

			Calculation of Dietary Diversity Score																								
(code)	Food group	Examples	Yes=1, No=0	Yes=1, No=1	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, No=1	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Yes=1, N=0	Sum (1-13)	IDD for each food Group
1	Cereals	rice, banku, millet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	1
2	Vitamin A Rich vegetables and Tubers	carrots, other local Vit. A rich vegetables eg. egg pepper	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.09
3	White tubers and roots	yam, cassava	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	21	0.95	
4	Dark green leafy vegetables & other vegetables	Ayoyo, cocoyam leaves, spaniach	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	0.95	
5	Vitamins & A rich fruits	mango	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0.09	
6	Flesh meats	beef	1	1	1	0	0	1	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	1	10	0.45	
7	Eggs	eggs	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	0	0	1	0	0	1	0	7	0.32	
8	Fish (dried & fresh)	Tuna	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	19	0.86	
9	Legumes, nuts and seeds	cowpea beans,groundnut	1	0	0	1	1	1	0	0	1	1	0	0	0	1	1	1	0	1	0	1	0	1	12	0.55	
10	Milk and milk products	Milk,	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	3	0.14		
11	oils and fats	frytol oil,	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	19	0.86	
12	Sweets (Honey and sugars)	Sugar, honey	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	3	0.14	
13	Spices, condiments beverages	Magic, Tea etc	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17	0.77	
	IDDs	Sum (13 food Group)/Total No HH	7	5	6	6	7	8	7	7	7	7	7	7	9	8	8	5	7	8	8	9	8	158	7.2		
	IDDs		0.32	0.23	0.27	0.27	0.32	0.36	0.32	0.32	0.32	0.32	0.32	0.32	0.41	0.36	0.36	0.23	0.32	0.36	0.36	0.41	0.36	7.2	HDDS		
IDDs	Individual Dietarty Diversity Score																										
HDDS	Household Dietary Diversity Score																										

Source-2019: Author modifies food group by FAO, 2011.

Reference to table 7.

Percentage of the household that consumed Vitamin A rich vegetables or fruits =

$$\frac{\text{No of Household with code 2, or 5}}{\text{Total No. of Households (22)}} \times 100$$

4.5 Categorisation of food group consumed into Low, Medium and High

The results indicated that household consumed food group made up of 1. cereal, 2. white tubers and roots, 3. dark green leafy vegetables, 4. oils and fats, 5. spices condiments and beverages. These food groups are highly consumed by the smallholder cashew farmers. Food group greater than or equal to (≥ 6) is considered the highest dietary diversity by FAO. Results indicate that all smallholder cashew farmer's dietary intake does not exceed 6 food groups and hence attest to the fact that smallholder cashew farmers have less dietary intake table 8. Whenever the food group consume is less or equal to (≤ 3) it indicates low dietary diversity. However, food group between 4 and 5 indicates medium dietary intake. The number of food group that fall under (4-5) category includes eggs, legumes, fresh meat, fish and sweets table 8. It was further revealed that medium food group consumed by smallholder farmers were associated with protein based food while little attention was paid to food group which help in maintenance of the immune system and general body systems such as fruits and vitamins table 8.

TABLE 8: FOOD GROUP CONSUMED ≥ 50 % OF HOUSEHOLDS IN JMAN NORTH DISTRICT

13 Food groups arranged and coded in numbers refer to table 7.	Lowest dietary diversity (≤ 3)	Medium dietary diversity (4-5 food groups)	Highest dietary diversity ($6 \geq$)
2,7 1	Vitamin A Rich vegetables and Tubers	Eggs	Cereal
5,9,3	Vitamins & A rich fruit	Legumes, nuts and seeds	White tubers and roots
10, 12,4	Milk and milk products	Sweets (Honey and sugars)	Dark green leafy vegetables & other vegetables
6,		Fresh meat	
8		Fish & seafood (dried & fresh)	
11			oils and fats
13			Spices, condiments beverages

