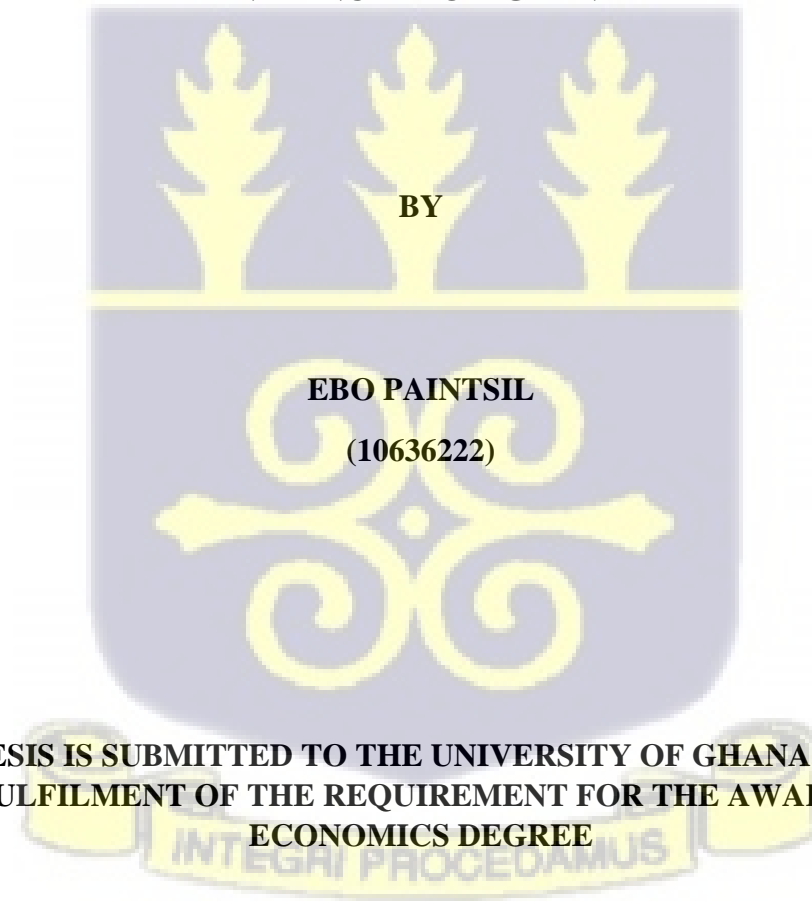


**UNIVERSITY OF GHANA  
COLLEGE OF HUMANITIES**

**DETERMINANTS OF RURAL FARMING HOUSEHOLD SUSTAINABILITY:**

**EVIDENCE FROM GHANA**



**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MPhil  
ECONOMICS DEGREE**

**DEPARTMENT OF ECONOMICS**

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## DECLARATION

This is to certify that this thesis is the result of research undertaken by **EBO PAINTSIL** towards the award of the Master of Philosophy (MPhil) degree in the Department of Economics, University of Ghana and that no part of it has been presented for another degree in this university or elsewhere.

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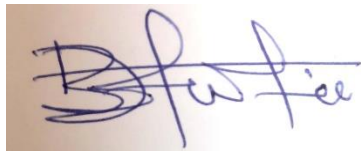
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## ABSTRACT

Sustainability has become essential in all aspects of our modern world. With unbiased consideration of social, economic and environmental components of sustainability, the concept has become important in finding long term solutions to global problems. Sustainability of policies is critical in ensuring that policies have their desired long-term goals. In Ghana, rural farming households make a significant portion of the total population. It is therefore important to have accurate knowledge of the factors that mostly affect the sustainability of rural farming households to ensure that policies targeted at improving living conditions for this group produce positive long-term effects. The purpose of this research is to investigate the factors that are important in determining the sustainability of rural farming households in Ghana. Using a cross-sectional analysis, this research analyzed data from the Ghana Living Standards Survey published in 2018 to create indices for sustainability and identify the factors that contributes to sustainability. This research found that, involvement in trade and ownership of farmland are key determinants of rural household sustainability in Ghana. Thus, in making policies concerning rural farming households, there should be focus on enabling rural household to acquire farmlands. Creation of facilities to ensure that farmers are able to trade farm produce is also an important factor to consider in policy making. Further studies are needed to use panel analysis of data from the Ghana Living Standards Survey to determine how sustainability of rural farming households in Ghana have changed in recent times.

**Keywords: Rural farming, Social Sustainability, Economic Sustainability, Environmental Sustainability**

## **DEDICATION**

This study is solely dedicated to my mother, Georgina Atwsie Ama Laryea for her tremendous support for me through trying times.

## **ACKNOWLEDGEMENT**

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## LIST OF ABBREVIATIONS

AMSEC	Agricultural Mechanization Services Centre
BOG	Bank of Ghana
CAADP	Comprehensive Africa Agricultural Development Programme
CCT	Condition Cash Transfer
DFID	Department for International Development
ECOWAS	Economic Community of West African States
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agricultural Organization
FASDEP	Food and Agricultural Sector Policy Development
FSN	Food Security Nutrition
GBRP	Ghana Broiler Revitalization Project
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GSFP	Ghana School Feeding Programme
GSGDA	Ghana Shared Growth and Development Agenda
LBC	Licensed Buying Companies
LEAP	Livelihood Empowerment Against Poverty
MAFAP	Monitoring and Analyzing Food and Agricultural Policy
MDG	Millennium Development Goals
METASIP	Medium Term Agricultural Sector Development Plan

MOFA	Ministry of Food and Agriculture
MRTS	Marginal Rate of Technical Substitution
NAFCO	National Food Buffer Stock Company
NHIS	National Health Insurance Scheme
NSPS	National Social Protection Strategy
SDG	Sustainable Development Goals
TRS	Technical Rate of Transformation

## **CHAPTER ONE**

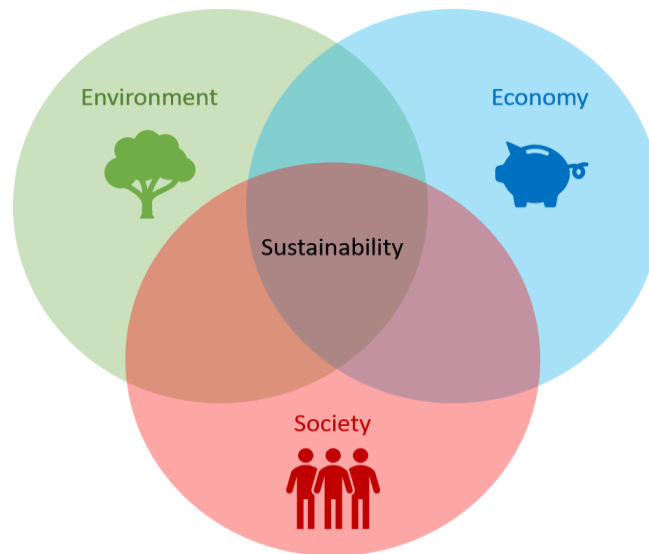
### **INTRODUCTION**

#### **1.1 Background of the Study**

Neuman and Churchill (2015) defined sustainability as processes whose stock are at least maintained over time given the surrounding ability to support that process. Also, Brundtland (1987) defines sustainable development as development that meets the necessities of the present generation without compromising the ability of succeeding generations to meet their . As indicated by Munasinghe and Shearer (1995) although sustainable development originated over four decades ago, global enthusiasm for the subject was re-ignited in 1987 by the Brundtland Commission.

In recent years, considerable interest has been shown by governments and organizations to ensure that future generations are not adversely affected by the attempt to provide for current generations. This can be confirmed by the implementation of the Sustainable Development Goals (SDG) which has been signed by 193 countries including Ghana. Thus, sustainability in this context refers to the capability of a household to provide continuously the basic needs of the household without depleting available resources. The subject of sustainability is crucial in maintaining the continuity of the human race. With topics, such as climate change and global warming becoming more and more widespread, it is important that all aspect of human civilization contribute to the sustainability of our world. The subject of sustainability is most important at this time because future generations would suffer if we fail to achieve sustainability.

Sustainability is considered in three main dimensions. These are the economic, social and environmental dimensions. According to Todorov and Marinova, (2009), these dimensions of sustainability are represented as pillars interacting with each other as presented in Figure 1.1 “The representation of sustainability as three overlapping circles makes clear the importance of the intersection between the three dimensions” (Marinova & McGrath, 2005).



**Figure 1.1: Illustration of the Dimensions of Sustainability**

Source: (Marinova & McGrath, 2005)

In view of this, it is notable that any attempt to ensure sustainability at any level requires an effort in relevant factors under all the three dimensions. Due to the interdependence of the three dimensions of sustainability, it is relevant to simultaneously address all three if sustainability is to be achieved. It is therefore important to identify the relevant factors in all three dimensions of sustainability in order to make a good measure of the subject.

Although sustainability is a subject for all, there is the interest to focus more on groups that have shown a degree of vulnerability. Vulnerability is conventionally treated likewise to notions of risk, need, susceptibility to neglect or harm, or lacking durability or capability. Sectors of the population that have less education, lack basic social amenities, earn relatively less income and are mostly involved in subsistence farming can be classified as vulnerable (Mechanic & Tanner, 2007). According to the World development report (2008, pg72), “Agriculture is a major source of livelihoods for people in developing countries, but rural areas are a large harbor of poverty”. The World development report (2008, pg72) also recommended that is a clear path for rural households to move out of poverty.

Thus, even though sectors of the population in rural areas indulge in agriculture as the major source of income, they still lag behind in terms of being able to provide all their basic needs. According to the GLSS7, 76% of rural household are actively involved in agriculture. Despite this statistic, poverty still remains high and hence such households are not sustainable. According to Soltani et al. (2012) poverty and sustainability are highly and positively correlated. By this, it is safe to say the poverty in rural farming households demonstrate low sustainability of the households. Sub-Saharan Africa has not been exempted from this phenomenon as indicated by Diao, Hazell, and Thurlow, (2010). They asserted that even in highly industrialized economies of Europe and America agriculture plays a major role in development, but the same cannot be said about sub-Saharan Africa.

In relation to rural farming households, Robert (2004) indicated that, generally the contribution of agriculture in production and employment is on the decline globally. That is, labor, dedication and profitability for rural agriculture is declining significantly year after year. Whilst in developed countries, technology has made up for the shift in labor from agriculture to other sectors such as services and industry. However, the same cannot be said about a developing country like Ghana.

In Ghana, agriculture's contribution to gross domestic product (GDP) has been on the decline since the year 2013. According to the Ghana Statistical Service, agriculture's contribution to GDP declined from 45.38% in 2013 to 40.65% in 2017. This could be an indication that the agricultural sector which is mainly based on rural farming households is not encountering challenges which need to be identified and properly addressed. For this reason, there is a need to investigate the characteristics of rural farming households in Ghana to acquire understanding for more tailored policies in aid the growth of these households.

With sustainability considerations increasingly becoming a major issue, it is important to identify the factors that influence agriculture, especially in Africa (Sultan & Schrofer, 2008). Studies such as Palmer (2012) and Polèse & Stren (2000) have focused on urban sustainability and these two are part of a significant number of researches related to urban sustainability relative to rural sustainability. In Ghana, about 45.32% of the population lives in rural areas of which a significant proportion are farmers (Dumenu & Obeng, 2016). It is therefore important that a study be conducted to provide insight into the sustainability of rural farming households and the factors that influence them in order to make more productive policies and programs that will positively affect these households. In spite of the numerous efforts in addressing global and regional sustainability,

efforts in creating globally accepted rural sustainability indicators especially, at the microeconomic level is not encouraging (Dillard et al., 2008).

Aside mineral mining, deforestation and industrial waste disposal, little can be said about regional community-based sustainability indicators. One would expect that measures or standards for regional sustainability would be readily available and applicable to most parts of the world. On the contrary, regional and community based sustainability measures does not have adequate reproducible data, standards and indicators for measurement(Hayati et al., 2010). Most community based assessments of rural sustainability are project based and focuses on pollution caused by industrial plants, traditional agriculture or resource extraction (Lopez, 1997). With evidence on high rate of agriculture in rural households and the contribution of agriculture to the GDP of Ghana, it is important to identify the factors that affect the sustainability of rural farming households. Such a study would inform policy makers in Ghana on the appropriate measures and strategies to improve sustainability of rural farming households. The major challenge, however, is that, sustainability indices has not focused on the sustainability of rural farming households in Ghana.

