UNIVERSITY OF GHANA

FARMERS' KNOWLEDGE, ATTITUDES AND PRACTICES OF SUSTAINABLE ENVIRONMENT ACTIVITIES IN THE EASTERN REGION OF GHANA

BY

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DECLARATION

I declare that this research "**Farmers' Knowledge, Attitudes and Practices of Sustainable Environment Activities in the Eastern Region of Ghana**" is my own work and sources of secondary information that I used or cited have been indicated and duly acknowledged. This thesis has never been presented either in whole or in part to any institution for the award of any degree.

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DEDICATION

I dedicate this thesis to my lovely husband, Mr. Obed Ayisi-Addo and my adorable children, Adubea, Ampofo and Amponsaa.

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First and foremost, my sincerest appreciation goes to the Almighty God for His Grace, Guidance and for granting me good health towards the completion of the thesis. To Him be the Glory.

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LIST OF ABBREVIATIONS

ER	Eastern Region
IBMP	Integrative Model of Behavioral Prediction
KAP	Knowledge, Attitude and Practices
MDG	Millennium Development Goals
NGOs	Non-Governmental Organisations
SDG	Sustainable Development Goals
SEA	Sustainable Environment Activities
SPSS	Statistical Package for Social Sciences
TPB	Theory of Planned Behaviour

ABSTRACT

Sustainable environment has become an important issue in global development as a result of recurrent instability in the interaction among environmental, economic and social systems. Different policy directives and interventions have therefore been championed for promoting a balance in these systems. Key among them is education for sustainable environment, identified to contribute knowledge, skills and attitudes required to bring about a change. In spite of these, sustainable farming environment continues to pose a challenge in most Ghanaian communities; of which the Eastern Region (ER) is no exception. It is as a result of this that the study sought to address the research question: What are farmers' knowledge, attitudes and practices of sustainable environment activities (SEA) in the Eastern Region (ER) of Ghana?

The study addressed four objectives; namely, to find out the levels of farmers' knowledge, attitudes and practices (KAP) of SEA with regards to sex, education, age and type of farming. The study also sought to identify the relationships among farmers' levels of KAP of SEA and finally the farmers' views on measures to enhance their KAP of SEA.

The explanatory sequential mixed method was adopted using a population of all actively engaged farmers from the ages of eighteen (18) to sixty (60) years in the ER. A sample of 400 farmers from an estimated population of 724,001 was selected using the multi-stage sampling techniques for the quantitative study while 30 other farmers from the population was purposively selected for the qualitative study. Structured interview schedule and focus group discussion guide were used to collect data for the study. Quantitative data was analysed descriptively and inferentially using IBM SPSS version 24 and thematic analysis was also done for the qualitative data.

Some major findings were that: Farmers had high levels of knowledge and practices of SEA and more favourable attitudes towards SEA. In spite of this, no significant relationships were found between farmers' knowledge and attitudes towards SEA in relation to sex: Female farmers however practiced more SEA than males. Farmers with formal education had higher levels of knowledge and attitudes towards SEA while they exhibited varying levels of practices of SEA. Farmers ages were not related significantly to their KAP of SEA. Their levels of attitudes were however related to their knowledge and practices of SEA and their knowledge of SEA also contributed to their levels of practices of SEA. Finally, the provision of environmental education and stringent punishment of offenders with regular communal activities could enhance farmers' knowledge, attitudes and practices of SEA in the Eastern Region of Ghana.

The study recommended that stakeholders should formulate and implement environmental education policies for the non-formal education sector to promote SEA. Again, adult education institutions should intensify their environmental education curriculum. Agricultural extension officers, community development agents and non-Formal Education Organizations should provide regular environmental education to grassroots farmers whose activities directly impinge on the physical environment.

The study therefore concluded that farmers' had high knowledge and practices of SEA on the scales used and also exhibited more favourable attitudes towards SEA. In spite of this, farmers' knowledge, attitudes and practices of SEA were at varying levels in relation to their sex, educational backgrounds and age.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Sustainable environment has become a major issue of global concern due to the reoccurring instability in the interaction of the environment, economic and social systems (Rabinowicz and Chinapah, 2014). Additionally, the global quests for development in recent years through urbanization, industrialization, and increased food production for an expanding global population, among others have collectively contributed to depletion of the natural environment (Sharma, 2012). For instance, it is estimated that about 80% of global lands are degraded through agricultural practices; a greater percentage (40%) of which are severely degraded in Africa (Tesfahunegn, 2017). In effect, scarce resources which are meant to satisfy the needs of the present generation without comprising those of future generations are depleted at a faster rate (World Commission on Environment and Development, 1987).

Different strategies and policies have therefore been adopted to raise concerns for promoting a balance in the use of these resources (Holden, Linnerud and Banister, 2014). These date back to the 1900s when air and water pollution became major environmental issues during the industrial revolution. For instance, it was the 1987 international conference on the environment that placed sustainability at the center of the world. Subsequently, different conferences such as the 1992 (Earth Summit), 2002 (World Summit on Sustainable Development) and 2012 (African Ministerial Conference on the Environment) were all geared towards promoting a sustainable world (Commonwealth Secretariat, 2007). Key among these conferences has been Agenda 21; which was a plan of action held in Rio de Janeiro, Brazil in 1992 to be taken globally in all areas in which

humans' have an impact on the environment. Agenda 21 was intended to implement global policies on sustainable development at local levels so that nations could translate global goals into national ones.

Reports emanating from some of these conferences estimated that the world requires about 50% more food, 45% more energy and 30% more water in order to keep up with a nine million estimated world population growth by 2030 (Meara, Leather, Hagander, Alkire, Alonso, Ameh and Mérisier (2015). For this purpose, global indicators known as the Millennium Development Goals (MDGs) were put in place. The Millennium Development Goal seven, for instance, aimed at ensuring environmental sustainability through specific targets such as: "to integrate the principle of sustainable development" and "reverse environmental resource loss", "to reduce biodiversity loss, while increasing access to basic sanitation and safe water and causing an improvement in the lives of slum dwellers. After 2015, the unfinished businesses of these MDGs were translated into Sustainable Development Goals (SDGs). Four out of the 17 SDGs; namely, goals 12, 13, 14 and 15 are specifically geared towards sustainable environment (National Development Planning Commission, 2018). Goal 12 focuses on the need to "ensure sustainable consumption and production patterns". Some specific targets to this goal include: achieving sustainable management and efficient use of natural resources, managing all forms of wastes while reducing their impacts on human health and the environment, reducing waste generation through prevention, reduction, recycling and reuse as well as ensuring that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature. Likewise, Goal 13 emphasises efforts to "take action to combat climate change and its impacts". The goal specifically focusses on targets such as taking actions in combating climate

related hazards and natural disaster through improved education, awareness raising and capacity building on climate change mitigation. Goal 14 on the other hand pays attention to effort to "conserve and sustainably use the oceans, seas and marine resources for sustainable development". This goal aims at preventing and significantly reducing marine pollution of all kinds by conserving at least 10 per cent of coastal and marine areas, increasing scientific knowledge, developing research capacity and transfer of marine technology as well as enhancing the conservation and sustainable use of oceans and their resources. Finally, Goal 15 addresses the need to "protect, restore and promote sustainable use terrestrial ecosystems, sustainable manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". This is targeted at conserving, restoring and sustainably use of terrestrial and inland fresh water ecosystems. These are to be achieved by promoting sustainable management of all types of forests, halting deforestation, restoring degraded forests and increasing afforestation and reforestation, combating desertification, restoring degraded land and soil and mobilising significant resources from all sources and at all levels to finance sustainable forest management. (Sustainable Development Goals Report, 2018).

Apart from these initiatives, education is also identified as a major component for the enhancement of sustainable environment. The United Nations Decade of Education for Sustainable Development (DESD) was thus established to promote this course within the period of 2005-2014 (UNESCO, 2012). The DESD suggests that "education is a motor for change" that ought to contribute requisite knowledge, skills and attitudes needed by citizens to face challenges of today and that of the future (Jabareen, 2012:4).

According to UNESCO (2009), efforts like political agreements, financial incentives and technological solutions alone cannot be used to address environmental degradation but rather a change in the way individuals think and behave. Education, therefore, became recognised as a major catalyst that could help humans to achieve sustainable future.

Different scholars are also highlighting and advocating for nations to promote requisite education to its citizenry for smooth enhancement of sustainability. Maclean, Austin, Rehfisch, Blew, Crowe, Delany, Van Roomen (2008) for instance, pointed out that even though there are many keys to development; education is the master one. According to them, effective education can help ensure a safer, healthier and more prosperous environmentally sound world. Similarly, Briguglio and Pace (2004) explained that requisite education could enable actors to understand the values underpinning environmental sustainability and participate in appropriate and conducive actions geared towards promoting it.

In spite of all these interventions, the global environment keeps deteriorating at a faster rate, especially in developing nations such as Ghana. The United Nations Development Programme (UNDP, 2007) for instance, reported that Ghana's population and economic activities are highly dependent on natural resource, resulting in environmental degradation. Additionally, the World Bank (2006) report revealed that land degradation in Ghana is associated with unsustainable agricultural practices like deforestation, cultivation over river banks and farming expansion (especially, cocoa production). Deforestation in Ghana for example is reported to be "65,000 ha/year" (World Bank, 2006:30). Apart from this, Asiedu-Amoako, Ntiamoah and Gedzi (2016) also emphasizes that many technological and institutional innovations to help reduce degradation in

Ghana have not been successful due to lack of fit between proposed techniques and local farming systems as well as low attention to consider knowledge and perception of local people.

It is in line with this that Nnabue and Asodike (2010) postulated that the real problem facing sustainable environment is how to motivate individuals to acquire relevant education to change underlying behaviours and activities that waste scarce resources built over the years. Additional interventions are therefore instituted to provide requisite environmental education to the general public.