4.6 Production and consumption trends of smallholder cashew farmers in Jamera Jaman North District

Table 9 provides a summary of the production and consumption trends of smallholder cashew farmers. Results obtained from the respondents showed similar food groups eaten by the households. At the focus group discussion, scoring was done and results obtained by the farmers are indicated in table 9. The result indicates that food eaten by households signifies culturally acceptable food preferred by the households in the community. During the research period, it was revealed that staple crops produced and consumed after and before cashew production do not differ significantly from

each other especially yam and cassava. The average grain yield for maize recorded during the research was 6.5 max bag at 100kg before cashew and after cashew it was 8 bags @ 100kg table 9. When asked in the focus group discussion why maize crops were produced some farmers indicated that, it was produced as a security to get income pending the harvest of other food crops and cashew nut. Farmers indicated yam, cassava, maize, tomatoes and pepper as the usual crops produced while major food groups eaten mostly are from the starchy staples examples are cassava, yam and maize. From focus group discussions it was revealed that though groundnuts could be found in farmer's field it is usually not considered as frequent crops produced by smallholder cashew farmers. Generally, crops produce helps to support the major cash crop during the season. it was further revealed that income generated from vegetables after cashew production such as tomatoes, pepper, egg plants was used in hiring labour for the management of cashew farms.

TABLE 9: CROP PRODUCTION AND CONSUMPTION TREND OF SMALLHOLDER CASHW FARMERS

<i>Crop produce before cashew production</i>	<i>Types of Crops produced after cashew production</i>	<i>Type of Food Consumed before cashew production (local diets).</i>	<i>Consumption type after cashew production (Local diets).</i>	<i>An average yield of maize grains obtained before cashew production</i>	<i>An average yield of maize grains obtained after cashew production</i>
Yam, cassava, maize, groundnut, pepper	Yam, cassava, maize, groundnut tomatoes, pepper, Egg plant	Ampesi, fufu, Konkote, banku	Ampesi, fufu, Konkote banku	6.5 max bag @ 100kg	8 max bags @ 100kg

Source- Field data (Esiape, 2019).

4.7 The value of income from cashew, its utilization and average cereal yield obtained (maize)

The results conducted indicates that smallholder cashew farmers used accrued income from cashew for food in the household. However, most farmers produce other food crops to supplement what is spend on food. Through focus group discussion and semi structured interviews it came to light that only 30% of their income was used for food consumption as a result of primary food production embarked on by individual households.

It was further revealed that apart from food, income generated from cashew production by smallholder cashew farmers are used for catering children school fees and settling bills of the household especially hospital bills and building projects. Through focus group discussions and responses from the lead farmers, it was further found out that cashew production improved the general standard of living of farmers in the community however, there were opinions which suggest that expansion of the cashew farms has the tendency of affecting food security since majority of the farm lands are into cashew cultivation.

The result indicated that indigenous farmers are no longer selling their lands out but preferred share cropping to avoid total extinction of family lands in the hands of outsiders who have the purchasing power to afford vast track of cashew production.

Apparently, farmers in Ghana considered cashew as a gold mine for most smallholder farmers. In the FGD it was revealed that people have invested much in the cashew industry and its returns remarkable improves the wellbeing of many farmers.

CHAPTER FIVE: DISCUSSIONS

Chapter 5 discuss and synthesised the empirical data presented in chapter four and compare with existing literature. This is done by extracting key themes from chapter four in line with the objectives of the study and discussed as follows.

5.1 Gender of smallholder cashew farmers

The analysis of the results shown that more men are involved in cashew cultivation than women. The research is consistent with the results obtained by (CASSA, 2002; Wongnaa 2013) which indicates that cashew farmers are mostly owned by men. However, in the research, it was revealed that smallholder women also engaged in the cashew production of which the income accrued is used to compliment the household diet taken since women are much concern with the nutrition of the family.