Implementation of the sustainable development agenda requires knowledge on the factors that impacts sustainability at the household level. Unfortunately, not more is known about the factor that ensures sustainability in rural farming households. There is therefore the need for internationally recognized standards and indicators for assessing sustainability of rural farming household. For developing countries, especially Ghana it is more important because of the unsustainable production and consumption patterns. Furthermore, households are more rural in nature and therefore efforts at achieving sustainability should focus on them. In Ghana, factors such as the gender and education of rural household head, number of children, farm yield or

income, non-farm income and crop failure are presumed to affect rural household poverty (Al-Hassan & Poulton, 2009)

With respect to this paper, it is essential to identify the actual factors that affect the sustainability of rural farming households. That is, what are the factors that would maintain the sustainability of the rural farming household?

## **1.2 Problem Statement**

It is important that rural farming households are able to provide for all their basic needs without hindering the next generation's ability to do same. Poverty however stands in the way of this essential role of households. According to Handa et al. (2013) recent policy orientations have had its background from the insignificance of the progress made in solving deep rooted problems confronting developing countries even after several decades of policy reforms. The entrenched problems facing developing countries indicated here is essentially poverty related.

Several research papers such as Hayati et al., 2010 and Gómez-Limón and Gabriela, 2009 have focused on using indices that aggregates all the three dimensions of sustainability in analysis. Although these researches have produced excellent results that have supported policy decisions, it is important to disaggregate the dimensions of sustainability. The reason for this is that by disaggregating the dimensions of sustainability, we can essentially focus on the factors that affects each dimension of sustainability. This would help Ghana to make customized policy decision in tackling issues of sustainability in Ghana

In respect to poverty, Ghana has been no exception to the case of sub-Saharan Africa. Although poverty has been reduced over the years, the rate of reduction has not reached the expected levels

planned. In many cases, the benefits of poverty reduction policies fade quickly and leaves the poor a “short distance” away from where the policies picked them off.

This assertion is confirmed by the conclusion drawn by Besley (2006) that indicated that, “in Ghana and Uganda, the gains from economic policy reforms appear to be shorter-lived; the bulk of the population and in particular the poor remain in agricultural and low-return nonagricultural self-employment activities.”

In view of the above problem, it is important to shift focus from poverty reduction to sustainability policies and programs. Foli (2016) indicated that, sustainability policies might address a broader concept of poverty and might be more forthcoming than the regular poverty alleviation programs such as the Livelihood Empowerment against Poverty (LEAP).

Following Foli (2016) there has been the need for a shift of focus from poverty-oriented policies to sustainability-oriented policies. These researches mainly focus on drawing conclusion based on sustainability studies to provide policy makers more empirical factors and indicators to work with.

According to Marsden (2003) the nature of rural farming and its constitution to the development of rural areas demonstrates that farming is at a cross roads of both academic and policy making circle for over a decade. That is, conditions and factors that affects the nature and role of farming to a nation’s GDP still needs more empirical evidence for any conclusions to be drawn. According to him, rural sustainability overlaps across rural areas and affect change in dual ways. With the existence of such a phenomenon, it is important that a local study is organized to identify the nature and dynamisms of rural farming household in Ghana and the policies that would lead the development of rural farming households.

Again, according to Li et al. (2013, p.3) “generally, rural farming decline is not exclusive to China and it is also a global issue. Since the 1950s, rural populations have fallen in the developed countries such as the US and Sweden as well as in the developing countries such as those in Sub-Saharan Africa.” With such recent studies indicating the fall in rural farming in Ghana, it becomes imperative of researches of this subject to conduct studies that would enable policy makers to make informed policies to Ghana out of the global fall in the in rural farming. This study seeks to contribute to that subject.

Unfortunately, very little is known about the factors that influences sustainability at the household level. It is for this reason that this study becomes relevant

### **1.3 Research Objectives.**

In an emerging economy as what we have in Ghana, it is important that policies and government decisions are made with adequate and accurate information on the nature of our problems. It is therefore important that adequate research is conducted at the micro economic level in order to be well informed about the factors that affect sustainability in rural farming households. It is evident that not much research has been conducted in relation to what factors affect the sustainability of rural farming households the most and as such, this paper seeks to shed more light on this topic.

Knowledge on the nature and characteristics of the factors that contribute to the sustainability of farming households would add to the existing research and contribute its quota to better policies.

The specific objectives of the research are

The overall objective of the study is to examine the factors that influence the sustainability of farmers at the household level. The specific objectives are to:

1. Identify the factors that influence the sustainability of rural farming households in Ghana.
2. Investigate the factors that contributes to social sustainability in rural farming households
3. Examine the determinants of environmental sustainability in rural farming households.

#### **1.4 Research Questions**

The study would answer the questions:

1. What are the factors that contribute to economic sustainability in rural farming households?
2. What are the factors that contribute to social sustainability in rural farming households?
3. What are the factors that contribute to environmental sustainability in rural farming households?

#### **1.5 Significance of the Study**

Considering the global focus on sustainability in recent years, it is important to attempt to resolve the lack of adequate research conducted on sustainability of farming households and the microeconomic factors that actually contribute to it. Most researchers interested in researching around the topic have focused on aggregating the dimensions of sustainability. As indicated by the previously mentioned studies that are Li et al, (2018) and Marsden, (2003), it has become important that countries conduct studies that disaggregates the dimensions of sustainability and reveal the nature and conditions under which rural farming thrives.

Especially in Ghana, studies on farming household sustainability and livelihood are rather rare in the face of the fact that poverty does not necessarily translate to unsustainable households. This prompted my desire to conduct a research on this topic in an attempt to throw more light on the topic. In sub-Saharan Africa and Ghana especially, macroeconomic policies have benefited little to the poorer sections of the population. This study would help governments and policy makers to be more informed on the variables to target in order to improve the sustainability and welfare of households

### **1.6 Organization of the Study**

This study is organized into 5 chapters. Chapter one discusses the introduction, research problem, objectives and significance of the study. Chapter two discusses the overview of rural agricultural farming in Ghana. This is followed by a review of relevant theoretical and empirical literature in Chapter three. Chapter four discusses the methodology, the type of data use, presentation and discussions of empirical results. The summary, conclusion and policy recommendations are discussed in Chapter five.

## CHAPTER TWO

# OVERVIEW OF RURAL AGRICULTURE FARM HOUSEHOLDS IN GHANA

### 2.1 The Socio-Economic Context of Farming in Ghana

The republic of Ghana is located between Latitude “4o 44’N and 11o 11’N; and Longitude 3 o 11’ W and 1o 11’E”. Ghana has a land area of about 23,884,245 hectares with a 550-kilometer-long coastline. Ghana has recently added 6 more regions to its original 10 administrative regions and a total of 254 districts with its population reaching 28.83 million in 2017. As a middle-income country in West Africa, Ghana has experienced significant economic growth from 2005 to 2012 (Dzanku & Aidam, 2013). This high growth has however slowed since 2013 mostly because of macro-economic challenges which include high budget deficit, corruption and inflation (Martey et al., 2012). The economic growth of the country is however expected to hover above the zero-line due to the country’s relatively stable democratic institutions as well as its resources (mostly natural).

The country’s per capita GDP reached US\$ 1,786 in 2017, and simultaneously, the Human Development Index continued to improve as access to quality health care and education also improved, ensuring that Ghana become one of the few countries with a ‘medium human development’ in Sub Saharan Africa (Martey et al., 2012).

Ghana impressively reduced extreme poverty from 36.5 percent to 18.2 percent between 1991 and 2006, making it the best record in sub-Saharan Africa at the time. The country has also achieved the Millennium Development Goal of halving poverty as well as hunger before the years 2015 (MDG1). That notwithstanding, it’s still worth knowing that over 25 percent of the entire

population remains beneath the poverty line of US\$ 1.25/day, which is particularly heightened in the three main Northern regions of Ghana (based on the 10-region era).

Agriculture is an important sector of Ghanaian economy, contributing 18.3 percent to the national GDP in 2017. Although the percentage contribution of agricultural activities to the Ghanaian GDP has been falling since 2009, its nominal value has however sturdily increased since 2007. Thus, this key sector has grown impressively since 2007, taking a boost from rising international prices, especially for the country's main agricultural exports such as cocoa. Even in the light of such growth, Ghanaian agriculture still remains predominantly subsistence-based and rain-fed, with century-old technology used in the production of about 75 percent of total output (Nyantakyi-Frimpong & Bezner Kerr, 2015).

Agriculture in Ghana provides employment for about 29.27% of the country's labor (Plecher, 2020). Cocoa, yam, cassava, maize and banana as well as few small ranges of fruits and cereals are the country's major staple and cash crops. Coconut, oil palm and cotton are also essential cash crops for the country. Rural small-scale cultivation of staple and cash crops has risen over the last decade although under productivity still remains a challenge. The country is a serial importer of a variety of agriculture commodities, bringing in predominantly ready products such as sugar, wheat, poultry and rice (Martey et al., 2012). (Pernechele et al., 2018) summarizes that despite the overall increase in public expenditure to farmers in Ghana, expenditure on research and knowledge dissemination are general declining or outright stagnant. This has led to downward trend of both staple and cash crop production in Ghana.

## 2.2 Agricultural Objectives of the Government

Brooks (2013, p.3) states that “Ghana’s government over the years has adopted and implemented several agricultural policies and programs with the overall objective of stimulating agricultural growth and enhancing food security”. Other researches such as Appiah, 2018) have outline key objectives of the government of Ghana in addressing the state and nature of farming in the country.

Similar to the findings of Pernechele et al. (2018) and Angelucci et al. (2014) which assets that, the government of Ghana has clear intentions of aiding farmers in the country to become more sustainable. However, these studies jointly show that the various government have at best under achieved in implementing these objectives. The “Ghana Shared Growth and Development Agenda” (GSGDA 2010-2013) had a key objective of developing major sectors of the economy which includes the agriculture sector. One of the key objectives of the (GSGDA 2010-2013) was to modernize agricultural production. Also, the GSGDA social policies focused on human capital development in education, health and poverty reduction. The “Ministry of Food and Agriculture’s” (MOFA’s) official Vision Statement is to “modernized agriculture culminating in a structurally transformed economy and evident in food security, employment opportunities and reduced poverty”. With MOFA’s official vision to improve food security by modernizing agriculture, it becomes important to highlight that in the year 2018, the Ghana Statistical Service reported a domestic production of farm produce valued at GHc 4.4 billion. This represents an 8% increase from the year 2017. Thus, with a sturdy implementation of MOFA’s vision, farm produce and hence revenue is likely to rise.

In line with the Ministry's vision, all governmental policies, plans and frameworks prioritize agricultural research and extension, and infrastructure development as the principal focus areas to attain higher productivity and hence better livelihoods. According to the FAO's 2015 fact sheet of Ghana, the approach used by the government in its policy is intended to agree with modern market trends and envisions high involvement of the actively ready private sector. "The modernization of agriculture and increased productivity of Ghanaian farmers" is one of the key objectives stated in the Food and Agriculture Sector Development Policy (FASDEP II, 2007). When the productivity of a farmer is increased, there are a few trickle-down effects. Thus when policy objectives leads to higher farm productivity, income increases and leads to a more sustainable farming household (Appiah, 2018).

The "Medium Term Agriculture Sector Investment Plan" (METASIP 2010-2015) is the policy framework of FASDEP II which consists of six (6) frameworks that encapsulates the objectives of the Ghanaian government. The major investment areas under the METASIP, 2010-2015 is Increased Growth in Incomes, Food Security and Emergency Preparedness. Once again, with focus on agriculture and farming, governmental objectives has aimed at growth in incomes of farmers and food security. Dumenu and Obeng (2016) in their research on rural communities in Ghana suggested that (METASIP 2010-2015) has aided in improving the economic conditions of rural farmers.

"The National Social Protection Strategy" (NSPS, 2008), implemented in 2009, seeks to bring to action the aim of the government to the creation and inclusion of an empowered socio-economic citizenship by providing sustainable livelihood systems for the support of the vulnerable minority. The major aim is to provide the household necessities of the extremely poor sections of the

population through active social protection programs and improvement of the accessibility of livelihood opportunities (Al-Hassan & Poulton, 2009).

### **2.3 Key Agricultural Policy Decisions**

The Government of Ghana considers the development of the agriculture sector as an important priority. Development of agriculture produce and its export has been the main focus of agriculture policies since 2007 with emphasis on the modernization of agriculture and targeting minimum input prices for farmers (Appiah, 2018). Programs implemented by the Ministry of Food and Agriculture (MOFA) on a nationwide scale include the Fertilizer Subsidy Programme, Agricultural Mechanization Centers, the Irrigation Development Programme and the Block Farming Programme. Estimates indicate that expenditure on these frameworks and policies put together constitute 85% of MOFA's total budget (Al-Hassan & Poulton, 2009).