Besides, environmental protection and management in Ghana is carried out in a highly decentralized manner, right from the Ministry of Environment Science and Technology, Ministry of Food and Agriculture (MOFA), Environmental Protection Agency (EPA) to the District Assemblies and Environmental Protection Committees. For instance, the government of Ghana through MOFA, EPA and other related agencies keep implementing food security and environmental protection strategies like afforestation projects (the introduction of drought or flood tolerant crops), the National Environmental Action Plan as well as fertilizer subsidy programmes aimed primarily at supplementing the soil nutrient deficit (Boafo, Jasaw and Dayour, 2014). Apart from the formulation of relevant environmental policies, these institutions also raise awareness and educate the general public on environmental management and protection. In spite of this, reports indicate that some of these institutions lack capacity for evidence based policy and are also faced with implementation challenges. For instance, most District Assemblies are said to lack qualified personnel and resources needed to promote requisite education at

the grassroots' level (World Bank, 2006). In essence, environmental education is therefore invariably low among grassroots farmers including Eastern Region.

The Eastern Region of Ghana is one of the most populous regions in the country and it has districts which can be classified into rural, semi-rural and urban. It is also one of the most forested regions in Ghana with agriculture being the dominant occupation of the inhabitants (Ghana Statistical Service, 2013). The region is however reported to experience rapid environmental change in the last many decades as a result of diverse agricultural practices and other human activities. (Tesfuhunegn, 2017, Asiedu-Amoako, Ntiamoah & Gedzi, 2016, Agyemang, 2012 and Amanor, 1997). Poor agricultural practices, bushfire, regular logging, fuel wood collection, plant and animal extinction and in general, over exploitation of cover vegetation complimented by poor soil and water conservation/managements are the reported causes of rapid degradation of environmental resources in the Eastern Region (Ministry of Food and Agriculture, 2016, Tesfuhunegn, 2017 and Asiedu-Amoako et al). These activities have resulted in low soil fertility, water pollution, reduce surface water availability and forest depletion. For instance, the Forest Commission (2012) reported that "40% of the 48 forest reserves in the Eastern Region is degraded through human activities like illegal mining, farming and lumbering". It is therefore not surprising that the region is in a precarious condition as far as environmental degradation is concerned. Farming experiences, access to information and educational levels of farmers have been identified to influence environmental sustainability in the region (Tesfuhunegn, 2017). There is therefore the need to assess the educational gap among farmers whose routine activities directly impinge on the natural environment in order to better provide the requisite environmental education.

1.2 Statement of the Problem

A sustainable environment is one of the major challenges facing the world today. This is because there is constant instability in the economy, society and the environment, especially in recent years, as a result of urbanization, industrialization, and increased food production for an expanding global population (Rabinowicz, and Chinapah, 2014). Different policies have therefore been formulated as a means of stabilizing these systems. Typical of such is the education for sustainable environment policy. Through series of deliberations at various international conferences like the United Nations conferences, education has been recognized as a critical component needed to promote environmental sustainability.

Different scholars are therefore advocating that enhancement in knowledge, skills, attitudinal and behavioural changes are the requisite educational tools needed to bring about environmental sustainability (Jabareen, 2014; Briguglio and Pace, 2004; Maclean et al. 2008; Nnabue and Asodike, 2010). Efforts are subsequently made towards the provision of tenets, values and practices of sustainable development in all educational reforms throughout the world. Little is however known about the knowledge, attitudes and practices of farmers whose activities directly hinges on the environment. Rural dwellers are often assumed to be hostile towards attitudes, knowledge and skills for sustaining the environment (Dutifield, 2010). With reference to education for sustainability policy as a new global dimension, there is a call to address human development gap through access to relevant, equitable and effective education for rural populations (Rabinowicz, and Chinapah, 2014) as would also be in the case Ghana.

The Eastern Region is one of the most forested and highly degraded areas in Ghana with agriculture being the dominant occupation and livelihood of inhabitants. In spite of the numerous policy directives and interventions towards sustainable environment in Ghana, the nature and extent of farmers' knowledge, attitudes and practices on sustainable environment is not sufficiently known. Reports indicate that a number of agricultural practices in the region continue to degrade a greater portion of its forested areas (Ministry of Agriculture, 2016). For example, areas with food crops like maize farms are like savannah. This is because the forest does not support such farming activities; leading to regular cutting of trees. Additionally, there are areas with over-grazing that causes erosion and gullies. Even though these farmers may constantly be involved in different indigenous activities, one may not be certain whether they are acquainted with recent global environmental practices. It is therefore necessary to address the question: What are farmers' knowledge, attitudes and practices of sustainable environment activities (SEA) in the Eastern Region of Ghana?

1.3 Purpose of the Study

Education for sustainable environment has been recognized as a critical component for promoting sustainable development worldwide. A number of global and national efforts are being channeled towards providing relevant education for this purpose. The purpose of the study is therefore to find out farmers' levels of knowledge, attitudes and practices of sustainable environment activities (SEA) in the Eastern Region (ER) of Ghana to inform stakeholders in designing appropriate educational programmes for grassroot farmers.

1.4 Objectives of the study

The objectives of the study are to:

1. Find out the levels of farmer's knowledge, attitudes and practices (KAP) of SEA in the Eastern Region with regards to:
   i. Sex
   ii. Educational background and
   iii. Age
2. Find out farmers' levels of KAP of SEA in the Eastern Region with reference to type of farming.
3. Identify the relationship between the farmers':
   i. Knowledge and attitudes towards sustainable environment activities
   ii. Knowledge and practices of sustainable environment activities
   iii. Attitudes and practices of sustainable environment activities.
4. Find out the farmers' views on measures to enhance their knowledge, attitudes and practices of SEA in the Eastern Region of Ghana.

1.5 Related Research Questions

1. What are the levels of farmers' knowledge, attitudes and practices of SEA in the Eastern Region with regards to:
   i. Sex
   ii. Education
   iii. Age
2. What are the farmers' knowledge, attitudes and practices of SEA?
3. What are the knowledge, attitudes and practices of the farming groups on SEA in the Eastern Region with reference to type of farming?

4. What relationships exist among the farmers' in terms of:
    i. Knowledge and attitudes towards SEA in the Eastern Region?
    ii. Knowledge and Practices of SEA in the Eastern Region?
    iii. Attitudes and Practices of SEA in the Eastern Region.
5. What measures do the farmers' think could enhance their knowledge, attitudes and practices of SEA in the Eastern Region of Ghana?

1.6 Significance of the Study

The high rate of environmental deterioration in the world today has necessitated global and national efforts in restoring the natural environment from being degraded rapidly, especially in developing countries. Different interventions have therefore been channeled towards this agenda. Key among them is education for sustainability. Education is therefore being promoted globally in order to empower people for the achievement of a sustainable environment. Meanwhile, little is known about the level of knowledge, attitudes and practices of local people (farmers) whose activities directly impinge on the environment. It is therefore essential to assess the farmers' level of knowledge, attitudes and practices on sustainable environment activities in the Eastern Region of Ghana. Findings from this study will:

- Inform policy makers about educational gaps among farmers in the Eastern Region in order to formulate regulations and policies needed to empower grassroots for promoting sustainable environment.
- Disclose to programme implementers the specific sustainable environment educational gaps among farmers so that requisite education on sustainable environment could be planned and implemented to address the gap.

- Through workshops, seminars and community engagements (e.g. fora) expose farmers in the Eastern Region to the knowledge, attitudes and practices available to them and improve their levels of KAP as a result of their interaction with programme Implementers.
- Help extend frontiers of knowledge, attitudes and better practices on sustainable environment activities.

1.7 Operational Definition of Terms

Sustainable Environment: A responsible interaction with the environment to avoid depletion or degradation of natural resources so that the needs of the current generation will be met without jeopardizing the ability of future generations to meet their needs as well.

Sustainable Environment Activities*:* Activities that are environmentally friendly and aims at protecting and sustaining all natural resources such as water, land, forest and air to the benefit of current and future generations in the same way.

Knowledge about Sustainable Environment: Being aware and showing understanding of environmental issues as well as how to sustain environmental resources for equal benefits to contemporary and future generations.

Attitude towards Sustainable Environment Activities: Having a positive, negative or an ambivalent feeling towards activities that sustain the environment.

Practices of Sustainable Environment Activities: This refers to individuals' performance in activities which aim at sustaining natural resources available in their various communities.

Farmers: All actively engaged individuals who are either into food crops/vegetable, cash crop or livestock farming.

1.8 Organization of the Study

The study is organized into six chapters. Chapter one provides an introduction of the study and comprises background to the study, the statement of the problem, the objectives of the study, the related research questions, the significance of the study, an operational definition of terms, an outline of the organization of the study, theoretical/conceptual framework and the profile of the study area.

Chapter two reviews literature on related topics. Chapter three describes the methodology for the study which includes the research paradigm, population, research design, sample, sampling, research instrument, reliability and validity, field work and data collection procedures and data analysis.

Chapter four focuses on the presentation of results. Chapter five also discusses results. Chapters six summarizes the entire study, the major findings of the study and ends with conclusion and recommendations.