5.2 Socio economic factors affecting dietary diversity of smallholder cashew farmers

Education and malnutrition in most rural society are associated with inadequate educational level. Smallholder cashew farmers have high illiteracy rate as indicated in the result section of the socio economic factors affecting dietary diversity table 6. Income level of farmers greatly influences dietary diversity of smallholder cashew farmers. This results confirmed with De Irala (2000) which indicates that low income groups consumed unbalanced diets and have low intakes of fruits and vegetables. Education and income determine food choices which can affect behavior of farmers to lead to the rate of specific food group taken at the households. The analysis shows that socio economic factors impact positively on the dietary diversity among smallholder cashew farmers in Jaman north district of Ghana. This result is interpreted to mean that smallholder cashew farmers access to income through sales of cashew informed the decision taken by most of the heads in the choice of diet taken. In agreement with other studies, low income household purchase fewer fruits and vegetables and fewer healthy foods compared with higher income households (Andreyewa et al., 2012; Mancino et al., 2018).

5.3 Dietary diversity of the smallholder cashew farmer in the Jaman north district

Due to the necessity associated with various food group consumed in the study area, it is imperative to understand the dynamics related to farmer's dietary diversity. The study conducted by Legwegoh and Hovorka (2013) found in Botswana that, people consumed more cereals, sugar and honey, beans which confirms the study conducted in Jemera a community in Jaman north of Ghana in Brong Ahafo Region. With the exception of fruits and vitamin and milk and milk products taken in less quantity, all other food groups were known to be taken in large quantities. In this research, the HHDS average was 7.2, a result that differs from the ones found by De Cock et al. (2013) in Limpopo province, South Africa. They reported that the households had an average HDDS of 4.5, However, what the HDDS

means in terms of public health is not clear, since there are no specific cut points (Swindale and Bilinky 2006; Mimirian et al 2006).

5.4 Farm size and yield of cashew for smallholder farmers in Jaman north district

The research conducted indicates that smallholder cashew farmer has average cashew farm land ranges between 6 to 10 acreages, with the highest percentage representing 45% for (8 to 10 acreage). The research, however, observed that almost each smallholder cashew farmer has other food crops which supplement what is purchased outside the households.

The food produced by smallholder cashew farmers helps in improving the diverse food groups obtained from other sources by the farmers. It was further revealed that smallholder cashew farmers were getting low yield far below the potential yield per acreage (MOFA, 2015).

The low yield of cashew could be attributed to poor management of cashew plantation since most cashew farmers have other food crops producing at the same period of the cashew season limiting management of cashew farms for high productivity. According to a farmer interviewed the low yield of the cashew nuts was as a result of poor weather affecting the formation of kernel development (Respondent # 15, 2019).

5.5 Income generation from cashew

The survey revealed that smallholder cashew farmers generate income from the sales of cashew nuts. Although raw cashew nuts harvested is not comparable to the potential yield, farmers are able to make changes in their life and standard of living of cashew farmers was improved. The improved wellbeing could be attributed to the income obtained from the cashew which also affects the household's dietary diversity to some extent. The study by French et al (2019) augments work done which states that household with lower income has been associated with poorer quality diet. This finding is consistent with evidence obtained indicating that income improved quality of dietary diversity at the household's level of cashew farmers. Conversely, diversifying farming food crops helps to improved diet diversity in development world (Jones et al., 2014; Shibhatu et al.,2015).

5.6 Production and consumption trends of various food groups

Focus group discussion of smallholder cashew farmers conducted showed that type of food crop produced before and after cashew production did not show any major significant differences in yam and cassava. The major staple crops produced after the cashew remain same for yam, cassava but slightly changes in maize with differences showing in vegetable crops. Maize, cassava, and yam are the major staples which form a component part of smallholder cashew farmers diet.

Changes in yield for maize grains could be due to the application of fertilization as a result of the increase in income from the cashew nuts. Some farmers interviewed has vegetables associated with the major staples produced after the introduction of the cashew. The reasons according to the farmers were that vegetable has high nutrient component which could improve the life of the family. It was

further revealed that small holder farmers generate income to supplement the consumption of food in households. This research is in agreement with Sibhatu et al. (2015) which indicates that resource-poor farmers diversify their sources of food and income as a risk-coping strategy.