In Ghana, policy decisions on farming has been a talking point of politicians even during campaign election. With a large section of the Ghanaian population being directly and indirectly associated with farming, it is not surprising that farming policies are usually on the forefront of campaign rallies in Ghana. Such policies have been the "One Village, One Dam" policies which was and is still widely talked about by current government which is the New Patriotic Party. This policy has been with the intent of providing adequate water for both domestic and agricultural purposes. According to Kyei-Baafour et al. (2020) water is not a substitutable input in farming and hence its availability in beneficiary villages has led to an increase in general economic wellbeing of inhabitants.

After about two decades of governmental silence on large-scale agriculture, the government intervened with the fertilizer production and import. A nationwide “Fertilizer Subsidy Programme” was launched in the third quarter of 2008, as a mid-term measure to the volatile price fluctuations of fertilizer and food domestically. The main objective of the programme was to enhance the use of fertilizer application across the entire variety of farmers, which at the time was one of the lowest globally. According to Al-Hassan and Poulton (2009) instead of abolishing the programme after the price crisis ended, as the plan was initially, the government increased its commitment to the programme. Its budget more than quadrupled starting at US\$ 10.7 million in 2007 to US\$ 62 million in 2013. The price subsidy was however dropped to 21% by the end 2013, because of the rise in fertilizer prices and constraints of the nation budget. Sadly, fertilizer application by farmers in Ghana has remained low despite the implementation of the input subsidy programme (Akudugu et al., 2012).

Due to the low level of agricultural mechanization in Ghana, the government intervened with the implementation of the “Agriculture Mechanization Services Enterprises Centre’s” (AMSECs) policy framework in 2008 as a facility for the provision of funds which aimed at aiding qualified and vetted private sector individuals in acquiring modern agriculture equipment at a reduced cost and credit repayment rate which is then hired to small-scale farmers at relatively lower costs This programme has since been expanded such that, as of 2016, eighty nine (89) AMSECs have been completed and commenced across the country. Assessment on the feasibility of AMSEC shows that they have not operated profitably enough for private investors, despite the currently high capital budget (Nyantakyi-Frimpong & Bezner Kerr, 2015). The provision of high subsidies on large and heavily priced farm machinery has not proven to be a viable solution in a nation with

predominantly rural farmers. To complement the AMSECs is the “Block Farm Programme,” which the government established in 2008 as a part of the “Youth in Agriculture Programme” to make available huge consignment of fertile grounds for the cultivation of carefully chosen agro products, so as to provide the youth in rural areas with profitable employment. The selected beneficiaries received a bundle of subsidized modernized inputs and services, as well as the provision of extension services, which are paid by the farmers as a portion of the harvest.

The “National Food Buffer Stock Company” (NAFCO) set up in 2010, had the main objective of reducing the proportion of agricultural commodities lost after harvest, resulting in stable prices and establishing emergency agro-food reserves. As a state owned entity, NAFCO acquires, sells and stores surplus agro-commodities in warehouses throughout the nation. Islam (2016) indicated that there are currently seventy-three (73) Licensed Buying Companies (LBCs) which have the mandate to buy maize, soya beans and rice from farmers at minimum prices, which are legally enforced to include the actual cost of production and an extra 9% profit small-holder farmers. In the first quarter of 2014, there were rumors that the government sought to privatize NAFCO because of the enterprise’s financial limitations and unavailability of warehouses in most regions. This hindered the general productivity of the enterprise’s activities. Information from MOFA indicate that, the government is opening up for partnership to ease constrains on its finances. Assessment of the effectiveness of NAFCO shows that the positive sum gain envisioned at its establishment and commencement through more stable prices, post-harvest commodity loss reduction, lower retailing prices and higher profitability for farmers have not been achieved, despite substantial capital investments (Nyantakyi-Frimpong & Bezner Kerr, 2015).

Provision of funds to rural smallholder farmers is characterized by a number of limiting conditions. One limiting factor that stands out the most is the lack of collateral security be it property or stable employment status. Recently, there has been marginal improvements in the proportion of agricultural loan to small and medium scale farmers in the commercial banking institutions, increasing from 4.5% in 2007 to 6.2% percent in 2010 (MAFAP, 2014). There are several reasons for the low levels of agricultural investments and these include a continuous default on loans which are already heavily subsidized, risks of inconsistent weather patterns, land tenure problems, and a low level of technical know-how on risk assessment and management. To improve the access of agricultural credit, the government several decades back had established the Agricultural Development Bank specifically in 1965, with particularly low loan rates to small, medium and large-scale farmers alike.

Typically, high default rates have resulted in a sharp fall in the overall portion of loan to farmers with a record low of 29 percent in 2010. In as much as there has been a rise in the national number of leasing institutions in the beginning of the 21<sup>st</sup> century, agriculture still sums up to under a percent of the total leasing value (Sarpong & Anyidoho, 2012). Plans are currently being implemented to increase access to funds for agriculture in Ghana. Ghana launched a “Collateral Registry” the early months of 2011, which is heavily supported by the Bank of Ghana (BOG) and also puts prices relatively low to beneficiaries. The entity is implemented to make available adequate details about “borrowers’ assets that are registered as collateral” with the aim of facilitating credit access as well as permitting financial entities to “recover assets from defaulters and place them on sale without having to go to court.”

With respect to the Ghana Shared Growth and Development Agenda (GSGDA 2010 - 2013), the nation's socio-economic programme has aimed at credit supply policies to enhance education and health, as well as reduce and possibly achieve the grand aim of alleviating poverty. Resulting from these giant steps, the socio-economic welfare of many have improved by the end of 2014. The improvement in income and social livelihood has resulted in an increase in the real per capita income as well as in the Food Security and Nutrition (FSN) indicators (Islam, 2016).

The Livelihood Empowerment Against Poverty (LEAP) programme was launched in 2008 as a Conditional Cash Transfer (CCT) programme, with the aim of ensuring the availability of funds and heavily subsidized health care to vulnerable and poorer individuals. Eligibility for this programme is strictly dependent on the financial state of a household as well as having a member of the household falling under at three selected demographic conditions.

The beneficiaries of the LEAP programme received a funding of US\$4 to US\$ 8 twice in every month with the mandatory enrollment in the "National Health Insurance Scheme" (NHIS), which was set up in 2005. Fifty percent of the LEAP programme is funded by government, and the other 50 percent comes from donations from the Department for International Development (DFID) and a credit facility from the World Bank. LEAP is the key programme of the "National Social Protection Strategy" (NSPS), covering a tremendous 71,000 households throughout Ghana in 2013. The annual LEAP expenditure is approximately US\$ 20 million (de Groot & Unicef, 2016). Impact assessments demonstrate an increase in food security and higher enrolment for basic education for LEAP beneficiaries and also over 85% of them had enrollment in the NHIS.

However, the generally low value of the cash transfers and unstable payment patterns has prevented the programme from having any impact on food and non-food consumption across the nation. Also, most demographic coverage of leap beneficiaries are usually rural areas as stated above. This means that rural farming households benefit from this policy and adds to their annual and monthly incomes. How this affects them is demonstrated in Peprah et al., 2017). According to their research in the rural areas of the Ashanti Region of Ghana, the LEAP programme has led to an increase in the productive assets of a rural farming households. This translates to higher economic income and social status of LEAP beneficiaries.

Trade is an important component of economic policy in Ghana's development agenda, with the government targeting agricultural exports promotion. The nation's trade objectives are indicated in the 2004 Trade Policy (Dzanku & Aidam, 2013). The trade guidelines have however been changed in accordance with the vision of the government's attainment of middle-income by 2015 as well as becoming the leader in agriculture industrialization in Africa. However, the government of Ghana has periodically adopted somewhat protectionist measures, highlighted below.

Ghana is a one of the founding members of the Economic Community of West African States (ECOWAS), set up in 1975. The trade policies of Ghana have generally been in accordance with regional concerts. Ghana has however occasionally breached the policy on free duty imports of products from ECOWAS nations by applying a variety of taxes and levies on importations. For instance, in 2014, the country implemented the ban of rice imports and only permitting import through o the Takoradi and Tema Ports and only the airport.

This measure was to enhance the collection of duties, taxes and tariffs on rice importation. However, MOFA indicates that the policy is currently under review due to external pressures. In addition, the launch of the “Ghana Broiler Revitalization Project” (GBRP) in 2014, has regulated and restricted the importation of meat products as a protectionist measure for the production of broilers locally. In May, 2008, there was governmental change to the Customs and Excise Act to do away with various charges on the importation of yellow maize, wheat, rice and vegetable oil with the aim of cushioning the impact of spiking food prices on the local consumer (Foli, 2016). The duties were however reinstated in the first quarter of 2010 at the initially rate of 20 percent.

The Ghana Export Promotion Authority (GEPA), set up in the late 1960s, and the Ghana Export Trade Information Centre (GETIC), set up in 2004, are the two major companies providing necessary details on trade and policy information to the business enterprises. This information include facilitation on market access for export companies, human resources development and technical advice. A National Export Strategy for the Non-Traditional Export Sector” and a National Export Development Programme provide a pathway for the application of the government’s trade targets. Also, in year 2008, Ghana followed suit after Ivory Coast signed a bilateral Economic Partnership Agreement (EPA) with the European Union (EU) that has t abolished charges on most exports from Ghana to the European Union Nations and on about 80% of EU’s export to Ghana over the next 15 years.

## **2.4 Farming Systems in Ghana**

In Ghana agriculture is dominated by smallholder farmers throughout the country. The higher percentage of farm holdings are below 2 hectares in size, though a few large oil palm, rubber, coconut, rice, pineapple and maize plantations and farms exist. Traditional rural household farming is predominant and has involved the use cutlasses and hoes as the main farming tools for several decades. There are very little modernized farming methods, except for bullock farming which is practiced in places such as the Northern regions of Ghana. Agricultural production differs with respect to the amount of rainfall as well as its distribution. Soil factors which include ph, texture and nutrients, play a vital role in the agriculture yield in Ghana. Intercropping is highly associated with household farming whereas commercial and large-scale farming predominately practice monoculture.

## **2.5 The Ghanaian Climate and Soils**

Ghana's climate is typically tropical. The east coast is warm and relatively dry. The south-west coast belt is rather hot and humid, while the northern section is generally dry and hot. Ghana's annual average temperatures usually fall within 26 degrees Celsius in the coastal regions to 28.9 degrees Celsius in the northern areas. The region is usually sunny and breezy. The day temperatures could exceed 40 degrees Celsius in the northern section. Ghana has the bimodal rainfall system in the south where two rainfall seasons occur between March and July and then between September and October. On the other hand, the Northern part of Ghana has the monomodal rainfall system which occurs from July to September each year. These explain the farming seasons of Ghana which is categorized into the major and minor seasons.

In Ghana, soils usually have light textures on the surface horizons which contain loams and sandy loams. Deeper soil horizons however possess heavier textures which vary from coarse sandy loams to clays. However, some parts of the Greater Accra region have heavier textured soils especially in the valley bottoms of the Accra Plains. Coarse materials such as gravels and stones are extremely common and these concretionary materials usually bring negative effects to their physical farming properties (Henao & Baanante, 2006).

## **2.6 Importance of Farming to the Economy of Ghana**

Agriculture continues to be one of the most important economic sectors in Ghana and employs a significant portion of the country's labour force. It directly and indirectly account for a substantial proportion of the country's Gross Domestic Product (GDP) and export receipts. There is a wide variety of crop types produced in Ghana. This usually depends on the ecological area varying from the dry savanna to wet forest. The kind of agricultural crop production in the country includes cassava, timber, cocoa, yams, oil palms, oil grains, and kola nuts. Agricultural production plays a significant part in enhancing growth and the reduction of poverty in Ghana by contributing heavily to government revenue. Asuming-Brempong (2004) confirms the contribution of the Ghana's agricultural sector to its economy. An appreciable portion of this contribution is acquired through duty payments on agricultural exports especially.

The proportion of the agricultural sector's contribution to the nation's foreign exchange earnings totaled 38.5%, 35.4%, 33.9%, and 35.5% from 1999 to 2002 respectively (Asuming-Brempong (2004). These earnings were acquired by agricultural product exportation and also the conservation

of vital foreign exchange by the production of import-substituting commodities and raw materials. The sector also adds to the national and household food security. Furthermore, the agricultural sector contributes to the Ghanaian economy by making food readily available by providing a substantial portion of the entire country's food needs. Through the agricultural sector's contributions to foreign exchange earnings, Ghana is able to import the shortage in the nation's agro-production to ensure that demand is met at all times.