1. 9 Profile of the Study Area

The Eastern Region constitute the study context for this study. This region was chosen for the study mainly because reports have indicated that natural resources are being degraded rapidly from a number of different activities; agriculture and mining in the region (Tesfahunegn, 2017). For example, it is reported that 40% of the region's forest reserves are degraded through human activities like illegal mining, farming and lumbering" (Forest Commission: Timber Industry Development Division, 2012). The region was again selected due to the peculiar nature of farmers and agricultural activities in the area. Thus, farmers engage in mixed farming practices with cash crop, food and

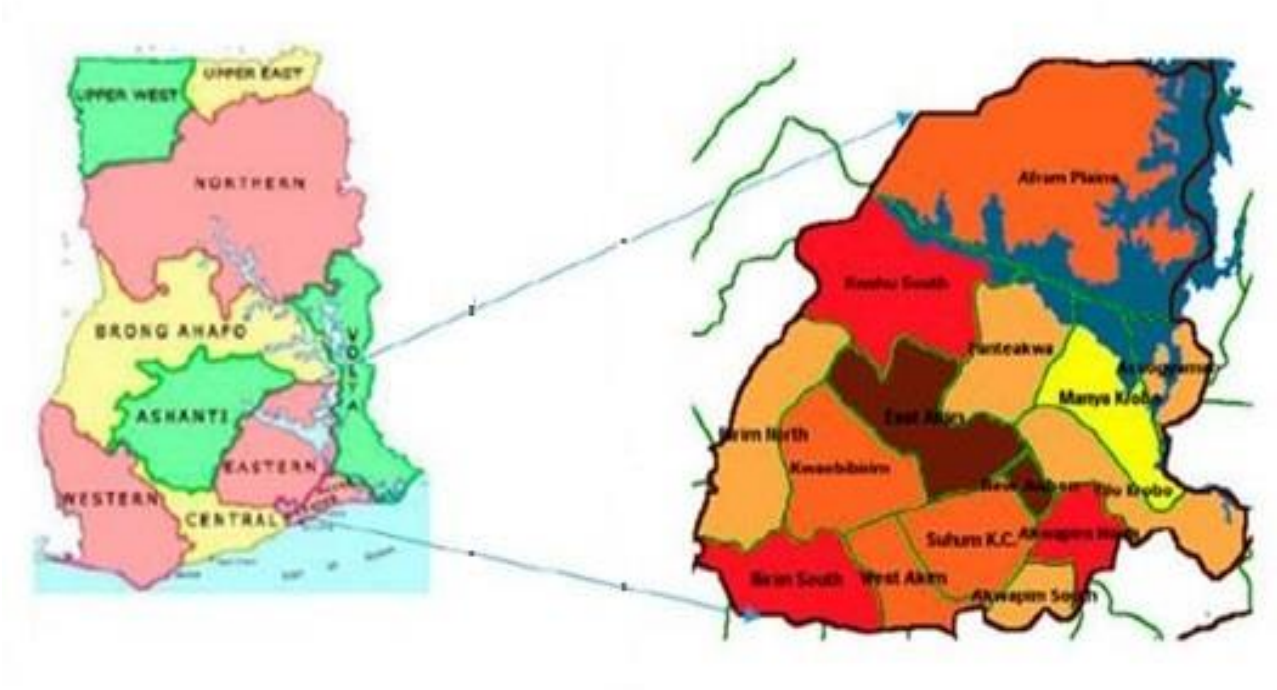
vegetable production as well as livestock rearing (Ministry of Food and Agriculture, 2016); a variety of farming activities that the researcher seeks to assess for the study. With agriculture being the dominant occupation in the region, there is the need to find out how farmers' knowledge, attitudes and practices in their activities directly hinge on the environment to inform policy directives and interventions.

The Eastern Region is the sixth largest region in Ghana and it shares boundary with five regions; namely, Greater Accra, Volta, Brong Ahafo, Ashanti and Central Regions. It is also one of the populous regions after Greater Accra and Ashanti Regions. The region falls within two ecological zones, namely, forest and Guinea Savannah. The forest zone constitutes 60% of the region's ecology while the remaining 40% is Guinea Savannah (Ghana Statistical Service, 2013). The region also experiences much rainfall patterns which support agricultural activities as a major occupation in the region.

The region is administered by a regional administration and local government structures; namely, districts assemblies and chieftaincies. It therefore has twenty-six districts and Municipal assemblies (as at 2018). These include: Brim South, Brim Central Municipal, Brim North, West Akyem Municipal, Akyem Manso, East Akyem Municipal, Suhum Municipal, Akwapim South Municipal, Akwapim North, New Juaben Municipal, Yilo-Krobo, Lower Manya, Asuogyaman, Upper Manya, Fanteakwa, Kwaebirem,Atiwa, Kwahu South, Kwahu East and Kwahu Afram Plains North, Asuogyaman, Ayensuoano, Upper West Akyem, Kwahu West Municipal, Kwahu Afram Plains South, Kwahu Afram Plains North, Nsawam Adoagyiri Municipal, Denkyembor, Akwapim South (Ghana Statistical Service, 2013).

The formal educational level of inhabitants in the region is very low. According to the 2010 Population and Housing Census, an average of 20% of all people's aged 15 years and older have never been to school while the majority; constituting 59% have Primary/JSS/Middle School education (Ghana Statistical Services, 2013). Even though agriculture is the dominant occupation in the region, quite a number of its inhabitants are also into commercial activities.

Figure 1.1: Map of the Eastern Region



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Relevant theories, concepts and empirical studies related to knowledge, attitudes and practices of sustainable environment are reviewed for the study. This chapter is presented in two sections. The first section reviews the theories of:

- Theory of Planned Behaviour (Ajzen, 2019)
- Integrative Model of Behavior Prediction by Fishbein (2000)
- Models of Public Communication of Science and Technology (Lewenstein, 2003)

The second section also reviews concepts and empirical studies such as:

- Meaning of Sustainable Environment
- Ways of Promoting Sustainable Environment
- Factors Influencing Sustainable Environment
- Sustainable Environment Activities/Practices
- Knowledge about Sustainable Environment
- Attitude towards Sustaining the Environment
- Relationship Among Biographical data and Practices of Sustainable Environment Activities
- Relationships Among Farmers' Knowledge, Attitude Practices of sustainable Environment Activities
- Public Participation in Sustainable Environment Activities

2.2 Theoretical Frameworks

This section reviews the theories of Planned Behaviour (Ajzen, 2019), Integrative Model of Behavioral Prediction (Fishbein, 2000) and the Models of Public Communication of Science and Technology (Lewenstein, 2003). These are discussed as follows:

2.2.1 The Theory of Planned Behaviour

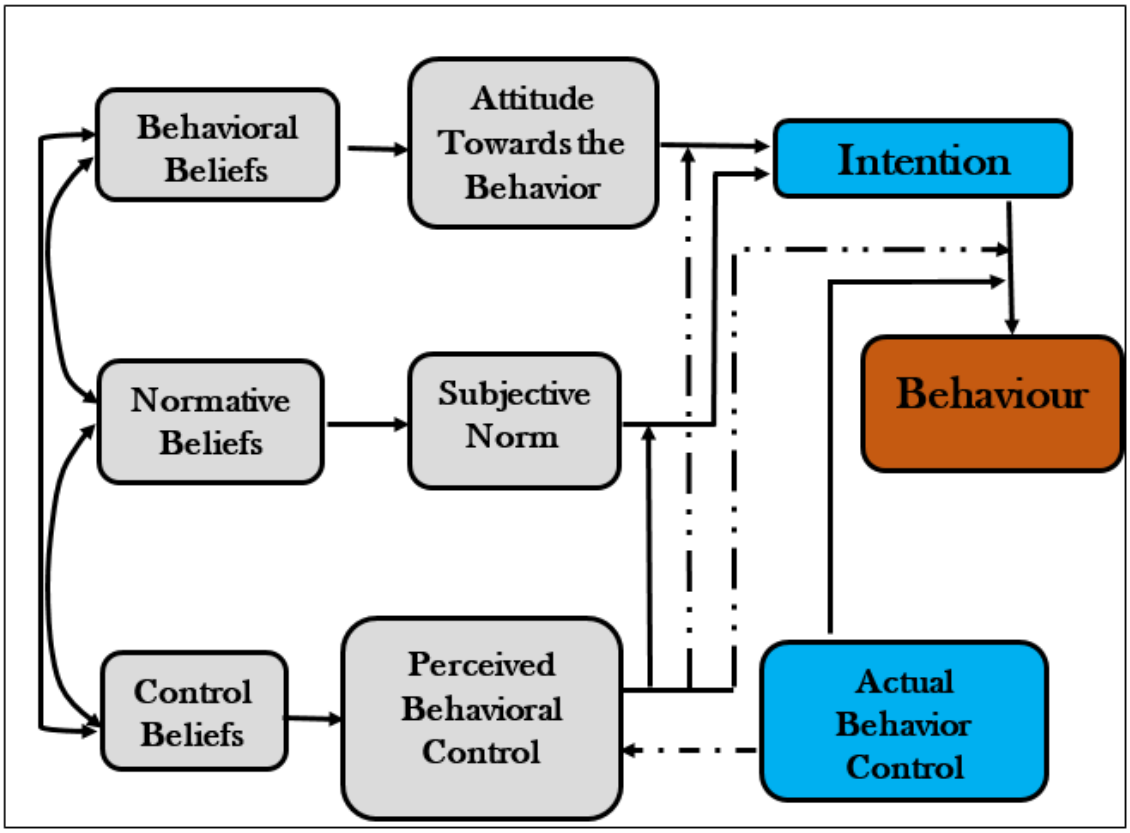
The theory of Planned Behaviour (TPB) is an extension of the theory of Reasoned Action by Fishbein and Ajzen (1975). The TPB constructed in 1991, has undergone series of modifications over the years until recent (Ajzen, 2019). The TBP is said to be one of the most frequently used theories for predicting human social behaviour (Ajzen, 2011). The theory basically suggests that individual's make behavioral intentions on the basis of careful consideration of available information (Corner and Armitage, 1998). In its earlier construction (Ajzen, 1991), TPB outlined the link between beliefs (being it subjective or normative) and attitude towards behavioral intention leading to the performance of a behaviour.

The TPB postulate that human behavior is directed by three kinds of concern, which include beliefs about possible consequences of the behavior (behavioral beliefs), beliefs about the what others expect within norms (normative beliefs), and beliefs about possible factors that may ease or hamper the performance of the behavior (control beliefs). The theory assumes that if all these factors are in their right aggregates will produce other factors. For instance, behavioral beliefs produce a favorable or unfavorable attitude toward the behavior; normative beliefs result in perceived subjective norm; and control beliefs give rise to perceived behavioral control or self-efficacy. The effects of attitude toward the behavior and subjective norm on intention are moderated by perception of

behavioral control. The underlying principle then is the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger should be the person's intention to perform the behavior in question. Finally, given a sufficient degree of actual control over the behavior, people are expected to carry out their intentions into when the opportunity arises. Intention is therefore assumed to be the direct antecedent of behavior. To the extent that perceived behavioral control is veridical, it can serve as a proxy for actual control and contribute to the prediction of the behavior in question

Behaviour is depicted by the theory as a function of behaviour intentions and perceived behaviour control. This implies that farmers' decisions to undertake sustainable environment activities are highly dependent on available information on the SEA and the farmers' intentions to sustain the environment. Meanwhile, the attitude towards generating sustainable environment intention is moderated by the farmers' ability to perform the behaviour together with their control over the intention to sustain the environment towards the performance of SEA. The depiction of TBP (Ajzen, 2019) is presented in Figure 2.1 as follows:

Figure 2.1: The Theory of Planned Behaviour



Source: Ajzen, 2019

Figure 2.1 illustrates Ajzen's (2019) Theory of Planned Behaviour. It shows how individual's intention to perform behaviour is influenced by a couple of factors. As indicated on Figure 2.1, an individual's decision to carry out an action/practice/behaviour is often influenced by a number of factors towards having intentions to perform the behaviour which Ajzen's (2019) terms as behavioral intention. Discussion of each of these factors are as follows:

Intention

Ajzen (2019) postulates that an individual's behaviour is influenced by his or her intentions which he described in his earlier construct as behavioral intention (Ajzen ,1991). Intention constitutes a central variable in the TPB. It is defined as the 'conscious

decision taken by an individual to either perform a behaviour or not' (Corner and Armitage, 1998, 12) or how motivated an individual is to perform a particular behaviour or not (Ajzen, 1991). An individual's behavioral intention is said to be either strong or weak. Fishbein (2000) explains that the stronger an individual's sense of behavioral intention, the more likely the behaviour will be performed by that individual.