Key informant interviewed revealed that over the expansion of cashew farms is likely to cause food insecurity but this results contrast with Lisa, (2016) which study indicated that increasing cashew cultivation is not the leading cause of food insecurity.

The socio economic factors such as education, income, head of the family were seen as one of the contributing element which affects the consumption of food eaten at the household level. The analysis showed that smallholder farmers with diverse crop production were not positively associated with dietary diversity. This scenario could have been due to some socio economic factors that affect food intake which is in agreement with studies conducted by Codjoe (2016) which showed that higher education is associated with better employment and higher incomes and might translate into purchasing power for effective nutrition.

5.7 REFLECTION REPORT

Taken a sober reflection and retrospection of the research, it came to light that applied research has been a lot of experiences to me. The reflection process is important in education because it leads to deeper learning and helps to create new knowledge through critical thinking. It began with the mini research with a team of five, one male and a female at Rheden municipality on the perception of citizens on SDGs practiced in the municipality. Basically working in research teams, always bring a source of joy since a lot is learnt with people of diverse backgrounds with great life experiences.

My role as a researcher impacted positively on the design and strategy that was used for the field work. It was further noticed that at a point in literature review I needed to be flexible to understand the content of the topic and focus on the study. As a researcher, I needed to be problem solver and all challenges met was dealt in a very professional manner. Designing research with emphasis on smallholder cashew farmers needed a tool that will help measure the adequacy of nutrient intake and other food groups consumed hence, the thought of using FAO dietary diversity questionnaire which serves as a proxy indicator of nutrient intake and access to quality food.

Using purposive sampling techniques was an ideal way of getting my target group without leaving any of them to chance. Farmers were purposively selected per the list generated from the community and it worked out just as planned in the proposal. The FAO dietary diversity is the most current indicator for measuring Household Dietary Diversity Score and even Women Dietary Diversity as well as Individual Dietary Diversity Score. Per rigorous search for other alternative measures for such testing, it came to light that World Food Programme also depended on such tools for dietary score measured

in most Africa and other developing nations. During the research period the researcher employed mixed of techniques such as semi structured interviews, focus group discussion, key informant in order to triangulate the sources of information. This helped researcher, in making critical deductions from the data and also to informed the decisions during reasoning and analysis. This served as a source of validation and reliability for smooth operationalisation of the research work.

It is known that learning is based on the theory of observation and scientific study and hence one may suggest that people construct their own knowledge, understanding and knowledge of the universe when dealing with research work. The research revealed that life experiences and reflection of what is done on the field has the propensity to create own knowledge to contribute to the literature.

At the field, there was the need to adjust many ways of doing things to make the team very comfortable of administering questionnaires and this created a nice rapport between research assistants and myself. This makes me appreciate how researcher needs to be flexible in carrying out research without comprising the interest of himself.

The kind of encouragement received from the MOD coordinator of VHL during the period when all students were out for field data was a source of motivation to me as a researcher. I picked my hand set and saw inscription, we are aware you are currently on your thesis work, keep focus and work hard. This alone made me to realised that we were not alone and that tutors were always thinking about how best student keep focus and come out with credible data sources. The researcher at the community was not in any way influenced by the department workers. Conducting research far away from my area of jurisdiction though in the same organisation did not compromise the research work. As a researcher, I opted not to use any officials in the unit as a key informant as a result of they been able to influence the answers that will be expecting from the respondent. Hence decided to use a lead farmer and well experienced elite farmer who could be in the position to response to all questions posed. The only biggest challenged had was issue of internet connectivity which was not reliable. I also understood that analysis of qualitative research was based on critical and system thinking approaches. Kim (2003) indicates that positivism asses the physical world and social events that can be studied and examined.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

This chapter highlights the conclusion and recommendation of the study as drawn from the findings and discussions that came up from the research. The observations made by the researcher throughout the study have also been incorporated.