Furthermore, the agricultural sector aids in the alleviation of food insecurity through its job creation opportunities for a high proportion of the country's active labour force, hence ensuring that access to food is made easy through income that is earned by employment. Heather (2012) also asserted that the agricultural sector also contributes to the ecological environment through a variety of roles. It contributes to positive externalities by improving and conserving soil quality, minimizing soil erosion, restoring the fertility of the soil through plant cover, reducing atmospheric greenhouse gas through carbon sequestration and protecting catchment as well as catchment areas. It is worth knowing however that there are negative externalities from agricultural activities such as deforestation, soil erosion, flooding, soil degradation and pollution.

## **2.7 Agricultural Land Ownership by regions**

A household's location usually contributes to its decision to partake in farming activities. This stems from the facts that the necessary conditions such as the availability of land which is very important in the household's choice to indulge in the farming activities may be more easily obtained in some areas than in others. Analyses of the GLSS 7 data shows that 5,667 households

out of the total of 7,491 households surveyed are involved in farming activities. In Ghana, 1,824 households in the GLSS 7 survey disclosed that they do not own any agricultural land and that makes 24 percent of the total households surveyed. That is, the total number of households in both rural and urban areas involved in agricultural land constitutes 76 percent of the total surveyed households. The Upper East region possesses the highest number of households with ownership of agricultural land holding a significant 1,036 households making up 18.28 percent. The Northern region is followed closely by the Upper West region in agricultural land ownership with 896 and 887 households and percentages of 15.81 and 15.65 respectively. This is followed by the Western, Central, Brong Ahafo, Volta, Eastern, Ashanti, and Greater Accra regions respectively. The Greater Accra region stand out as the region with the lowest agricultural land ownership in Ghana according to the GLSS 7 survey with only 59 (1.04) households identifying to own agricultural land. This low rate of land ownership may be due to region's high population and the more competitive use of land for relatively more profitable urban development projects such as real estate development. Table 2.1 illustrates the agricultural land distribution by region in Ghana.

**Table 2.1: Agricultural Land Ownership by regions**

<b>Region</b>	<b>Frequency (No. of Households)</b>	<b>Percentage (No. of Households)</b>
Western	487	8.59
Central	483	8.52
Greater Accra	59	1.04
Volta	447	7.89
Eastern	444	7.83
Ashanti	374	6.60
Brong Ahafo	554	9.78
Northern	896	15.81
Upper East	1036	18.28
Upper West	887	15.65
<b>Total</b>	<b>5,667</b>	<b>100</b>

**Source: Computation by Author based on GLSS 7 data (2016/2017)**

## **2.8 Rural Farm Land Distribution by region**

The ecological location of households informs its decision to engage in rural farming activities. This is based on vital factors such as more available and less industrial that enable easy acquisition of land by the household. This phenomenon enables a relatively higher agriculture land ownership in rural areas than in urban areas. Data of the GLSS 7 demonstrates that 4,788 households of the 6,310 rural households surveyed actively own agricultural land making up a surprising 76 percent similar to the total for both rural and urban household combined. In rural areas, however, fewer households (i.e., 1,522) do not own agricultural land which could be as a result of a higher availability and accessibility to land. The Upper East region yet again possesses the highest number of households with ownership of rural agricultural land with an outstanding 942 households making up 19.67 percent. The Upper West follows the leader with 17.67 percent (translating to 855 households) owning rural agricultural land. The Northern region comes in third place in rural agricultural land ownership with 768 households constituting 16.04 percent. This is followed by the Western (8.73 percent), Volta (7.89 percent), Brong Ahafo (7.94 percent), Central (7.52 percent), Eastern (7.00 percent), Ashanti (6.35 percent), and Greater Accra (1.00) regions

respectively. Again, Greater Accra region is the outlier with a significantly low rural agricultural land ownership in Ghana according to the GLSS 7 survey with only 48 (1.00) households identifying to own rural agricultural land. The explanation of this low rate of land ownership may be due to region's high population and the more competitive use of land for relatively more profitable urban development projects such as real estate development. Table 2.2 illustrates the rural agricultural land distribution by region in Ghana.

**Table 2.1: Rural Farm Land ownership by region**

<b>Region</b>	<b>Frequency (No. of Households)</b>	<b>Percentage (No. of Households)</b>
Western	481	8.73
Central	360	7.52
Greater Accra	48	1.00
Volta	378	7.89
Eastern	335	7.00
Ashanti	304	6.35
Brong Ahafo	380	7.94
Northern	768	16.04
Upper East	942	19.67
Upper West	855	17.86
<b>Total</b>	<b>4,788</b>	<b>100</b>

**Source: Computed by Author based on GLSS 7 data (2016/2017)**

## 2.9 Characteristics of Rural Household Heads

The characteristics of a farming household head in terms of age, gender, and education are vital indicators of the household's livelihood or economic stand. An individual's ability to ensure a good and well-paid job relies heavily on his/her educational status. That is, highly educated households stand a better chance of higher levels of welfare status. Information from GLSS 7 shows that about 43.10 percent of heads of rural farming households have no formal education as compared to 24.29 percent of non-rural farming households. Of the rural farming household's heads with formal education, 37.3 percent had completed basic education, 8.5 percent had attained secondary education, 2.3 percent had attained some form of vocational education and 6.5 percent had attained post-secondary education. On the other hand, of the non-urban agricultural households with formally educated heads, 44.74 percent, 3.69 percent, 2.26 percent, 1.79 percent and 4.68 percent had attained basic, secondary, vocational, tertiary and formal adult education respectively. Table 2.3 shows the educational status attained by rural farming household heads compared to non-rural farming household heads by status of participation.

**Table 2.2: Educational level of rural farming and non-farming household head**

<b>Level of Education</b>	<b>Rural Farming Households Head (%)</b>	<b>Rural Non-Farming Households Head (%)</b>	<b>Total (%)</b>
No Education	43.10	24.29	40.18
Basic Education	44.74	54.28	46.23
Secondary	3.69	9.12	4.53
Vocational	2.62	6.39	3.21
Tertiary	1.17	3.38	1.59

<b>Level of Education</b>	<b>Rural Farming Households Head (%)</b>	<b>Rural Non-Farming Households Head (%)</b>	<b>Total (%)</b>
Formal Adult Education	4.68	2.05	4.27
<b>Total</b>	100	100	100

**Source: Computed by Author based on GLSS 7 data (2016/2017)**

Tripp (1990) and Sanyal (1984) conducted studies in some Sub-Saharan African countries that suggest that there are more women actively involved in agricultural activities than men. In Ghana, however, rural farming activities are predominantly male headed (Asomani-Boateng, 2002). Data from the 2016/17 Ghana Living Standards Survey (GLSS 7) shows that an appreciable proportion of rural farming households are headed by males as compared to females. Specifically, about 77.73 percent of rural farming households are male-headed while 22.27 percent are headed by females. Also, 72.0 percent of non-rural farming households are headed by males while 28.0 percent are female headed. This is illustrated in table 2.4

**Table 2.3: Distribution of rural and non-rural farming household by sex of household**

<b>Sex</b>	<b>Rural Farming Households Heads (%)</b>	<b>Non-Rural Farming Households Heads (%)</b>	<b>Total (%)</b>
Female	22.27	28.0	23.15
Male	77.73	72.0	76.85
<b>Total</b>	100	100	100

**Source: Computed by Author based on GLSS 7 data (2016/2017)**

The household heads may affect the household’s decision to indulge in rural farming activities. Studies have confirmed that rural farming is dominated by households with older heads. Such a study includes that of Dossa et al. (2011). Contrary to this, Jongwe (2014) concludes that urban agricultural households have younger heads compared to rural agricultural households. Data from GLSS 7 illustrates that the mean age of female rural farming household heads (54.38 years) is higher than the mean age of male rural farming household heads which is 48.08 years. Thus, rural farming households involved in some kind of agricultural activity have older female heads compared to male heads. This is illustrated in table 2.5 below.

**Table 2.4: Mean age of rural farming household by Sex of household head**

<b>Age</b>	<b>Mean</b>	<b>Standard Deviation</b>
Male	48.08014	15.38756
Female	54.38186	14.87752
Total	51.231	15.13254

**Source: Computation by Author based on GLSS 7 data (2016/2017)**

## CHAPTER THREE

### LITERATURE REVIEW

#### 3.1 Theoretical Review

There are quite a number of researches that look into the factors and effects of economic sustainability, social sustainability and environmental sustainability of rural settlements. A lot of the researches on economic, environmental and social sustainability focuses on the factors that affects sustainability at the household level. However, few studies provide specific community-based factors which reveal the micro underpinnings of rural farming household sustainability. Theoretical and empirical literature and evidence does not show a universal standard for measurement of rural household sustainability. However, studies exist that are similar to the interest of this study. It is important to understand sustainability in the sense of rural households to better comprehend the essence of this study.

##### 3.1.1 Economic Sustainability

In reference to both the micro and macro-economic dialog, a household's economic sustainability is usually identified as the essence of maintaining a stable income, human, man-made and social capital for the economic wellbeing of the household (Akudugu et al., 2012). This is generated from at least a non-declining economic status which we can relate to the Hicksian income. That is, in this perceptive at least, steady stock of income, human, natural, man-made and social capital are viewed as necessary and sufficient conditions of economical sustainability (Pearce & Barbier, 2000)

The issue about changing the economic sustainability debate has come to light in recent years. The main question being whether stable household's finances ensure sustainability or the focus of

sustainability should involve all the capital resources to ensure economic sustainability (Goodland & Daly, 1996). Although the focus is on household economic sustainability, this discord throws light to the basic problems that exist within households (Pearce & Barbier, 2000)

Essentially, all the debates hinge on the presumption of a good exchangeability, the availability of a standardized measurable unit such as ‘utility’ with which various programs could be assessed. This assertion originate from O’Neill (1993).

Economic advancement is viewed as a requirement for all dimensions of social developments and sustainability. Though this is to a reasonable extent this is non-factual (Palmer, 2012). While empirical evidence shows that, employment is correlated to economic growth, income distribution and sustainability does not conform to this (Albert, 2002).

Improving equality with improving growth and sustainability does not come about by mere chance. Rather it is a result of effort, intensive governmental policies and programs in concerned and resourced nations (Kuznets, 1955). That notwithstanding, by universal perspectives, conditions related to household growth as indicated by Spangenberg et al. (2002) are not well defined and accessed. Also, the only relevant parameter is growth rate.

If investigating the effects of each system and capital resource has passed the socio-economic component, to say the rate of unemployment, rather than costs related to unemployment, or furthermore the marginal effects of global climate issues beyond the environmental costs, actual substitution is difficult to comprehend. With this given, there is more interest that economists continue to strive to envision future development which they are not very familiar with. In summary, the lack of a universal concept of appropriate measurability which demonstrates the

accuracy of the economic theory as well as non-economic theory, is rather there to be seen and has been discussed on major forums such as in Ecological Economics, 1998.

However, not for just the assumption of a good measurement which creates challenges. It essentially started since exchangeability was assumed which is also pegged with various level of measurability. These assumptions implied that various concepts, with no regard to having a common indicator or numeracy, some sort of common key nature which would allow measurement on a reasonably comparable scale.

One must note that, rural households do not bear a lot of this characteristic. If specified as a criterion for comparable measurability, these concepts could instead detail a defined measure of human sustainability through utility. By this there is a need for a well-defined meaning for the concept of sustainability such as to include rural farming households. Better still universal measures are expected to be in sustainability criteria.

That notwithstanding, we understand that there is not one internationally accepted determinant, used for socio-economic sustenance, and mankind's satisfaction with the state of the global ecosystem. These issues, are vital to sustainability in terms of a universal measure and have to be scrutinized with economic theory. A specific measurement numeracy must be considered. An economic theory that insists on a good measure remains helpless when aiming to understand economical sustainability (Spangenberg et al., 2002).

### 3.1.2 Social Sustainability

A lot of literature about sustainability, especially one with the focus on the social element is by two main assumptions:

1. The progress of social sustainable development programs is determined by their essence in achieving the highest increase in the standards of living measured with the yardstick of environmental degradation. In view of this, social development and environmental sustenance are viewed as in substitution and hence the need to them as items on a bin balance (McKenzie, 2004)
2. In majority of definitions pertaining to sustainability that arise in environmental and economic perspectives, the ideology of social sustainability primarily acts essentially as a tool of discipline with which the messages of economic and environmental sustainability is promoted (McKenzie, 2004).

It's been only recently that strong attempts to define "society" as the main focus of sustainability development and research. As has been the focus of preceding passages, the interdisciplinary and integrated models of sustainability have become continually a common ground which he believes to have detrimental effects on the vulnerable such as rural households. The social pillar has been positioned in the other pillars of sustainability that vitally have the environment or economy as their main concern.