As indicated on Figure 2.1, Ajzen (2019) explained that an individual's intention to perform a behaviour is determined by three factors; namely, behavioral beliefs, normative beliefs and control beliefs which are discussed as follows:

Behavioral Beliefs

Behavioral beliefs are among the three considerations Ajzen (2019) postulate to influence the performance of a behaviour. This according to Ajzen (2019) refers to the likely consequence individuals expect from his or her performance of a behaviour, in this case practice of SEA. Individuals will always consider the likely effects of their behaviour before performing it. Farmers will thus consider the likely effects of their practices of SEA before carrying out those activities. For instance, if a farmer considers that tree planting to yield more benefits, then according to the TPB, he or she is likely to perform the behaviour.

The theory further explains that behavioral beliefs in its aggregates produces favourable or unfavourable attitude. Attitude is therefore discussed as follows:

Attitude

The attitude towards performing a behaviour is said to be one of the main predictor of an individual's intentions apart from subjective norm. Attitude is defined as an evaluation of

the degree to which an individual feel about behaviour. Such an evaluation according Ajzen (2019) could be favourable or unfavourable. He further explains that a favourable attitude would mean a strong sense of behavioral intention and vice versa. These attitudes in my view could also be formed from the knowledge and beliefs that a person has about the behaviour. For instance, farmer's knowledge and beliefs about sustainable environment combine to form their attitude towards practicing SEA which intend determines their intention for practicing it.

Normative Beliefs

This is also one of the three considerations Ajzen (2019) identified as guiding human behaviour apart from behavioral beliefs and control beliefs. Normative beliefs according to him are the beliefs about the normative expectation of others. They are thus the beliefs that an individual has about the feelings of certain persons about the performance of a particular behaviour. Every individual is expected to behave in a particular way and this constitutes the normative norm. Within the context of this study, normative beliefs are the sustainable environmental practices within the norms of the communities that others expect them to perform. Normative beliefs as depicted in Fig. 2.1 also in its aggregates leads to subjective norms as follows:

Subjective Norm

It is defined as one's perception of the social environment that surrounds the performance of behaviour. Ajzen (1991) emphasizes that norms and values in every society tend to influence individuals to perform or not to perform a particular behaviour. In his earlier construct, Ajzen (1991) subjective norms were classified in two forms; normative beliefs and motivation to comply. According to the theory (Ajzen, 2019), the

effect of the attitude towards the behaviour and subjective norm on intention are moderated by perception of behavioral control.

Perceived Behavioral Control

This is defined as an individual's perception of how the performance of a behaviour will be easy or difficult (Ajzen, 1991). It could also be seen as the personal control of an individual's behaviour over a decision to perform the behaviour or not. Such decisions according to Fishbein (2000) are based on the capacity and available resources to the individual. Thus, an individual with requisite capability and resources is likely to have a positive behavioral control towards the performance of behaviour. This would mean that farmers who have sustainable environmental capabilities as well as resources are likely to sustain the environment.

Actual Behaviour Control

This basically means having control over your intentions to perform a behaviour. Ajzen (2019) explained that given a sufficient degree of actual control over the behaviour, individuals are expected to carry out their intentions when the opportunities present itself.

It could be seen that the TPB (2019) although a modification of the initial construct in 1991 still failed to acknowledge knowledge as an important factor towards the performance of a behaviour. It is worth noting that the absence or presence of a behavioural knowledge could go a long way to influence its practices.

2.2.2 The Integrative Model of Behavioral Prediction

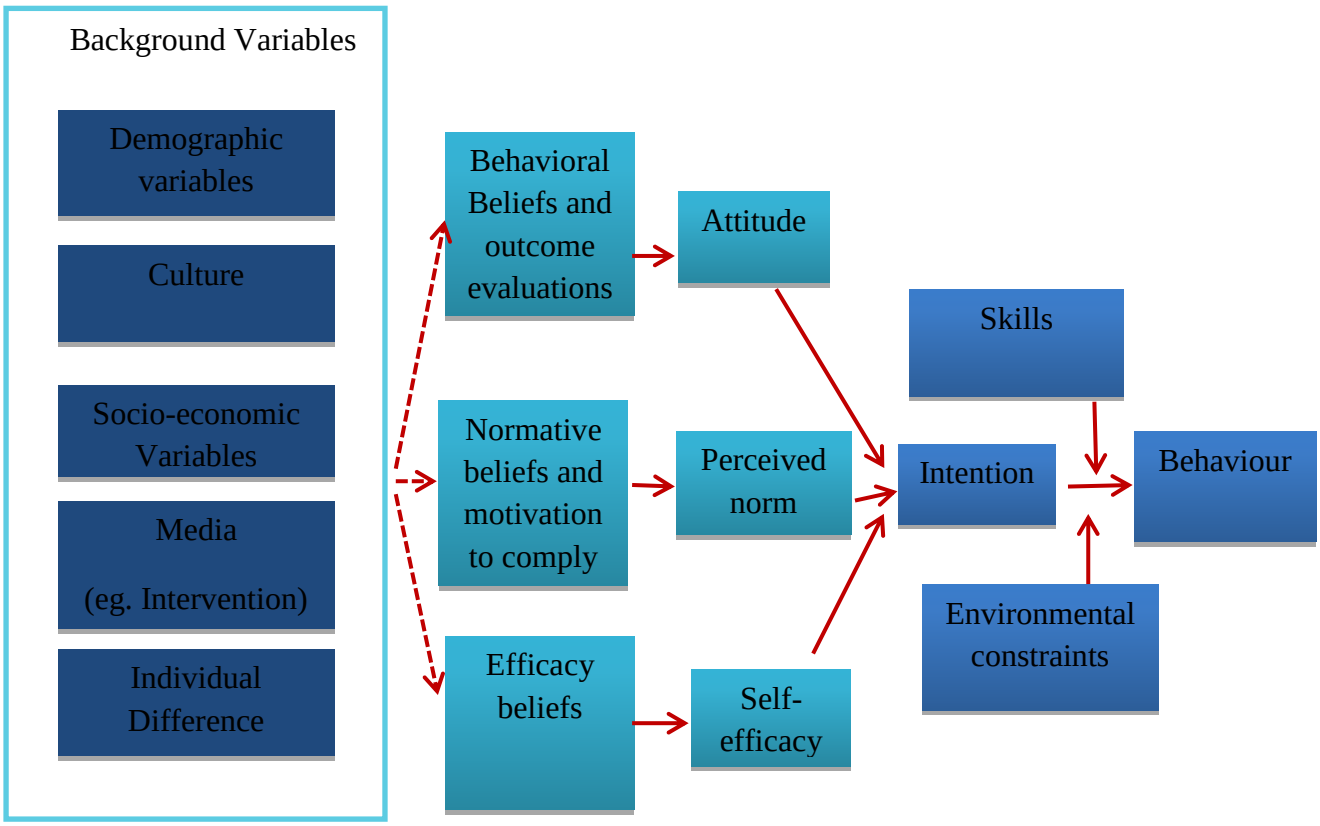
The Integrative Model of Behavioral Prediction (IMBP) is the underlying model for this study. The IMBP is one of the recent theories developed by Fishbein (2000) in predicting social behaviour. The theory generally holds that an individual's behaviour is influenced by a number of related factors in different ways. In spite of this, Fishbein (2000) explains that only a small number of these variables are needed to predict behaviour (action/practice in the context of this study). For him, an understanding of these variables and their roles in behaviour prediction enables individuals to adopt behaviour change interventions.

Behaviour according to the IMBP is influenced by a number of factors namely: intention, skills to perform the behaviour, environmental constraints and other background variables. Fishbein (2000) explains that behaviour is directly influenced by intention, skills and environmental constraints and indirectly influenced by these background variables. According to him, a particular behaviour is likely to occur when an individual has a strong sense of intention to perform the behaviour together with the required skills and abilities to perform that behaviour with no environmental constraints against the performance of the behaviour.

Unlike the theory of Planned behaviour which holds that individuals will perform behaviour perceived to be good and fails to perform behaviour perceived to be bad, the IBMP accounts for any behaviour (good or bad). It rather emphasizes that individual's act on their intentions to perform behaviour when they have the requisite skills and intention to do so without any impediments by any environmental constraints. This implies that farmers' will practice SEA when they have a strong intention for it, skills

and abilities to do so and are also devoid of any environmental constraints to practice. Figure 2.2 depicts the IMBP.

Figure 2.2: The Integrative Model of Behavioral Prediction



Source: Fishbein (2000)

As depicted on Fig. 2.2 the model shows that the occurrence of any behaviour is influenced directly by three factors; namely, a strong sense of intention to perform the behaviour, skills to perform the behaviour and the absence of any environmental constraints. The model further explains that the performance of behaviour is indirectly influenced by certain background variables, namely, demographic variables, culture, socio-economic variables, media and individual differences. Detailed explanations of these variables are as follows:

Intention

As shown on Fig. 2.2 intention is one of the variables which directly influence the performance of behaviour. Intentions according to Fishbein (2000) refer to the indication of an individual's readiness or decision to perform a particular behaviour. The intention to perform behaviour is said to be determined by three factors namely:

- Attitude towards performing the behaviour
- Perceived Norms concerning the behaviour
- Self-Efficacy regarding performing the behaviour.