6.1 Conclusions

The purpose of the research is to investigate the underlying causes of dietary diversity amongst smallholder cashew farmers in Jaman North District in Ghana. The main question of the research was: What is the influence of cashew production on dietary diversity amongst smallholder farmers in Jaman north district? To get answers to this questions, sub questions were constructed to enable researcher find answers to the main questions which finally addressed the objectives of the research. The sub questions are as follows.

1. How is the household dietary diversity score of smallholder cashew farmers in Jaman north district?
2. What are the socio economic factors that influence dietary diversity amongst smallholder cashew farmers?
3. What food crops were previously produced and consumed by smallholder cashew farmers?
4. What food crops do smallholder cashew farmers produce and consume now?
5. How much cashew nut was sold by smallholder cashew farmers in the previous season?
6. What percentage of the income from sales of cashew goes into household food purchase?

It is being concluded that, though smallholder cashew farmers diversified the diet taken it does not fall within the highest dietary diversity ≥ 6 propounded by FAO with food group categorisation into low, medium and high for households. However, the aggregate Household Dietary Diversity Score for the community was 7.2 which is of higher side compared to the study conducted by other scientists. The overall HDDS for individuals smallholder cashew farmers was far below 1.

Thirteen (13) food group study shows that smallholder cashew farmers in Jemera community diet intake do not exceed 6 for households food groups.

It is concluded that the dietary diversity in the community was medium based on food group categorisation. This probably was due to socio economic factors numerated earlier in discussions such as income, education and head of the family.

The underlying social and economic problems present in low-income populations might have accounted for that. Again the study concluded that besides the socio economic factors affecting dietary diversity, smallholder cashew farmer's decision of paying children school fees, carrying out

building project and extra bill in the households could be one of the eminent factors that affected the households Dietary Diversity.

The study concluded that farmers with higher income from the sale of cashew as hypothesised by the study does not always ensure higher dietary diversity. Socio economic factors come to play to determine household food intake. The factors influencing the choice of diet are not only based upon individual preferences but are constrained by social, cultural and economic.

Through the study it came to light that income was not the major mechanism associated with dietary diversity. Oyarzun et al. (2013), and Powell (2012) all suggest that relationship is driven by direct contribution to dietary diversity through home consumption rather than through an effect of income as hypothesised in the research since only 30 % of the cashew income was spent on food.

The major staples produced and consumed before and after cashew production by the smallholder cashew farmers were cassava, yam and maize with few vegetable productions grown alongside. The food eaten was not significantly different before and after cashew production. It is therefore concluded that the socio acceptable food consumed by a household could remain the same or change irrespective of the socio status of the person especially income and education or other factors.

Through focus group discussions and interviews held it came to light that smallholders cashew farmers spent about 30% of income generated from cashew for food purchased. This means that the rest of the percentage left goes into other needs such as children education and footing bills of the household which was pointed out clearly in both focus group discussions.

6.2 Recommendations

The following recommendations would be some of the appropriate strategies for the improvement of smallholder cashew farmers dietary diversity in the Jaman North District.

The department could considered the integration of private partnership in developing irrigation schemes for smallholder farmers to use during the lean season to continue to produce high value vegetable food crops to enhance nutritious status of farmers.

The department of Agriculture to consider how to liase with other stakeholders in the health sector to build strong coordination to enhance the training of smallholder cashew farmers the importance and effects of poor nutrition to the human body.

Cashew farmers need to be trained in intensive crop production in the cashew fields 3 to 4 years before the buildup of canopies and tree branches. This will ensure that crops of diverse food groups are in cooperated in the farms along the alleys of the cashew plant. Cashew as a cash crop is planted far apart at a distance of 10 m X 10 m which could accommodate food crops for example, yellow maize, beans and **Orange Fresh Sweet Potato** which is a precursor of beta carotene for healthy nutrition.

6.2.1 Recommendation for further research

There may be the need to conduct further investigation on the impact of dietary diversity of smallholder cashew farmer's children on anthropometric factors such as (wasting and stunting) of children under five years.

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APPENDIX: 1