It is therefore not surprising that this has led to the desire into the elements that promotes and sustains an equitable and balanced society. As indicated, by Choi and Ng (2011) efforts to add social sciences into a model predicated by the physical sciences will not result in the true interdisciplinary positions that sustainability clearly requires. In order to address household social sustainability, it must first off be clearly defined as distinct from household economic

or environmental sustainability as much as possible for it to develop its context specific models of best practice.

Once the significant progress has been made in the definition of its context, parameters can be developed to measure the effect and extent of equitable social institutions and policies related to household economic and environmental outcomes. This will result in a truly interdisciplinary model of sustainability (McKenzie, 2004).

### **3.1.3 Environmental Sustainability**

#### **A Definition of Environmental Sustainability**

Understanding and use of the word “environmental” usually tends to be associated with the kind impacts humanity has on the environment’s support systems. This context very much distinguishes it from the word “ecological,” which can often be characterized as a concept of interdependence of elements that lies within a system. As discussed above in the essay. Goodland, (1995) suggest that an ecological definition of environmental sustainability be advanced in that it becomes in better accord with biological conservation.

Their proposition was that ecological sustainability is “meeting human needs without compromising the provisional abilities of ecosystems.” This comes off more inappropriate in the view that the general perception of the word “ecological” is that it implies a broader context than just the human activities, effects and experience. The word “environmental,” however, is often used in relation to human interaction with the ecosystem. To further enhance this precision, it thus seems reasonable to view “environmental” as a subset of the broader concept of “ecological,” that is the intersection of human activities and ecological systems (Jenks, 2000).

The simple understanding of the term “environmental sustainability” set forth in this paper essentially enhances our common perspective of household activity in order to more fully discover its essence to environmental sustainability. That is expanding the boundaries of this use of environmental sustainability to correspond to the overlay of all human activity upon the functioning of the supporting ecosystem. Environmental sustainability, then, is limited to and, as a matter of fact, become a subset of ecological sustainability.

Speaking generally, this concept of “environmental sustainability” might be viewed as creating more depth to the meaning of the most common definition of sustainable development, that is “meeting the needs of the current generation without compromising the ability of future generations to meet their needs,” by taking on the general definition “meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them,” (“Our Common Future”).

More specifically, environmental sustainability can be well defined as a condition of good balance, resilience, and interconnectedness that permits humanity to satisfy its needs and ensuring that it is neither exceeding the capacity of nature’s supporting ecosystems to continue to regenerate the provisions and services necessary to meet those needs nor by our actions diminishing biological diversity.

#### **3.1.4 Definition and Concepts of Rural Household Farming Systems**

Rural household farming is the most efficient and socially just way to increase productivity, resilience to climate change, house hold incomes generation, job creation, regeneration of land and improvements in household food security and sustainability (Actionaid, 2011). This argument is

supported by a research conducted by Tran, Tran, Tran, & Nguyen, (2018) which confirmed that most research carried on traditional and household farming in Latin America suggests that small holder systems are sustainably productive, biologically regenerative and energy efficient. Household farming also tend to be equity enhancing, participative ad socially just. This is the reason why the number of people working in agriculture production sector globally remains quite substantial (Altieri, 2000).

Rural household farming with access to a piece of land and mainly utilizes farm production and fundamentally characterized by partial engagement in markets, which are often imperfect or incomplete (Ellis et al., 2003). Rural household farmers produce not only for profit objectives but also for food for the family as well (Sadati et al., 2010).

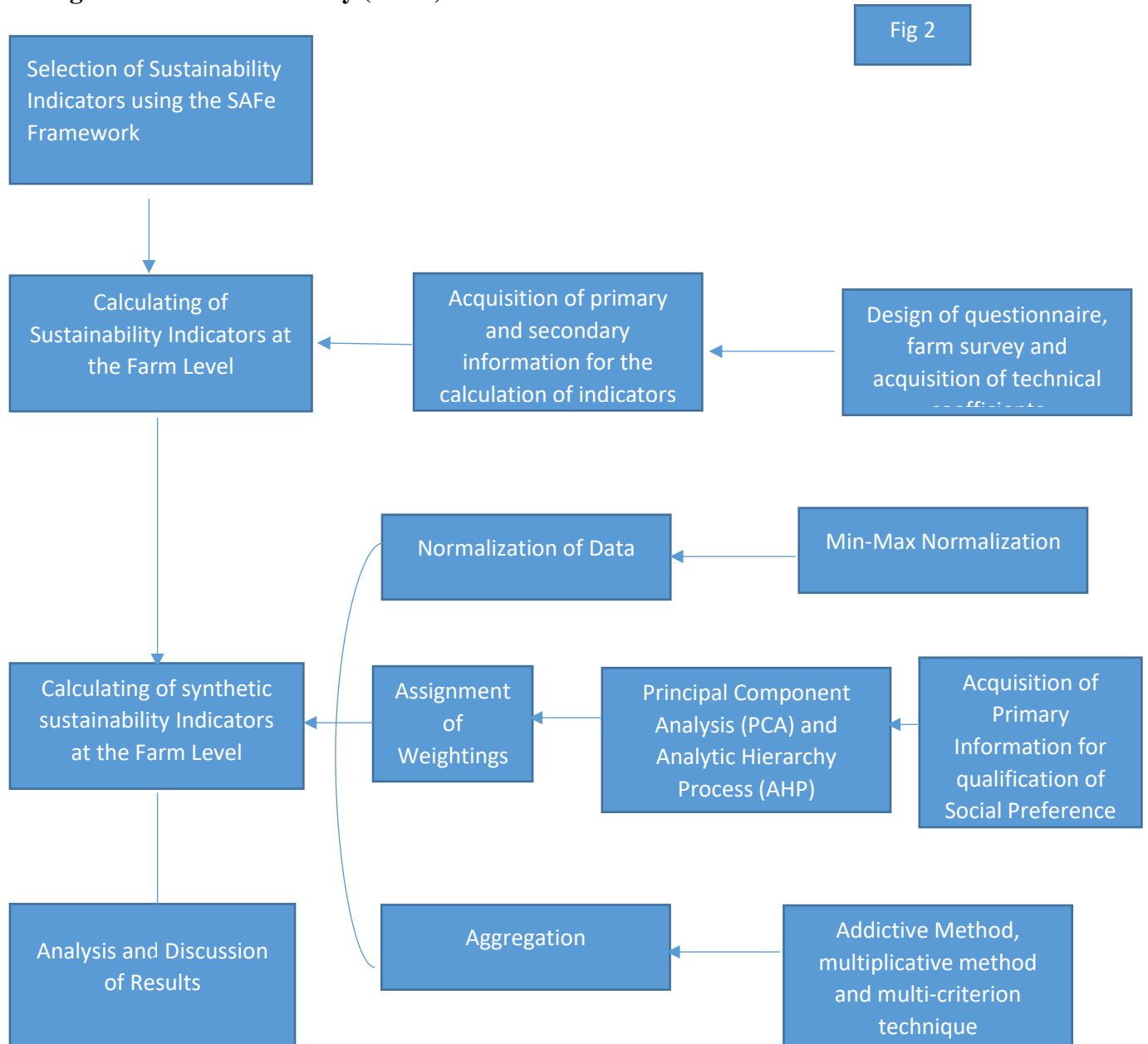
In a related study by Rosset (2000), multiple functions and benefits of small farm agriculture in the context of global trade negotiations, he defined rural household farming as family type farms, where a large part of the produce is consumes by the family. The rest are sold in the market for money to pay utility bills, school fees, medical bills and other commodities which are not produced by the family members. The study noted that capital investment in production equipment is very low since these farms mainly exist to produce crops without any aim for expansion.

Hunt (1991) identified rural household farms as both production and consumption unit where a proportion of produce is sold to meet their cash requirements, financial obligations and part is consumed by them. These units involve varieties of market and non-market tasks such as agriculture, pastoralism, fishing, crafts and gathering of fruits and fuel wood. In a similar study by Roumasset (1976), rural household farmers are described as communities rather than single individuals that retain specific cultural identities and represent the transition. This delineates the difference between peasant household farms and commercial farms.

Altieri (2002) accounted that rural household farmers are people who farm on small plots of land, usually located in marginal environments utilizing traditional and subsistence methods of farming. This system of farming mostly relies on local resources and complex cropping systems and patterns. The farmers are also considered to be smallholder agriculturalist, producing a mixture of market and subsistence crops, using a significant portion of household labour and communal social capital. Household farming is different from subsistence in that atypical subsistence farm has a range of crops and animals needed by the family to eat and clothe themselves all year around. Planting decisions are made with an eye toward what the family will need during the coming year, rather than market prices (Austen, 2001).

Similarly, Alegre (2006), argued that rural household farming is a family farm, based on food sovereignty model, prioritizes local production of food for local and national markets, negates dumping and uses sustainable production practices based on local knowledge.

**3.1.5 Scalable Analysis Framework (SAFE) for the Calculation of the Composite Indicators for Agricultural Sustainability (CIAS)**



**Figure 4.1: SAFE Framework**

Source : (Gómez-Limón & Gabriela, 2009)

### **3.1.6 Definition and Concept of Rural Agriculture**

A usual difficulty encountered with the studies on rural agriculture is the phenomenon of the non-conforming nature of its definitions. Mougeot (2000) throws more light on the fact that most author's definition of rural agriculture is only in general terms and in view of that, such studies barely use their results to provide and improvement in the rural agricultural concept and to converge its distinctiveness.

The lack of a globally accepted definition of rural agriculture makes analyses among these studies inconsistent and sometimes problematic. Also, this lack of a universally accepted definition makes the measurement of the livelihood impacts of rural agricultural undertakings empirically difficult. Efforts to clearly define rural agriculture should put into consideration the fact that, the concept should have a distinctive framework on both form and content. The author also demonstrates that rural farming is an integrated part of the local rural economy as well as its ecological system. That is, the concept of rural agriculture will contribute little to the policy and scientific fronts if this aspect is clearly analyzed and made operational. In view of this, location does not necessarily differentiate rural and urban farming (Richter et al., 1995) as cited in (Mougeot, 2000).

The integration of the ecosystem not highlighted in most definitions of the rural agricultural concept. ("Moustier (1998) - Google Scholar," n.d.) Binns and Lynch (1998, p. 5) defines urban agriculture as "an industry which is located within (intra-rural) or on the fringe (peri-rural) of a village, or town which cultivates and raises, processes and distributes a variety of food and non-food products, (re-)using largely human and material resources, products and services found in and around that rural area, and in turn supplying human and material resources, products and services largely to that area".

In the quest to define rural agriculture, some authors have compared rural and urban agriculture (Binns & Lynch, 1998). (Moustier (1998) - Google Scholar, n.d.) defines urban agriculture as one that takes place within or on city peripheries where a nonagricultural usage of local resources is real option; rural farming takes place in areas where this option is not a problem. Likewise, Mbiba (1995) describes rural agriculture as farming which takes place on land parcels which are directly or indirectly available for farming purposes.

A survey of rural agriculture concepts and definitions identified five elements which were found to be important. These are the location where the farming venture occurs, the system of farming included, the land ownership and system of land tenure of the farming, the production stages of rural farming and the scale of rural farming activities (Smit et al., 2001)

This paper uses the definition of rural agriculture similar to that of Zezza and Tasciotti (2010, p. 9) such that “rural agriculture does not necessarily depend on the location of the activity but rather the location of the household.” In relation to this study, rural agriculture is defined “as the production of agricultural goods by rural residents according to the official definition of the rural space utilized by the survey data employed in this study which is the Ghana Living Standards Survey 7 (GLSS 7”).

Such a definition is mandated since the survey data adopted in this study does not collect information of the location of the agricultural activity but instead collects information on the location of the households. This being made clear, rural agriculture here is strictly “agriculture practiced by rural residents”. Under this study, a rural agriculture household is that which has at least one inhabitant of the household is involved in an agricultural activity.

### **3.2 Empirical Review**

Empirical review essentially discusses and reviews previous research and papers on the subject of sustainability. In the proceeding paragraphs, findings on research, papers and articles related to social, economic and environmental sustainability would be considered with their authors, methodology and findings highlighted.

As discussed above, the subject of sustainability has three major dimensions that interdependently form the concept of sustainability. These dimensions sometimes referred to as pillars although unusually measured individually, together create the concept of sustainability. However, the empirical evidence of this paper would highlight research based on the three dimensions of sustainability and also report on researches where all the three dimensions were considered in a single research. It is important however to be informed that the definition and concept of sustainability used in the researches reviewed are used to suit the writer and for that matter creates a slight disparity in definitions and conclusions. I present these findings in the state they were written and in no way, consider it to be representative of sustainability in Ghana.