Attitude

An individual's intention to perform behaviour is determined by the individual's attitude. Attitude according to Fishbein and Yzer (2003) refers to an evaluation of how favorable or unfavorable performing a particular behaviour will be to a person. Attitude is said to be either experiential or instrumental. Experiential attitude according to Fishbein (2000) is an individual's emotional response to performing behaviour whereas instrumental attitude is determined by the outcome of performing the behaviour. It is therefore implied that farmers' attitude towards SEA is an evaluation of how favorable or unfavorable practicing SEA will be to them.

Perceived Norm

Perceived norm is also said to be one of the determinants of an individual's intention to perform behaviour. It is said to be the social pressures one expert from performing a particular behaviour. Fishbein (2000) identifies two forms of perceived norms as; injunctive and descriptive norms. The injunctive norm refers to the extent to which social networks are expected to support the performance of a particular behaviour. Descriptive

norm on the other hand refers to the extent to which members of the social network perform the behaviour. This implies that perceived norms as a determinant of farmers' intention to practice of SEA is highly dependent on the extent to which members of their communities and families support such actions as well as the extent to which such members also practiced the activities themselves.

Self-efficacy

An individual's intention to perform behaviour is also said to be determined by the individual's self-efficacy. Self-efficacy according to Fishbein (2000) refers to an individual's perceived capabilities to perform behaviour effectively. An individual's self-efficacy is also influenced by his or her efficacy beliefs.

Skills

Skills as depicted on Fig. 2.2 is one of the variables Fishbein (2000) identifies as having a direct influence on the performance of behaviour. The model holds that an individual who has a strong sense of behavioral intentions is likely to perform behaviour when he or she has the needed skills to do so. Skills in this sense refer to the actual capacity of an individual in the form of knowledge, capability and abilities required to perform the behaviour. Fishbein (2000) explains that behavioral change intervention like capacity building and awareness raising is required for an individual with a strong sense of behavioral intention and the absence of any environmental constraints to who fails to enact that behaviour. This means that knowledge, skills and abilities could serve as a behavioral change intervention. For example, the failure to enact behaviour by a farmer with a strong sense of intention to practice SEA, without any environmental constraints to perform this behaviour could be empowered to be equipped with requisite knowledge,

skill and abilities to practice sustainable environment activities. The knowledge, skills and abilities become behavioral change intervention.

Environmental Constraints

Environmental constraints are said to be a major impediment in the performance of an individual's behaviour. The IMB holds that if an individual has a strong sense of behavioral intention and the individual possess the requisite skills, behaviour is only likely to be performed if there are no environmental constraints. This implies that an environmental constraint is a major determinant of behaviour. An example of environmental constraints could be policy that surrounds a behaviour or action. Thus, no matter the strength of an individual's behavioral intention and the skills possessed by such a person, performing a particular behaviour is impossible if there are environmental constraints.

Background Variables

Apart from the variable discussed earlier, Fishbein (2000) identifies background variable as additional factors that influence the performance of behaviour indirectly. These variables are said to include demographic variables, culture, media intervention, individual differences and socio-economic variables. Fishbein (2000) explains that these variables tend to influence the performance of behaviour in varying ways. For instance, being female, young or old or our individual differences may affect the performance of a particular behaviour in different ways. It is as a result of this that the study sought to find out levels of farmers' KAP in relation to selected biographical data of sex, education and age.

The IBMP was used by the researcher as the underlying model of the study even though the other theories were reviewed to shape the researchers' understanding of the variables under the study and also throw light on the underlying theory. For instance, the IBMP unlike the other behavioral prediction theories and models, explains that individual's, attitudes and skills come together to form beliefs which tend to influence behaviour that are often translated into actions. It also implies that gaining skills and abilities on issues like sustainable environment does not lead to attitudinal change that can bring about sustainable environment practices. Rather a change in attitudes together with one's personality, environment and culture determines the rate of change that enforces people to develop better attitudes which are reflected in their practices. Hence, the exposition of rural people to requisite environmental education could promote SEA.

The model however fails to acknowledge that knowledge is also one of the variables that influences enacting of a behaviour. An individual's knowledge about sustainable environment may tend to inform his/her performance of a behaviour, in this case, the practicing of SEA. Meanwhile, knowledge is missing from the IMBP. Additionally, the model failed to establish the kind of relationship existing between knowledge, attitudes and skills towards the performance of a behaviour. There is the need for a holistic model that outlines all the variables that could influence practices of sustainable environment activities as well as the kind of relationship existing between KAP of SEA.

There is therefore the need to tap into the knowledge, attitudes and skills available to farmers on SEA as a prerequisite to design requisite educational programmes to cause a change in their KAP so as to sustain the environment for the future generation.

2.2.3 Models of Public Communication of Science and Technology

Uncertainties and skepticism bordering modern science and technology, including environmental issues and concerns led to the identification of four models in explaining public communication activities of science and technology (Lewenstein, 2003). The four models identified by Lewenstein (2003) are:

- Deficit model
- Contextual model
- Lay expertise model
- Public Participation Model

The Deficit Model

The information deficit model suggests that the uncertainties and skepticism towards modern science and technology is as a result of the lack of adequate knowledge about the goals, values and principles of science and technology.

The model is associated with the gap that exists between experts who are knowledgeable about science and technology and non-experts who lack the information. The model presupposes that there should be information sharing between experts and non-experts to help bridge the gap, termed as 'knowledge deficit'. With reference to this study, this model suggests that sustainable environment knowledge should be shared between environmental experts and ordinary people like grassroot farmers whose activities directly impinge on the environment.

As a result, national goals on technological innovations and economic development have been introduced through this model to provide information/ science literacies to help bridge the gap. This approach is what Lewenstein (2003) termed as the 'deficit model'.

Despite the remarkable contributions made by the deficit model of communication, some scholars have raised a number of criticisms against the approach. Among them was the failure to communicate science literacy within individuals' context to bring out meaning and practical relevance to individuals. This model has been in use for over 25 years and yet the science knowledge gap has not been bridged. These concerns and others led to the introduction of the three other models, namely, contextual, lay expertise and public participation model to provide understanding of what the problem is, how to measure it and how to address the problem.

Contextual Model

The contextual model of information acknowledges that individuals do not respond to information as empty vessels but rather process information according to socio-psychological factors shaped by their previous experiences, cultural context and personal circumstances. This means that individuals receive information within a particular context, which tends to shape how they respond to the information. For instance, the aspects of the goals and indicators of the Sustainable Development Goals on environmental conservation and sustainability are received by indigenous people like farmers in their cultural and routine farming practices context. This means that the specific demands of the global goal will be transcended into local context before usage.

The model also recognizes that social systems and public communication systems have the ability to amplify or dampen people's concern on issues. For instance, social systems like the family and institutions like schools together with communications systems like the media can positively or negatively influence local peoples' concerns on conservation issues through their utterances and practices.

The contextual model therefore provides guidance in constructing messages about science within the context of individual that would be useful and meaningful to development issues like sustainable development. This implies that even though the Sustainable Development Goals are global in nature, implementing strategies and interventions ought to target contextual model of information by translating the goals and their specific indicators into the context of farmers to bring out the meaning and usefulness of SDGs. By so doing farmers will develop positive attitudes towards conservation issues that can inform them about their practices.

The Lay Expertise Model

This model according to Lewenstein (2003) acknowledges that every individual has a level of knowledge accumulated from lives and histories of real communities which is popularly known as the "lay knowledge". The model argues that scientists are uncertain about the level of knowledge possessed by lay people and therefore fail to recognize them as 'additional knowledge needed to make real-world personal or policy decision (Lewenstein, 2003, p. 5.).

The model assumes that indigenous knowledge may be relevant in solving problems like technical knowledge and ought to be central to intellectual knowledge and development. Critics are of the opinion that indigenous knowledge cannot be factual since they cannot be empirically tested by scientific methods. Such knowledge is therefore considered as anti-science.

It should however be emphasized that indigenous knowledge frequently influences policy implementation and intervention strategies. Even though technically such

knowledge is considered as anti-science, policies and implementation strategies are often technical and have less meaning in the practical lives of beneficiaries. Hence, policy makers and experts ought to tap into indigenous knowledge by accepting and incorporating practical aspects into technical knowledge to enable beneficiaries appreciate policies and intervention meant for them. By so doing, beneficiaries will blend that of indigenous knowledge and factual ones, thereby translating them into practice.

Public Participation Model

The 'public participation model' also known as or the 'Public engagement model' emerged as means of building social trust of science and technology policies. The model focuses on series of activities intended to enhance public participation, thereby building trust in science policies. Among some of these activities are consensus conferences, public juris and deliberate technology assessment.

The model also aims at empowering the general public through their participation in any of the scientific activities designed to build social trust. The term 'participation' or 'engagement' as used in this model imply getting public concerns in scientific policy formulation or involving the public to take part in the control of scientific discoveries and policies. Participation in the researcher's view however goes beyond this. It means the active involvement of all stakeholders in the entire processes of interventions geared towards development. Thus active involvement of all forms of decision making through to evaluation stages. In the context of this study the active involvement of farmers on sustainable environmental decisions (policies), implementation through to evaluation

stages are needed. This could allow individuals to own and manage environmental resources due to their active involvement in decisions surrounding the issues.

2.3 Summary of models

All these models are relevant and requires an integration of all into a holistic approach towards scientific and technological discoveries and for that matter environmental sustainability. Inferences from these models show that there is the need to bridge the knowledge gap between experts on environmental science and lay people. This is because issues of the environment affect all. Environmental issues thus have no boundary.

Information sharing and awareness raising are therefore key in this approach, especially among grassroot farmers whose activities directly affect the environment. In this regard, farmers should be directly involved in all issues that boarders their lives right from decision making through planning to implementation stages so that their indigenous knowledge and practices together with their socio-cultural, economic and personal situation could be brought to bear on every intervention. By so doing, interventions would be appreciated, promoted and implemented effectively by all rather than grassroots always serving as mere beneficiaries of planned interventions. For instance, the worldwide global goals also known as the Sustainable Development Goals would be meaningful and appreciated by grassroots like farmers if they are part and directly involved in stakeholder consultation and intervention programmes in the country. This therefore calls for an Integrated Model of Sustainable Environment.

2.4 Related Literature Review

This section reviews concepts and empirical studies related to the study of farmers' knowledge, attitudes and practices of sustainable environment activities which are discussed as follows:

2.4.1 Meaning of Sustainable Environment

Sustainable environment is a major component of sustainable development. The concept of Sustainable development emerged from a report by the World Commission on Environment and Development (1987). The Commission used the concept to denote "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The concept of sustainable development was used within this period to describe environmental issues in development policies. The concept has however evolved over time to include socio-economic aspects of human life ever since the Johannesburg Summit was held in 2002 (UNESCO, 2005). Sustainable development in recent times is therefore identified with three pillars; namely, environment, social and economic development. The composition of sustainable development with these three pillars is challenged by Kuhlman and Farrington (2010). They emphasized that the original meaning of the concept was linked to development and preservation of limited resources for an 'indefinite future' rather than economic and social spheres of development. Additionally, environmental sustainability is said to be the prerequisite for socio-economic sustainability (Morelli, 2011, p.17). This implies that environmental sustainability is a major pillar of sustainable development upon which the others are built.

With this background, the concept of sustainable environment could be better understood by taking a critical look at the concept of sustainability. Just like the concept of sustainable development, sustainability has recently been used loosely and general to mean anything that is "good" and continue to exist for a longer period (Morelli, 2011, Kuhlman and Farrington, 2010). Kuhlman and Farrington (2010) assert that the concept of sustainability has been reduced to embrace socio-economic spheres of life for policy appraisal purposes. Sustainability according to them is best used to explain environmental resources and development related issues. Thus, preserving limited environmental resources for an 'indefinite future'. The concept of sustainability basically implies using environmental resources judiciously to meet current and future generational needs in the same way.

This implies that sustainability is technically an environmental concept in development spheres. In spite of this, different scholars have defined the concept differently. Goodland (1995) for instance defined environmental sustainability as the 'maintenance of natural capital' (p.2). According to him the natural capital can be maintained when socio-economic systems are held in a balance within the limit of ecosystems. He further emphasized that this is possible when there is improvement in production and consumption.

In recent times, Morelli (2011) has defined environmental sustainability as 'meeting the resource and service needs of current and future generations without compromising the health of ecosystems that provide them'. In a more specific sense, Morelli (2011) explains that environmental sustainability implies a 'balance, resilience and interconnectedness' which allow humans and society to address their needs without

causing harm to the ecosystem to renew itself to enable it continuously provide support over time.

From the above discussions and definitions, sustainable environment could be seen as the ability of human society to utilize existing environmental resources judiciously while conserving and enabling these resources to regenerate itself to meet future generational needs as well. This could be possible through environmental education (Bedural, 2018).

2.4.2 Ways of Promoting Sustainable Environment Activities

Achieving sustainable environment is one of the greatest challenges of the world today. This is due to the constant instability of the environment and socio-economic systems which are mostly caused by industrialization, increased food production for a rising population, urbanization, just to mention a few (Rabinowicz and Chinapah, 2014; Sharma, 2012). A number of interventions and strategies have therefore been put in place to help raise concerns for creating a balance in the use of scarce resources. These range from participatory approaches to consensus building.

Environmental education has been postulated as key pillar to achieving environmental sustainability (Bedural, 2018; Waitling and Zhou, 2011, Laurie; Nonoyama-Tarumi, Mickeown and Hopkin, 2016)). Conservation of Nature and Natural Resources (cited in Bedural, 2018) defined environmental education as:

> The process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his biophysical surroundings. It also entails practice

> in decision-making and self-formulation of a code of behavior about issues concerning environmental quality (p. 60).

Environmental education in this regard equips people with the requisite knowledge, attitudes and skills needed to be translated into sustainable practices.

It is in line with this that Chi (2015) identified three typologies of environmental education as education about the environment; education in the environment and education for the environment. Education in the environment according to Chi (2015) is the educational techniques or practical approaches needed to facilitate activities in the physical environment while education about the environment refers to the raising of environmental awareness to inculcate environmental values within individuals in order to establish a harmonious relationship between people and the environment. The last typology, education for the environment is the type that aims at preserving the environment while at the same time improving individual's standard of living through specific actions and developing environmental knowledge and attitudes to address any environmental issues. A holistic integration of all these typologies could go a long way to position the individual theoretically and practically to sustainably utilize natural resources.

Attitudinal change is also emphasized as one of the variables needed to promote environmental sustainability. A number of studies have proven that attitudinal change is a determinant of individuals' intentions to perform behaviour, thus undertaking actions which are aimed at sustaining the environment (Yauntari, Gestel, Straleen, Widianarko, Sunoko and Shorbib 2015; Hirsh, 2014; Walpole and Goodwin, 2001; Fishbein, 2000 and Ajzen 1991). Hirsh (2014) for instance asserts that attitude plays a critical role in ecological health. He also emphasized that collective actions put so much strain on the

environment so for human society to continue to be in existence for a long time there is the need for behavioral change.

Again, policy enforcement and awareness raising are other identified means of promoting sustainable environment (Hirsh, 2014 and Lewenstein, 2003). Environmental sustainability policy is recognized as a major component for promoting sustainability issues. These policies are mostly formulated by United Nations and translated into national ones as guiding principles to help promote global sustainability agenda at the national levels (UNESCO, 2005). National stakeholders are then expected to disseminate the information to citizens. This is however not the case. Many of these principles are not well enforced nor implemented at the grassroots levels but rather ends up in national policy documents. For instance, even though there is Global Development Agenda (Sustainable Development Goals) to be achieved by 2030, many grassroots whose activities directly impinge on the environment are not abreast with such issues. They even at times engage themselves in activities which conflict with such principles. There is therefore the need to increase awareness on environmental sustainability policies as well as strengthening its enforcements.

Promotion of local people in decision making is another way to promote sustainable environment. Walpole and Goodwin (2001) are of the view that implementing projects that promote local communities' involvement in decisions regarding conservation is a major attempt for promoting sustainable environment. According to them, the involvement of local communities in management decision engenders local support and also provides them with benefits which could cover up for any opportunity cost for conserving the environment.

This implies that local communities' involvement in decision making is a catalyst for enhancing environmental sustainability. This is so because firstly, one is bound by any decision he/she takes. Involving local members in issues that directly affects them enables them to implement actions geared towards achieving goals. It also enables them to influence others to do same. Secondly, it helps to promote community ownership and management. Local communities often tend to own, protect and manage projects that directly engage them right from the onset to the completion stages and by so doing, sustainability is assured.

2.4.3 Factors Influencing Sustainable Environment

Environmental degradation is a major problem facing the world today. Globally, agriculture is identified as the major form of human activity that causes about 80% of land degradation (Tesfahunegn, 2017). This situation is said to be more severe in Africa since a greater percentage of the population have their livelihood highly dependent on natural resources such as lands and forest. Other human activities that constantly degrade the environment include mining, infrastructure and urban expansion, charcoal production, fuel collection, illegal logging, uncontrolled fire and livestock overgrazing (Tesfahunegn, 2017).

Different factors have therefore been outlined to influence sustainable environment worldwide. Blake (1999) identified one of these factors as conflicting policies of national and individual practices. Blake (1999) emphasized that most often than not national policies are based on "information deficit model of participation" while individuals most often rely on 'knowledge based in the lives and histories of real communities' (Lewenstein, 2003: p. 4).

This therefore presupposes that not all national policies on sustainable environment are implemented by individuals at the community levels. This mostly occurs when experiences of local people are not supported by national policies. Community members tend to rely on accumulated experience from their routine practices, norms and values which may not necessarily be in line with national policies. For instance, farmers tend to rely on routine traditional agricultural/ farming practices in their communities and not all these practices may be approved in national policies. When this happens some kind of tension begin to exit between polices and actual practices in the field. This kind of tension could however influence sustainable environment positively or negatively.

Similarly, Krozer (2016) postulates that" innovation-based income growth" tends to reduce environmental impact. According to him any income generated out of innovations from the global markets end up reducing environmental impacts. This implies that the higher the innovations, the stronger sustainable environment is ensured. Nevertheless, Krozer (2016) points out those global markets for sustainable innovation are often hampered by protectionist policies. In addition, Krozer (2016) asserts that sustainable global innovators are not duly recognized and this tends to affect sustainable environment.

Additionally, Krozer (2016) assertion could be true because the quest for income and income growth most at times exert pressure on scarce environmental resources to the extent that it ends up degrading the physical environment which in turn affects conservation and sustainability agenda. Even though some scholars may be of the view that recent global development through innovation and technology tend to impede environmental conservation and sustainability. The researcher of this study however does

not support this. The issue is that recent innovations and technologies utilize limited environmental resources in such a way that those current and future generations will both benefit equally, thereby promoting sustainable development tenet.

Walpole and Goodwin (2001) also pointed out that the high cost associated with environmental conservation like adopting "wild life damaging crops" have negative effects on local's attitudes towards sustainable environment whereas benefits of conservation like 'game meat' bring positive effects (p. 160). It is therefore implied that individuals will consistently behave positively toward environmental conservation once they have positive attitudes towards it and vice versa. This is however not always the case. There are times that people are not influenced to conserve the environment even though they may have all the needed knowledge to practice it. This could be due to the existence of uncontrollable factors which Fishbein (2000) identified as environmental constraints.

For instance, Borges, Lansink, Ribeiro and Lutke (2014) assert that producing food for an increasing global population often comes without compromising the use of environmental resources. Agricultural practices according to them determine the level of food production and the extent of impact on the environment. This means that negative agricultural practices could negatively impact on sustainable environment.

2.4.4 Sustainable Environment Activities/ Practices

Sustainable environmental activities (SEA) generally refers to all activities undertaken by individuals to protect and sustain available natural resources in their communities so that they can be useful and beneficial to future generations as well as themselves in the

same way. Even though natural resources basically consist of land, water bodies, air, forest, just to mention a few, their availability differs across communities. This implies that the nature of sustainable environment activities may differ from place to place. In support of this, the World Bank (2006) identified various Ghanaian ecological zones with specific sustainable land management practices. For instance, cover crops were identified with the transitional zones of Ghana and crop rotation and organic matter within the guinea savannah zone.