Research on sustainability is broad, common and usually varying by the author's definitions. Works such as Dillard et al., (2008) found that unlike the first world, social sustainability has been elusive for second and third world countries. That is, their research reached a conclusion that unlike developed countries, third world countries such majority of SSA are still socially unsustainable. This they attributed mainly to corruption.

Polèse and Stren (2000) also concluded that, in Kenya, research is inconclusive the way governmental policies affect the social sustainability of Nairobi. They also indicated that a more

democratic procedure in social sustainability policies would ensure a more productive and distributive policy by reaching the necessary aid requiring areas.

Report by the Commission on the Measurement of Economic Performance and Social Progress (2017) used GDP as an indicator for both economic and social progress. The report distinguished between the measure of current well-being and a measurement of sustainability to ascertain whether this can last over time.

Current well-being was attributed with both economic resources, such as income, and non-economic parts of the society (“what they do and what they can do, how they feel, and the natural environment they live in”). They concluded that “whether these levels of well-being can be sustained over time depends on whether stocks of capital that matter for our lives (natural, physical, human, social) are passed on to future generations.” This work is of particular interest to me in the sense that, although is socio-economic sustainability based, the essence and dependence on the environment is accounted for.

This emphasizes that sustainability if well addressed and measured must contain a significant contribution of all the three dimensions. Clover and Eriksen (2009) conducted a study in Botswana, Mozambique, South Africa and Zimbabwe. Their research focused how the colonial regime affected land tenure and distribution of the people and the people's options and capacity to acquire, adapt or mitigate to risks to their human, environmental and social rights, and what the effects of land uses have on land degradation. At the end of their research, they concluded that, most importantly the presence of skewed land ownership and resources, insecurity of human rights, and the restriction and marginalization of savanna welfare systems have persisted.

This they identified as having undermined human security and environmental integrity in the region and has as well as lead to the mounting of civil conflict and insecurity. In relation to this paper, we can see a link between land ownership and distribution on the degradation of land and hence and effect on the environment.

Palmer (2012) in their research observed that Africa's environmental research were not exactly adequate to meet its environmental challenges. While professional research efforts were proportionately small. This made it difficult to plan for environmental sustainability which at the time was becoming more and more relevant.

Furthermore, Boon et al. (2009) concluded that the works of professional researchers like (Adger & Luttrell, 2000; Lourd et al., 2007; Kotey et al., 1998; Birikorang et al., 2001) have not been able to produce significant and sufficient literature and insight for addressing issues of environmental policy implementation and assessments in Ghana.

Stiglitz, Sen, and Fitoussi (2009) in their "Report by the Commission on the Measurement of Economic Performance and Social Progress" considered social well-being and considered it as a principle that must simultaneously measure Material living standards (income, consumption and wealth), health, education, personal activities including work, political voice and governance, social connections and relationships, environment (present and future conditions) and insecurity of an economic as well as a physical nature. They indicated that whilst these indicators were essential in the measurement of social sustainability, many of them are missed by the convention income measures. They recommended that social sustainability essentially depends on people's capabilities and objective conditions.

Finally, in respect to social well-being they concluded that “steps should be taken to improve measures of people’s health, education, personal activities and environmental conditions. In particular, substantial effort should be devoted to developing and implementing robust, reliable measures of social connections, political voice, and insecurity that can be shown to predict life satisfaction”.

In the same report, the authors considered the concept of sustainability as one quite related to that in this paper. To quote the statement in the report might throw more light on the complexity of conceptualizing and measuring sustainability as one that simultaneously considers separate dimensions. Stiglitz, Sen, and Fitoussi (2009) stated that “Measuring and assessing sustainability has been a central concern of the Commission. Sustainability poses the challenge of determining if at least the current level of wellbeing can be maintained for future generations. By its very nature, sustainability involves the future and its assessment involves many assumptions and normative choices.

This is further complicated by the fact that at least some aspects of environmental sustainability (notably climate change) is affected by interactions between the socio-economic and environmental models followed by different countries. The issue is indeed complex, more complex than the already complicated issue of measuring current well-being or performance”. They recommended that “Sustainability assessment requires a well-identified dashboard of indicators.

The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying stocks”. A monetary index of sustainability has its place in such a dashboard but, under the current state of the art, it should remain essentially focused on economic aspects of sustainability. All this suggests starting with a more modest approach that is focusing the monetary aggregation on items for which reasonable valuation techniques exist, such as

physical capital, human capital and certain natural resources. In so doing, it should be possible to assess the “economic” component of sustainability, that is, whether or not countries are over-consuming their economic wealth”

### **3. 3 Summary**

The theoretical and empirical literature on sustainability is a rather broad and usually author defined. Some researchers have focused on specific dimensions of sustainability and have concluded on indicators of sustainable households and livelihoods. Other researchers who have conducted empirical work have however been inconclusive about the appropriate indicators or factors that contribute to sustainability. This has mainly been due to the absence of data or limitation of measurement and/or assessment of theoretical factors.

Khor and Hormeku (2006), argue that income is the essential factor when determining the sustainability of a region in his panel analysis of Indonesia. In a cross-sectional analysis of Ethiopian data by Habtamu (2012), land ownership was argued to be a good indicator of sustainability in rural communities. A two stage least square econometric analysis of cross-sectional data for West Bengal carried out by Khatum et al, (2012) identified age, training, higher educational level, ownership of assets and access to credit facilities as the key factors of sustainability.

This study would seek to identify the factors that affect sustainability of rural farming households in Ghana using a similar definition to that of Alberti (1996). The succeeding chapters would address the overview, methodology, analysis and conclusion of this topic consecutively.

## **CHAPTER FOUR**

### **METHODOLOGY**

#### **4.1 Introduction**

This chapter presents a systematic discussion of the methodology used in this research and the data used for its analysis. Precisely, this chapter defines rural agriculture and sheds light on the theoretical framework adopted in the study's analysis. Furthermore, the econometric specifications used as well the estimation techniques used in the empirical assessment of the factors of rural household farming in Ghana. A brief discussion of the variable and data are also presented.

##### **4.1.1 Model Specification**

Mendola (2007) detailed that there are four standard economic theories of rural household behavior and each approach assumes that households have an objective function to maximize with a set of constraints. The theories include production function, profit maximization, utility maximization and risk-averse theory. These theories do not share the same assumption but rather adopt the same theoretical methods to explain peasant rural farming household behavior.

However, in respect to this study, production function (Cobb Douglas) is going to be adopted as the theoretical framework of the four with explanations of this choice highlighted below.

In order to develop the appropriate empirical estimation model for the course of this study, we adjust the original C-D model to include our variables of interest. The human capital theory put forward by Gary Becker throws light of human capital as the stock of knowledge or characteristics an individual has whether born with or learned that advances his or her productivity.

This theory postulates that human workers may have varying level of skills as a result of varieties in their innate abilities. Other Individuals may in like manner contribute to their human capital stock by education, medical treatment, and training. Furthermore, Becker's view on this very theory instills that human capital raises a worker's productivity across all tasks. The level of education of farm manager is used to capture the human capital. A theory brought forth by Mincer in his semi-logarithmic earnings function explains that "wage income is a function of schooling and experience somewhat affirming Becker's human capital theorem".

Thomas Emieux propounded that the model is "one of the most widely used models in empirical economics". In view of this, it is therefore not out of the blue that Acemoglu (2011) postulated the Mincer's theory based on income to provide a link from the human capital investments theory on income and modified it to provide a larger empirical literature on returns to income. Labour economics put forth various theories of discrimination in the labour market.

A main section of such theories is personal taste hypothesis developed by Gary Becker. Becker's theory is based on "taste for discrimination". Within Becker's model, discrimination can arise from three different sources which are the human, capital and physical. Employer choices is the prejudice against decisions for maximum output.

Productivity arises when employees prefer to work with co-workers of a particular family, friend, race, sex or religion since they associate a significant level of discomfort with working with members of the discriminated group. Customers as well may have a taste for commodities by associating with certain producers on the grounds of family, religion, sex, race etc. Different approaches in measuring productivity over time.

The study, therefore, investigates if there exist factors that determine the sustainability of rural farming household. Ecology encompasses a lot of theory fragments including age, gender, household size, region, education, income level dependency and firm survival. The theory of liability of smallness suggests that size matters, and the bigger the better.

Smallness is associated with inadequate or lack of financial resource, difficulty in acquiring financial capital for modernized farming mechanism, difficulty in meeting high-interest rate payment and many others (Aldrich & Auster, 1986) . Smallness in this sense may have a negative effect on performance. A proxy for size used in this literature is the number of farm income in the respective rural farming households.

A similar theory is the liability of newness coined by Arthur Stinchcombe in 1965. Stinchcombe maintains that new firms are mostly inexperienced at the initial stage and as a result suffer from low average quality performance. However, if they manage to survive, their “experience learning curve” increases with time.

The liability of newness again reasons that firms exhibit a decreasing monotonic behavior with age however, failure rates are high in the early years of the firms’ lifecycle. A twist to this assertion is the liability of aging theory which avers that the risk of failure increases with age. This literature uses the age of household farming activities. The concept of absolute advantage and competitive advantage in international trade have explained how and why countries devote limited resource to the production of certain goods. In his publication in 1776, Adam Smith argued that a country, individual or firm is said to have an absolute advantage over others if, given the same number of resources, it is able to produce greater quantities of a good or service than its competitors.

A modification to this concept of absolute advantage is comparative advantage which incorporates opportunity cost to the earlier smith's concept. A country's absolute advantage or disadvantage in a particular industry has an important role to play in the type of good(s) it produces. Similarly, to firms, the advantage or disadvantage they possess may inform their specialty. The choice to specialize in the production of a variety of farm produce is explained by the concept of comparative advantage which such farms have.

Trying to investigate whether the specialty of farms (whether livestock, farm produce or fishing) play any significant role in the sales performance of rural farming households. We include specialty of farms to cater for this concept. Rand and Torm (2011) concluded that formalization of a firm leads to an increase in the firm's profit, investment and access to credit and as a result becoming formalized is beneficial not only to the firm but also to the employees since it decreases the use of casual labour and improve the condition existing on rural farming households.

Again, becoming an affiliate of an association could be argued from the resource-based view or the social-exchange view in institutional (household) behavior. The resource-based view sees an association as a resource that affiliated members tap into the rich flows of the environmental resource.

Such proponents for this view argue that resources have the potential to provide firms with sustainable competitive advantage (Barney, 1991). Goedhuys and Sleuwaegen (2001) noted that social capital (strategic alliances or association membership) that characterize SMEs is among the important factors influencing their performance. Similarly, the social-exchange view of association membership maintains that firms (rural household farms) will choose and maintain alliances that maximize their rewards and minimize their costs. Members of the association can negotiate for exchanges between themselves which place them in a position to be more competitive

than non-members. As mentioned earlier, it is noteworthy that the C-D function has output as the dependent variable.

However, this study uses farm income as a proxy for social sustainability are usually profit seeking ventures (i.e. producing a variety of farm produce) and therefore the output component in the C-D function will be a make-up of one output which are which is farm income if adopted. Now adopting all the theories and concepts and building upon the C-D Model, the augmented C-D function leads to a semi-log equation. “Logarithmic transformation of variables helps to show influential points in very sharp manner and also corrects skewed variables into the right distribution toward normality” (Green, 2003). The semi-log equation as used by (Gómez-Limón & Gabriela, 2009) now becomes:

$$\text{INDEX} = \beta_0 + \beta_1\text{HHSIZE} + \beta_2\text{HHSIZE}^2 + \beta_3\text{REGION} + \beta_4\text{AGE} + \beta_6\text{ECO\_ZONE} + \beta_{12}\text{POV\_STATUS} + \beta_8\text{GENDER} + \beta_9\text{EMP} + \beta_{10}\text{EDUC} + \beta_7\text{LAND\_OWNERSHIP} + \beta_8\text{TRADE} + \varepsilon \quad (4.1)$$

Now we substitute the variables in equation (4.1) with the variables that will be used for estimation

The final semi-logarithm equation that will be used for estimation in the subsequent chapter is expressed as

$$\text{INDEX} = \beta_0 + \beta_1\text{HHSIZE} + \beta_2\text{HHSIZE}^2 + \beta_3\text{REGION} + \beta_4\text{AGE} + \beta_6\text{ECO\_ZONE} + \beta_6\text{POV\_STATUS} + \beta_8\text{GENDER} + \beta_9\text{EMP} + \beta_{10}\text{EDUC} + \beta_7\text{LAND\_OWNERSHIP} + \beta_8\text{TRADE} + \varepsilon \quad (4.2)$$

Where:  $\beta$  ' s represent the coefficients in the multiple regression model.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$  are the partial elasticities of the sustainability indices with respect to HHSIZE, HHSIZE2, REGION, AGE, ECO\_ZONE, PV\_STATUS, GENDER, EMP, EDUC, LAND\_OWNERSHIP, TRADE respectively.