It is however worth noting that there are generally accepted SEA which cut across communities. Interestingly, communities in the Eastern Region being dominant farming areas are homogenous in nature and can boast of all these basic natural resources. In effect, activities that can sustain these resources cut across the communities. Among the major sustainable environment activities identified by Salas-Zapata, Ríos-Osorio and Cardona-Arias (2018) are recycling and tree planting. Crop rotation, planting cover crops, applying organic matter, mulching, just to mention a few are also identified as sustainable land management practices in Ghana.

With regards to general environmental practices, it could be seen that globally, **f**armers in the 21st century are faced with a number of agricultural challenges. Among these are improving production systems to feed an increasing world population and adoption of agricultural practices which aims at sustaining the environment. It has therefore become necessary in implementing agricultural practices which seek to increase food production without compromising environment sustainability.

It is in line with this that Borges et al (2014) assert that the type of agricultural practices determines the level of food production and damage to the environment. The World Bank for example, emphasized that expansion of farming; particularly in cocoa production and conversion of off-forest reserves into agriculture increased land degradation rate in Ghana. Different strategies and interventions are promoted globally to achieve this course. Among these is the conduct of different studies into the adoption rate of environmental conservation practices and farmers' intention to adopt sustainable environment practices so that requisite intervention could be put across. Additionally, some specific government policies have also been formulated towards this course. Among those policies in Ghana include government reforestation programme and food and agriculture sector development policy.

In a study conducted by Borges et al (2014), using the TBP to understand farmers' intentions to use natural improved grassland, it was found out that farmers' intentions to use the natural improved grassland innovation was influenced by their evaluation of the improved natural grassland, perceived social pressure on its usage and the farmers' own perceived capabilities to adopt the innovation. This means that farmers' adoption of any sustainable practice is directly linked to attitude, subjective norms and perceived behavioural control. This implies that to achieve sustainable environment, there is the need to put in place interventions which are geared towards attitudinal change of farmers (Fishbein, 2000). This may include empowerment programmes, awareness raising and provision of technical support.

Similarly, Wauters and Mathijs (2014) also in a study on the adoption of Soil Conservation Practices in Belgium found out that Belgians adopted practices such as cover crops, reduced tillage and buffer stripes application as sustainable practices.

2.4.5 Knowledge of Sustainable Environment

Lewenstein (2003) postulated that 'people learn best when facts and theories have meaning in their personal lives" (p.2). Environmental protection and sustainability policies and measures often come with complex facts and theories which have little or no meaning in individuals' personal lives. When this happens individuals tend to rely on societal judgments or knowledge of nature acquired from routine practices. For instance, some of the goals and indicators of the seventeen Sustainable Development Goals are so complex that grassroots like farmers may find it difficult to comprehend even when exposed to them. In such a case, farmers will rely on "knowledge based in the lives and histories of real communities like local farming or agricultural practices' (Lewenstein, 2003, p.4) and experts agricultural extension officers.

Hirsh (2014) also noted that knowledge on environmental issues and awareness of information play critical role in promoting sustainability practices. According to him people with greater knowledge and awareness of environmental issues are more likely to act in a sustainable manner than those without it. For instance, farmers who have environmental conservation knowledge and are aware of the Sustainable Development Goals 7, 13 and 15 which talk about affordable and clean energy, climate action and life on land respectively are more likely to engage in conservation practices to promote SDGs.

On the basis of these assertions, some scholars have raised concerns about the relationship between knowledge and environmental management and how different classes of individuals' knowledge influence environmental conservation management. As a result, different types and sources of knowledge have been identified as 'local knowledge' and scientific knowledge' (Olson and Folke; Cash et al and Reid et al as cited in Raymond, Fazey, Reed, Stringer, Robinson and Evely, 2010). These scholars are also of the view that an integration of the two types and sources of knowledge could help address recent complexities of environmental management.

Even though these scholars are of the view that developing approaches to integrate local and scientific knowledge could promote environmental management, Raymond, Fazey, Reed, Stringer, Robinson and Evely (2010) stress that the integration could have challenges. According to them, there are different perspective of what constitute knowledge and how individuals come to know. They emphasized that many different forms of knowledge have been discussed in environmental literature and outlined as locally specified or generalized over a /region, formalize, expressed expertise, articulated in ways accessible to others and embedded in traditional rules and norms. According to them, these knowledge types cut across each other and affect the integration exercise.

Environmental knowledge in literature has been classified in three broad areas as:

- Localized, experiential or indigenous knowledge (local knowledge)
- More formalised scientific knowledge
- Hybrid knowledge (Lewenstein, 2003).

Localized, experiential or indigenous knowledge (local knowledge)

It is seen as the local knowledge held by a group of indigenous people that are unique to a specific culture (Howden and Davis as cited in Raymond et al, 2010). It is also classified as knowledge held by a particular group of people about their ecosystem in an interplay relation between organisms and their environment. In addition to this Boiral as cited in Raymond et al (2010) refers to local knowledge as 'tacit which according to him means unconscious knowledge available to individuals without articulation but has influence on the thinking and behavior on the person. It also identified by Frezey (cited in Raymond et al, 2010) as a form of knowledge which is not articulated in a form that is accessible to them.

Formalised Scientific Knowledge

This is seen as a systematic recorded knowledge or practice that has given rise to a scientific method which focuses on agreed principles of study, including reliability and validity. This form of knowledge is often identified as 'explicit'; it exists in written form and it is widely accessible. This form is seen as 'formal' knowledge; meaning that it passes through strict and universally acceptable rules and principles for a particular use (Frazey, cited in Raymond et al, 2010).

Hybrid Knowledge

This is the kind of knowledge that is formed from an integration of an interdisciplinary or multiple-disciplinary research. This means that even though each discipline has its own scientific knowledge, integrating with another discipline also with its own scientific knowledge may end up producing different and unique knowledge that is not common to them.

In addition to the above some scholars have also outlined education to be a major contributor to individuals' knowledge levels of sustainable environment (Rico, 1998; Waitling and Zhou, 2011, Laurie, Nonoyama-Tarumi, Mickeown and Hopkin, 2016). Rico (1998) for instance explained that, the type and level of education received by people become the pointers to the opportunities that people have both to minimize or resist the negative impact of environmental problems on their lives and to develop methods for using and managing resources that ensure that these are protected and that the process is a sustainable (p. 12).

2.4.6 Attitude towards Sustaining the Environment

Attitude is seen as one of the key variables which directly influence the performance of a behaviour, action or practice. Attitude is defined as the 'degree' to which execution of behavior is positively or negatively (or favorably or unfavorably) evaluated by an individual (Fishbein, 2000; Fishbein and Yzer, 2003; Borges, Lansink, Ribeiro and Lutke, 2014). Attitude has been identified by different scholars as a factor that tend to influence environmental sustainability behaviour, actions or practice (Hirsh, 2014; Aregay, Minjuan and Tao, 2017; Wang, Lassoie and Curtis, 2006; Lewenstein, 2003 and Waaple and Goodwin, 2003). Lewenstein (2003) for instance asserts that local support for sustainable environment has been recognized as an important element for biodiversity conservation in recent years. These scholars have identified positive or favorable environmental attitudes as a strategy for practicing environmental sustainability activities. For example, Wang, Lassoie and Curtis (2006) emphasized that attitudes and feelings of people concerning sustainability policies affect their behavior positively or negatively. They explained that individuals tend to develop positive attitudes when they

are directly involved in decisions and planning of environmental conservation and sustainability issues.

This is emphasized by Lewenstein (2003) when he asserted that locals' supports are built from their active participation in decisions regarding the environment. It is therefore implied that active participation of grassroots in decision regarding conservation is necessary for ensuring a sustainable environment. The truth is that most individuals are bound by their own decisions. Thus, such persons would always go to the extreme to mobilize scarce resources in taking actions or implementing decisions their decisions.

Another major source of developing environmental attitudes is through education. A number of studies have emphasized that providing environmental education ends up providing favourable environmental attitudes in individuals (Bedural, 2018; Aini, Laily, Nurizan, Azizah, Zuroni, and Norhasmah, 2006 and UNESCO, 2002). UNESCO Agenda 21, Manifesto for education for instance emphasizes that "Education is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making" (UNESCO, 2002, p. 7)

2.4.7. Relationship between Biographical Data and Practices of Sustainable Environment Activities

An individual's biographic data are said to influence the performance of his or her behaviour indirectly (Fishbein, 2000). Different studies have shown that people at different ages and differences in educational backgrounds tend to have different attitude and behaviour towards sustaining the environment. Also, different studies have shown

contrasting finding on the relationship existing between age education and sustainable practices.

For instance, with regards to age, Wiernik, Ones and Dilchert (2013) in their examination and meta-analyses of existing data from relevant studies between 1970 to 2010 found out that older people are more likely to conserve environmental resources than the younger ones. Older people according to them have positive environmental attitude which are translated into sustainability practices. On the contrary, Fransson and Garling (1999) also through a meta-analyses of data from relevant studies also found out that younger people are more concerned with environmental conservation than older people. Their findings showed that four out of six attitude scales were negatively correlated with age. According to them, younger people tend to support environmental conservation actions than the older ones since the older people most often perceive environmental solutions as threat to their livelihoods activities. This study would clarify these contrasting views by examining the relationship between framers' age and their sustainable development practices.

For education, Rico (1998) opined that the type and level of education of an individual tend to influence his/her level of interaction with the environment. According to her, the nature of education provided to an individual enables him/her to manage or damage environmental resources. In support of this, Laurie, Nonoyama-Tarumi, Mickeown and Hopkin (2016) highlighted that education for sustainability is a means of building people's capacity to promote sustainable development. This was reflected in a study that found out that sustainable knowledge, attitudes and practice were more among highly educated Malaysians than the less educated ones (Aini, Laily, Nurizan, Azizah, Zuroni

and Norhasmah, 2006). Using the descriptive survey with a total sample of 1246 out of a population of public officers of the Malaysian government, a cross tabulation was made to compare between three different categories of educational backgrounds of the respondents (group 1= up to secondary education; group 2= college/ diploma; and group 3= tertiary education level i.e. Degree and postgraduates). With formal education as a source of environmental knowledge, Aini, Laily, Nurizan, Azizah, Zuroni and Norhasmah (2006) found that 85.3% of those in group 3 education level explained that their sources of environmental knowledge was gained through formal education, while 47.9% and 5.9% of group 2 and 1 stated so. Similarly, Bedural (2018) found out that Filipinos with higher educational background expressed more positive values and attitudes towards the environment than those with lower education. Using a cross sectional data from the World Values Surveys (WVS) to examine the changing values and motivations of societies due to economic and technological advances, the chi-square test of independence result (X2 (6, N=1200) = 24.78, p= 24.78, p=<.001) shows that those with higher education were more likely to be active members of environmental organizations than those with lower educational attainment.