INDEX the index of economic, social and environmental sustainability

HHSIZE the size of the rural farming households.

HHSIZE<sup>2</sup> the square size of the rural farming households

REGION regional location of the rural farming household

GENDER is the gender of the household head (0 for female, 1 for male).

AGE measure the age of the household head.

ECO\_ZONE the ecological zone of the rural farming households

LAND\_OWNERSHIP refers to whether or not a rural household head owns land (dummy; 0 for Yes. 1 for No)

POV\_STATUS identifies whether or not the household is poor (dummy; poor=0, non-poor=1)

EMP employment status of household head

EDUC highest educational achievement of the household head (“no education as reference category)

TRADE refers to whether or not a rural household is involved in trade pf farm produce (dummy; 0 for Yes. 1 for No)

$\epsilon$  is the stochastic error term.

#### **4.1.2 Measurement and Justification of Variables**

##### **Dependent Variables**

The dependent variables used in this study are the calculated economic, social and environmental sustainability indices based on the Scalable Analysis Framework (SAFE)

##### **Economic Sustainability**

Economic sustainability encompasses the activities that lead to economic growth that does not adversely affect the environment and society. Farm income is an important indicator of Economic sustainability (Gómez-Limón & Gabriela, 2009). The GLSS 7 gives important data on farm income. It measures the farm income by the amount of produce the farmer sell for revenue. Thus, the higher the revenue the farmer gains from selling produce, the higher his economic sustainability. The yield of a household's farm is also crucial in the measurement of the economic sustainability of a farming household (Gómez-Limón & Gabriela, 2009). The more the farming household's yields, the more it can sell for revenue and hence higher economic sustainability. Also in the calculation of economic sustainability is the proportion of the total household's farmland that is actively used for farming purposes. The higher the proportion of farmland cultivated, the higher the yield. Refer to appendix for further details on the indicators calculating economic sustainability.

##### **Social Sustainability**

Social sustainability requires that future generation have at least the same access to social resources as future generations. One of the indicators for social sustainability is the proportion of total farm inputs/asserts acquired locally (Gómez-Limón & Gabriela, 2009). Here, the proportion of farm

assets locally acquired is positively correlated to the social sustainability of rural farming households. Secondly, the stability of labour force is important in determining the social sustainability of rural farming households (Gómez-Limón & Gabriela, 2009). Quantified as the number of the labour readily available during critical periods such as harvest. The higher the turnout, the less stable the workforce is. This is because citizens with unstable or insufficient employment tend to sign up for part-time jobs such as harvesting. Further details are indicated in the appendix.

### **Environmental Sustainability**

Environmental sustainability is the capacity to improve the quality of human life while living within the carrying capacity of the earth's supporting ecosystems (Palmer, 2012). According to Gómez-Limón and Gabriela (2009) crop diversity is a good indicator of the environmental sustainability of farming households. According to them, the higher the crop diversity, the more the benefits of the farm to the sustainability of the environment. Furthermore, the size to a farm can have adverse effects on the environment. Creating farms generally distort the local ecosystem of plants and wildlife in the location. Thus, the large the farm, the less likely it is for the environment to be sustainable. The smaller the farm, the more it benefits the wild fauna and flora. Also, the dependence of a rural farming households on their own produce can positively benefit the environmental sustainability of rural farming households (Choi & Ng, 2011). When farm produce is sufficient for the farming households, there is less demand for mass production which prevents creation of new farms and expansion of existing farms. This further saves the environment from continuous destruction to meet demand. The appendix gives more details on this subject.

**Independent Variables**

**Table 4.1: Summary, Descriptions and Measurements of Explanatory Variable**

Explanatory Variables	Description
Household Size	Number of people Residing in the household (count)
House size Squared	The square of the number of people residing in the household (continuous)
Region	The geographical location of the rural farming household within with Ghana (dummy)
Characteristic of Household Head	
Age	The age of the household head in years (continuous)
Gender	The gender of the household head (dummy; 0=female, 1=male)
Ecological Zone	Ecological location of household head (categorical; Coastal area=0(reference category) , forest= 1, savannah=2)
Education	Maximum educational status of the house household head (categorical; no education (reference category), basic=1, secondary=2, vocational=3, tertiary=4 and adult formal education=5.
Employment Status	The current employment status of household head (categorical; not part of labour force (reference category), employed=1, unemployed=2)

Explanatory Variables	Description
Poverty Status	Categorized rural household heads into poor and not poor classes. (dummy; poor=0, not poor= 1)
Land Ownership	Categorical variable, of household heads' land ownership status. (dummy; 0=Yes, 1=No)

**Source: Author's Own Construct**

#### 4.2 Data Source

The Data used for this study was acquired from the seventh round of the Ghana Living Standards Survey (GLSS 7) conducted in 2016/17. The GLSS is a national household survey intended to gather information on living conditions of all citizens in the country at the household, individual and community levels. The datasets are extremely helpful for examining various aspects of livelihoods in the country. Seven rounds of GLSS have been completed so far with each turn covering a representative portion of the nation. The GLSS 7 covers a sample of 14,000 households in 1000 enumeration areas. Of the 5667 total rural households covered in this survey, 4,788 households were rural farming households. The datasets showed explicit information on demographic characteristics of rural farming households, region, employment, farm yield and income, gender, education, household sized, land ownership, ages of household heads and ecological zones.

## **4.3 Results and discussion**

### **4.3.1 Descriptive Statistics**

#### **Summary Descriptive Statistics for Economic, Social, Environmental and Composite Sustainability Indices of Rural Farming Households in Ghana**

Table 4.3 below displays a summary of indices of rural farming households. Details provided in the GLSS 7 data enabled computations based on the SAFE theoretical framework to reveal the economic, social and environmental as well as composite sustainability indices for rural farming households across the country. This index is a measure of not welfare, neither poverty, but basically an insight into continuity of the rural farming households. According to Neuman and Churchill, (2015) and Aryee, Pumijumnong, Punwong, and Roachanakanan ( 2018) the measure of sustainability ranges from 0 to 1 with 1 being the highest measure of sustainability and 0 being the lowest measure. Between these, 0 to 0.49 demonstrates poor sustainability, 0.5-0.59 depicts a below average sustainability index, 0.6 to 0.69, 0.7 to 0.79, 0.8 to 0.89 and 0.9 to 1.0 shows average, good very good and excellent sustainability measures. According to them, a sustainability measure of 0.9-1 in means there is absolute sustainability and any measure below that demonstrates unsustainability. Below is a brief description of these indices.

The indices measured from the GLSS 7 data generally showed a poor sustainability measure for rural farming households in Ghana. The mean economic sustainability measure was 0.23 which is surprisingly the best component measure although is still low by global standards. The mean of social sustainability measure was 0.19 and environmental sustainability has a mean as low as 0.04. The mean composite or aggregate sustainability measure of rural farming households was 0.46 which was close to below average. The maximum aggregate sustainability for rural farming households in Ghana was 0.72 which fell within the “good” sustainability range. The maximums

of economic, social, and environmental sustainability measure were 0.34, 0.33 and 0.33 respectively. This demonstrates that rural farming households in Ghana are unsustainable. A study on sustainability in Accra by Aryee et al., (2018) shows that the mean of sustainability indices in the urban areas are better than that of rural farming households although they also found environmental sustainability to have the lowest index amongst the three dimensions of sustainability.

**Table 4.2: Summary and Descriptive Statistics for Sustainability of Rural Farming Households in Ghana**

<b>Index (Calculated on a scale of 0-1)</b>	<b>Mean</b>	<b>Standard Deviation</b>
Economics Sustainability Index	0.232156	0.1331687
Environmental Sustainability Index	0.0375426	0.0202888
Social Sustainability Index	0.1884845	0.15979797
Composite Sustainability Index for Rural Farming Households	0.45818332	0.1973433

**Source: Author's Computation based on GLSS 7 Data (2016/2017)**

#### **4.3.2 Summary Descriptive Statistics of Rural Farming Households in Ghana**

Table 4.4 details a summary of the characteristics of rural farming households in Ghana. The results demonstrate not much change has occurred in the explanatory variables based on GLSS 6 Data comparison. From the table, the mean of household size, age, employment status, gender has been relatively similar to that of GLSS 6. Furthermore, the mean poverty status for rural farming

households, educational attainment, and ownership of farmland and household the ecological locations of rural farming households are statistically similar.

Data from GLSS 7 shows that a little over 45% of rural farm household in Ghana are located in the Upper East and Upper West and Northern regions. This could be because of the high dependence of subsistence farming in these regions. In the data set, the Greater Accra region is shown to have the least number of rural farms in Ghana with only 0.7% of the total number of rural farming households. This could be attributed to the urbanization of the region.

Data from the GLSS 7 depicts that the average age of household heads in rural farming households is 51 years. Also, 77% of household heads are males and the remaining 23% of household heads are females. Compared to male household heads, female household heads are older. Female household heads have an average age of 54 years while that of males stands at 48 years.

Computations from the GLSS 7 also shows that 77% of rural farming households have ownership of the farmland. The remaining 23% of rural farming households do not have ownership of their farmland. The data also shows that over 55% farming households are located in the savannah zones. Only about 10% of farming households are in coastal areas. This is due the preference of fishing over farming in coastal areas.

The data also provides data on employment, poverty and educational status of the household heads. Computations show that 48% of rural farming households are categorized as poor with the remaining 52% being non-poor. Close to 80% of household heads are directly employed either on farmlands or elsewhere. In rural farming households, only about 10% of household heads have no education at all.

**Table 4.3: Summary and Descriptive Statistics of Rural Farming Households**

Variable Names	Variable Defining	Mean	Standard Deviation
<b>Dependent Variables</b>	Economic Sustainability	0.232156	0.1331687
	Social Sustainability	0.1884845	0.15979797
	Environmental	0.0375426	0.0202888
<b>Independent Variables</b>			
Region	Regional location of the household		
Western		0.092888	0.290298
Greater Accra		0.00757	0.086681
Volta		0.108343	0.310837
Eastern		0.094307	0.292278
Ashanti		0.066393	0.248988
Brong Ahafo		0.095411	0.293805
Northern		0.135783	0.342585
Upper East		0.1567862	0.36464
Upper West		0.164327	0.37060
Age	Age of Household Head	51.55623	15.325605
Land Ownership	Ownership of farmland (1=Yes, 0=No)		
Yes		0.771282	0.420057
No		0.228718	0.420057
Ecological Zone	The ecological location of the household		
Forest		0.33957	0.473619
Coastal		0.102198	0.302944
Savanah		0.558232	0.496656
Household Size	The size of the household	5.196211	3.214309

<b>Variable Names</b>	<b>Variable Defining</b>	<b>Mean</b>	<b>Standard Deviation</b>
Household Size Squared	Double the size of the household	37.32998	52.56862
Employment Status	Employment status of Household Head		
Employed		0.797942	0.401582
Unemployed		0.202058	0.285261
Poverty Status	Poverty status of household (1=poor, 0=non-poor)		
Poor		0.477081	0.499533
Non-Poor		0.522919	0.499533
Educational Status	Highest Educational Attainment of HHH		
No Education		0.098803	0.298433
Basic		0.638583	0.480468
Vocational		0.097864	0.297166
Tertiary		0.046233	0.210015
Adult Education		0.003286	0.057233
Trade	Involvement in trade of farm produce. (1=Yes, 0=No)		
Yes		0.577305	0.494037
No		0.422695	0.494037

**Source: Author's Computation based on GLSS 7 Data (2016/2017)**

#### 4.4 Estimation Results

**Table 4.4: OLS Estimation Results for Sustainability of Rural Farming Households**

Explanatory variables	(1) Economic Sustainability	(2) Social Sustainability	(3) Environmental Sustainability
House Size	5.70e-05 (7.70e-05)	0.000194** (7.99e-05)	-4.17e-05 (5.50e-05)
House Size Squared	-1.89e-06 (3.61e-06)	-1.01e-05** (4.34e-06)	1.00e-06 (2.20e-06)
Region			
Western (Reference Category)			
Central	-0.000621** (0.000286)	-0.00270*** (0.00104)	-0.000780 (0.000576)
Greater Accra	-0.000484 (0.000422)	-0.000747 (0.00132)	-0.000385 (0.000672)
Volta	-0.00111*** (0.000298)	0.00109 (0.00101)	-0.000309 (0.000975)
Eastern	-0.000254 (0.000436)	0.000948 (0.00100)	-0.00134** (0.000682)
Ashanti	-0.000254 (0.000402)	-0.00143 (0.00106)	-0.00140** (0.000711)
Brong Ahafo	0.000768 (0.000515)	0.00206** (0.00104)	-0.000965 (0.000685)
Northern	-0.00141* (0.000727)	2.58e-05 (0.00107)	-0.000856 (0.000789)
Upper East	-0.00128* (0.000719)	-0.00276** (0.00108)	-0.00104 (0.000766)
Upper West	-0.00138** (0.000682)	-0.00220** (0.00107)	-0.000308 (0.000823)
Ecological Zone			
Coast Areas (Reference Category)			
Forest	0.000847*** (0.000203)		0.00104* (0.000614)
Savannah	0.000920 (0.000607)		0.000324* (0.000166)
Land Ownership			
No	0.000264 (0.000257)	-0.000455* (0.000265)	0.000572* (0.000303)
Characteristics of Household Head			
Gender (Reference female)			
Male	0.000744*** (0.000114)	0.000616** (0.000245)	-5.57e-05 (0.000307)

<b>Explanatory variables</b>	<b>(1) Economic Sustainability</b>	<b>(2) Social Sustainability</b>	<b>(3) Environmental Sustainability</b>
Age	9.40e-06** (4.37e-06)	6.66e-06 (6.70e-06)	-7.10e-06 (6.15e-06)
Employment Status			
Not part of labour force (Reference Category)			
Employed	0.021336*** (0.000113)	0.000774** (0.000301)	
Unemployed	6.08e-06 (0.000113)	-0.000576 (0.000380)	
Poverty Status			
Poor (Reference Category)			
Non-Poor	0.000457** (0.000191)	0.000596** (0.000280)	-0.000516 (0.000365)
Educational Status			
No Education (Reference Category)			
Basic	0.000319** (0.000141)	-0.000400 (0.000298)	-0.000590 (0.000705)
Secondary	0.000658 (0.000539)	0.000260 (0.000454)	-0.000387 (0.000744)
Vocational	0.000526 (0.000331)	-0.000149 (0.000375)	-0.000375 (0.000754)
Tertiary	0.000611 (0.000379)	-8.71e-05 (0.000451)	-0.000118 (0.000832)
Formal Adult Education	0.00270 (0.00215)	0.000592 (0.00216)	-0.000787 (0.000714)
Involvement in Trade			
No	-0.030107* (0.000112)	-2.76e-05 (0.000232)	
Constant	-0.000449 (0.000823)	0.0109*** (0.00117)	0.00155 (0.000951)
Observations	3,549	3,837	4,253
R-squared	0.040	0.089	0.008

**Source: Author's Computation Using GLSS7 Data (2016/2017)**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Robust Standards errors in parentheses

## 4.5 Discussion

### **Contributing Factors to the Sustainability of Rural Farming Households in Ghana**

In order to investigate the factors that contribute to the sustainability of rural farming households, sustainability indices for all the three dimensions of sustainability (economic, social and environmental) were computed with GLSS 7 data using the SAFE methodology. The various sustainability indices were then used to run an Ordinary Least Squared regression against the explanatory variables. The results of the estimation are shown in Table 4.4 above.

The results indicate that the sustainability of rural farming households is influenced by the characteristics of the rural farming household head as well as that of the household. Characteristics of the rural farming household head such as gender and age significantly contribute to the economic and social sustainability of the rural farming household.

The results show that rural farming households headed by males are more likely to be economically and socially sustainable. A male headed household is highly probable to have better sustainability compared to households that are headed by females. This result is consistent with that of Amuzu, Jones, and Pereznieta, (2010), Gómez-Limón and Gabriela, (2009), and Rigg, (2006) Gómez-Limón & Gabriela, (2009) findings on the relationship between the ages of the rural household head in the same as that found in this study. The study shows that the economic sustainability of a rural farming household increases with the age of the household head.

That is, the older the age of the household head, the more likely the rural household is to be economically sustainable. Greenberg, (2010) also asserts that rural household characteristics such as its ecological location contributes to the household's sustainability and results from this study concluded on similarly. According to this study, rural households located in forest zones and more

likely to be economically and environmentally sustainable as compared to households in coastal areas. Also, this study shows that rural households in savannah zones are more environmentally sustainable if compared to households in coastal and forest zones.

Diao et al. (2010) study found results coherent with this study that, household size and its poverty status contribute to the sustainability of a farming household. Here, non-poor households are more sustainable than poor households and also, as the household size increases, there is a positive effect on the social sustainability of its household.

The coefficient statistic for this shows that non-poor households are both economically and socially more sustainable than poor households. According to the results of Tran et al., (2018) the educational attainment of the a rural household' head has no effect on the household's sustainability. According to him, the generally low level of education among rural farming household heads make it an insignificant factor in contributing to the household's sustainability. This study however found that household heads with basic education are more likely to be economically sustainable than those with no education. This finding also asserts that of the findings of Dossa et al. (2011) for rural households in Bobo Dioulasso, Burkina Faso.

In Ghana, this study concluded that rural households located in the forest regions are more likely to be more sustainable than rural households in the savannah and coastal ecological zones. Martin, Lorenzen and Bunnefeld (2013) study found similar results and further explained that the availability of abundant and fertile land in such areas provides rural inhabitants of such areas an advantage in sustenance.

In Ghana, all but two out of the ten regions have statistically significant coefficients or responsiveness to a sustainability index. With the Western region on Ghana as the reference region,

this study showed that rural farming households in the Central, Volta, Upper East, Upper West and the Northern regions of Ghana are less likely to be economically and socially sustainable. In Debrah, (2013) study on poverty in Ghana, he indicated that the three Northern regions of Ghana has for many years been the poorest, with a frequent episode of flooding that damages staple and cash crops and well as affects livestock, livelihood and welfare of the three northern regions. It is therefore not surprising that these northern regions would demonstrate such low levels of sustainability.

Land Ownership according to this research is an important contributing factor to the sustainability of rural farming household. That is, household heads that do not own their own farm land are less likely to be socially sustainable. Greenberg (2010) confirms this result in his study. He explains that under conditions where the most valuable asset is the most available and productive one, it become crucial to the sustenance of inhabitants. That is, when land is arguably the one resource in rural farming households, possession of such it a vital condition for the sustainability of the household.

Trade has always been a driving force in income and sustainability. Similar to findings in (Smit et al. 2001), households that are not involved in trade of agricultural produce are less likely to be economically sustainable. That is, households that trade their produce for money or other goods move more towards being economically sustainable than those who do not trade. Researches such as (Rosset, 2000) and Dean et al, (1994) have concluded similarly on this relationship.

#### **4.6 Summary**

Chapter four essentially highlighted the results obtained from this study. The Ordinary Least squared regression shows that the contribution factors to the sustainability of rural farming households in Ghana are Household size, Age, Ecological Zone, Poverty Status, Ecological Location, Regional Location Land Ownership, and Involvement in Trade.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS**

#### **5.1 Introduction**

Chapter 5 provides a summary of the finding of this study. Based on the findings of the study, some suggestions and recommendations are made. The final section of this chapter briefly discusses the limitations of the study and suggests areas for further research.

#### **5.2 Summary of Major Findings**

This study precisely intended to investigate the factors that contribute to the sustainability of rural farming households in Ghana. The study considered both household characteristics and that of the household head. With the concept of sustainability becoming more common, it was essential to investigate its contributing factors to specifically rural farming households in Ghana. Many rural households indulge in agriculture as a means of ensuring their livelihood and also securing a source of revenue.

Data from the seventh round of the Ghana Living Standards Survey (GLSS 7) collected in 2016/2017 showed that 76% of households in Ghana were involved in agriculture directly and indirectly. Further analysis revealed similar characteristics of rural farming households in terms of gender, age, educational attainment, and employment status of the household head with the GLSS 6 collected in 2012/2013. Household income was however not available in the GLSS 6.

The Ordinary Least Squared regression technique was used in analyzing the factors that contribute to the sustainability of rural households in Ghana. The analysis of the rural farming household's sustainability showed that some characteristics of the household and the household head's characteristics are important contributors of the household's sustainability. Characteristics of the household such as gender, and age, contribute to the sustainability of a rural farming household. The age of the household head increases the overall sustainability of the rural farming household with each passing year. Also, male headed households are more likely to be sustainable than female headed households. Basic education attained by the household head was a significant factor to the sustainability of the household.

Household characteristics such as its involvement in trade, size, the ownership of farmland land, ecological zone of the household, its regional location significantly contribute to the sustainability of the household. The analysis showed that, as a household's size grows, there is a likelihood that its sustainability would increase. Thus, a household with more members might see an improvement in their level of sustainability. Likewise, ownership of farmland by the household was an important contributor to the sustainability of the household. Forest ecological zones also showed better likelihood of sustainability than savannah and coastal zones. Furthermore, the three northern regions of Ghana showed a likelihood of lower sustainability for farming households in those regions.

### **5.3 Policy Recommendations**

The major conclusions drawn from this study have mandated some significant suggestions for policy. The results showed in this study identified the determinants of sustainability for rural farming households. To ensure the appropriate use of the full potential of this investigation, the following recommendations are worth considering:

First, the integration of rural farming household into rural development programs could be considered by rural planning committees. This is achievable by zoning rural farming households into centers and incorporating rural farming activity planning in rural development plans. This means that rural farms should be acknowledged as an important and viable economic activity in Ghana. That is, a need for development of institutional policies as well as a legislative framework that would promote rural agriculture has become an important issue of the development in Ghana. This institutional policy can be adopted by the Ministry of Local Government and Rural Development to increase the efforts to involve rural farming households in better trading activities. This action would improve sustainability and encourage investments into rural farming since rural farming will be more attractive.

Secondly, there should be a strategic plan by the government through the Ministry of Local Government and Rural Development to assist all rural farming households to own a land of theirs. This would significantly increase the sustainability of the farming household by providing them with arguably the most important asset of rural farming households. This can be achieved by the assignment of government plots to the vulnerable in the rural communities to ensure that they go up the sustainability scale.

#### **5.4 Limitations of the Study**

The GLSS 7 data used in the analysis of this study was the major limitations. A variety details household-level economic and demographic characteristic, the GLSS 7 is not designed to capture information on the location of the farm. The GLSS 7 is also currently not updated with household income which would have been a key piece of information in this study. Furthermore, environmental factors such as soil components and types would have provided better analysis of environmental sustainability. The dataset captures details on the location of the household only but not necessarily where the farming activity takes place.

#### **5.5 Conclusion**

The study essentially intended to identify the significant factors that contributes to the sustainability of rural farming households. The three components of sustainability were analyzed separately in this study. The study found that a household's participation in the trade of farm produce contributes to its long-term sustainability. Also, the size of a rural household affects its sustainability. Here, the more members a household has, the more economically and socially sustainable it is. The ownership of farmland by the household head also contributes positively to its sustainability.

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APPENDIX

**Table A1: Selected Indicators for the Calculation of the Sustainability Indices for Agricultural Systems (CIAS)**

Component	Indicator	Description	Measure
Economic Sustainability Indicators	1.Farming household's income 2. Productivity of agricultural land 3. Ratio of total household's farmland used for farming	1.Farming household's gross profit 2. Crop yield of the farm 3. The use of available resources (farmland) can affect farm gains	1.Income(value) made from sale of farm produce 2. Measured by the total yield of the household's farm 3. Ratio of total household's farmland used for farming
Social Sustainability Indicators	1. Self-Sufficiency of Farming Inputs 2.Household's Workforce Stability	1. Self-Sufficiency Is Based on The Ratio of Locally Acquired Inputs Cost to the Total Cost of Farm Inputs 2. The Stability of the Rural Households' Labour Force	1. A higher ratio of locally acquired inputs demonstrates a better self-sufficiency. 2. Quantified as The Number of the Labour Readily Available During Critical Periods Such as Harvest. The higher the turnout, the less stable the workforce is
Environmental Sustainability Indicators	1.Crop diversity 2. The area of the household's farm 3.households' consumption of own farm produce	1. The number of crops or tress planted by the farmer in a year. 2. The size of the farm is associated with the degree of discontinuity in the agricultural landscape 3. The ratio of the amount of farm produce consumed to the total yield	1. The higher the diversity, the better the support to the ecosystem. 2. The smaller the farm, the more it benefits the wild fauna and flora. 3.the higher the ratio, the lesser the dependence on manufactured goods

Source: Author's Own Construction