On the issue of gender, different studies have revealed contrasting findings. For instance, Michalous, Creech, MacDonald and Kahlke (2009) found out that gender has no relation on one's knowledge on sustainability. However, Sign and Hensel (2013) found out that significant differences existed between male and female knowledge about sustainability. The study results for Sign and Hensel (2013) showed that significant differences were found for knowledge index between pre-test and post-test for both male (mean difference=31.28) and female farmers (mean difference=33.96). These contrasting

findings therefore requires further studies to establish the relation between gender and sustainable environmental practices and to also explore reasons for this.

2.4.8 Relationships among Farmers' Sustainable Environment Knowledge, Attitudes and Practices

It is generally believed that knowledge about an issue together with positive attitudes towards it tends up influencing the performance of an action positively. Different studies conducted on the relations between knowledge and attitude on one side and environmental conservation and sustainability practices on the other side have shown contrasting findings (Aregay, Minjuan and Tao, 2017; Ebifa-Othieno, Mugisha, Nyeko and Kabasa, 2017; Nabahungu and Visser, 2011 and Bijani, Ghazani, Valizadeh and Haghighi, 2017).

In a study conducted by Aregay, Minjuan and Tao (2017) on the relationship between the conservation behavior of farmers and their environmental attitude and knowledge, using a cross-sectional data from 442 farmers from the Guanzhong Plain of China, found that local farmers generally possessed a positive environmental attitude and undertook considerable sustainable actions. It was again found out that conservation behaviour of farmers was directly affected by their environmental attitude and indirectly by knowledge of the environment.

An implication of this study is that individuals' environmental attitude could influence them to undertake practices geared towards sustainable environment. These attitudes are formed from accumulation of one's experiences and exposure to requisite knowledge of the environment. It could therefore be inferred that exposure to environmental

knowledge could bring about positive environmental attitudes which together can promote environmental sustainability practices.

In contrast to these, a study by Bijani, Ghazani, Valizadeh and Haghighi (2017) using a descriptive causal and correlational survey technique in employing a sample of 120 out of a population of farmers in sari found out from their study on 'pro-environmental analysis of environmental concerns and behaviours towards soil conservation' that in spite of the significant relationship between attitude and knowledge of environmental conservation behaviour, unfavourable attitude towards soil conservation has no remarkable direct effect on soil conservation behaviour and could predict 21% of soil conservation behaviour. This implies that other factors rather than knowledge and attitudes could also contribute immensely towards conservation behaviours.

Similarly, Ebifa-Othieno et al (2017) in their study on 'Knowledge, Attitude and Practices of Tamarind use and conservation in Eastern Uganda' found out that the farmers have high knowledge of conservation practices like the different uses of tamarind; food, medicine, environmental amelioration. Additionally, they found out that the high level knowledge has not been transcended into their practice; planting of tamarind. These findings are similar to that of Aini et al (2006) which revealed that Malaysians had higher knowledge and attitudes towards the environment but were not translated into sustainable practices (Aini, Laily, Nurizan, Azizah, Zuroni, and Norhasmah, 2006). They emphasized that sustainable environmental practices are not only influenced by personal habits and routines but other external factors like technology, social policies, laws and regulations and community values.

A study on the relationship between farmers' knowledge together with their attitude on environmental sustainability and sustainability practices is needed to confirm or disprove these findings especially focusing on what is pertaining to the Ghanaian context.

Research findings have shown that there is a significant relationship between knowledge, awareness and attitudes to environmental practices. This shows that to improve the environmental practices, people should be provided with requisite environmental knowledge to build awareness and develop a positive attitude towards the environment (Waiting and Zhou, 2011). This form of knowledge could be provided through formal and non-formal education. In the case of farmers and other informal groups, environmental education could be provided non-formally through agricultural extension officers, media or even community durbars while formal education handles that of school going groups from primary to tertiary levels in their environmental issues in their curricula.

2.4.9 Public Participation in Sustainable Environment Activities

The concept of sustainable development which encompasses three broad policy areas; environment, society and economic is not new but an issue of the past with various deliberations, campaigns and policies implementations across the world. In spite of all the efforts directed toward achieving a sustainable world, the environment continues to degrade rapidly (Sumiri, 2008); especially in developing countries of which Ghana is no exclusion. It is quite intriguing to note that despite all policy deliberations, the environment keeps deteriorating at a faster rate.

Some scholars have attributed this to the absence of a holistic involvement of all stakeholders in collective goals. Sumiri, Zakaria, Zin and Abdullah (2008) for instance, argued that the planning process in Malaysia is a one-way affair that mostly neglects the views of communities. This situation does not pertain to Malaysia alone but also common in Ghana. In Ghana, grassroots whose activities directly impinge on the environment do not or indirectly participate in decision making and planning processes revolving collective goals. In many instances, they are only actively involved at implementation stages when decisions and plans have already been taken without them. This could be one of the reasons why environmental issues continue to be detrimental.

It is in this regard that Sumiri (2008) emphasis the need to consider public participation in environmental sustainability. According to him public ideas are needed to direct political debates and policies towards initiatives for environmental sustainability. Individuals thus participate actively in activities emerging out of their own decisions and planning. Public participation also termed as 'local - level-participation' according to Ghai and Vivian (2014) is essential to prevent or reverse environmental degradation, especially in situation where global and national policies end up creating major destructive forces against grassroots environmental actions. They emphasize that sustainable environment or environmental habitation can only be possible where there is active local level support.

Emphasis must however be made to debates about public participation in environmental planning and policy in policy documents, academic literature and media pronouncements (Rydin and Pennington, 2010). According to them, these debates had existed in four rationales, namely:

- The pursuit of public participation in environmental policy planning and delivery
- The problem of collective Action
- Potential of social capital
- Social Capital and strategies for public participation

According to these authors, the earlier debate revolved around the pursuit of public participation in environmental planning and delivery. Proponents of these rationale argued that public participation in environmental policy planning and delivery was a human right and an inclusive effort for collective goals as well as a means of integrating community values into policy formulation. Rydin and Pennington (2010) stressed that 'the public hold key resources of environmental planning, detailed knowledge of local environment and its use by local communities is a reason for public participation' (p. 155).

Rydin and Pennington (2010) further explained that public participation is conceptualized as collective action problem. The focus of this argument was on the effectiveness of environmental policy delivery through public participation. Individuals in support of this argument were of the view that factors such as participation cost, benefit of participation, level of participation and level of knowledge for the policy process could influence the effectiveness of public participation in environmental policy planning and delivery. This therefore ushered in the third argument of the debate which considers strategies to overcome collective action problem as identified by Rydin and Pennington (2010). This according to them is the potential for social capital.

Potential for social capital paradigm according to Rydin and Pennington (2010) focuses on all efforts and strategies required to redesign institutions within the communities to

enable grassroots interact and actively participate in policies that affect them. They argued that there should be the existence of organisations and networks together relationships across all sectors, mostly among the deprived to enable them actively involve themselves in collective good.

Finally, Rydin and Pennington (2010) identified the final argument for public participation as social capital and strategies for participation. The argument for social capital and the need for expanding public participation are all relevant in their view. To them social capital is needed for effective social institution while at other times environmental planning associated with public participation may also be relevant.

2.4.10 Summary of the Chapter

The chapter reviewed literature in two areas, namely: Theoretical review and related literature review which also consisted of empirical studies. Three theoretical models were used for the study. These were the Theory of Planned Behaviour (Ajzen, 2019), the Integrative Model of Behaviour Prediction (Fishbein, 2000) and the Models of Public Communication of Science and Technology (Lewenstein, 2003). These theories and models are all relevant for the study but require holistic integration towards promoting sustainable environment. Related literature review on the other hand covered different areas which included: meaning of sustainable environment, ways of promoting sustainable environment, factors influencing sustainable environment, sustainable environment activities/practices, knowledge about sustainable environment, attitudes towards sustaining the environment, relationship among biographical data and practices of sustainable environment activities, relationships among farmers' knowledge, attitudes and practices of sustainable environment. Conclusively, literature has revealed

sustainable environmental knowledge, attitudes and skills as some direct variables required by individuals in practicing sustainable environment activities while age, educational backgrounds and cost are additional external factors that holistically integrate with the former to bring about sustainable environment.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methods and procedures employed to conduct the study. It includes the research paradigm, population, design, data collection methods and methods of data analysis. The study used the mixed method approach to research. The various quantitative and qualitative methods used for the study are therefore discussed alongside.

3.2 Research Paradigm

Every research is grounded within a philosophical assumption which is influenced by the nature of the research problem being studied, personal experiences of the researcher and the audience of the study (Creswell, 2009). The study is therefore situated within the pragmatic research paradigm. This type of research paradigm views reality from universal and multiple perspective. Epistemologically, the pragmatic approach to research rejects the idea that sources of knowledge for research should be solely objectivity (positivism) or Subjectivity (interpretivism) but rather must be functionally and practically applied to life situations (Saunders, Lewis & Thornhill 2009, Creswell, 2009 and Yin, Reuner, Tanzer, Kachroo, Shyam, Mitchell & Rall, 2009). This paradigm according to Creswell (2009) focuses on stating the research problem and using available research methods to fully understand rather than focusing on research methods first. As a result, in finding out farmers' levels of knowledge, attitudes and practices of sustainable environment activities in the Eastern Region of Ghana while determining the nature of relationships that exist among the farmers' knowledge, attitudes and practices, the pragmatic research paradigm was the best option. This was because it enabled the researcher to embrace views from both the positivist and constructivist research

paradigms to address the research problem from a multiple perspective of objectivity and subjectivity. The researcher has the general belief that reality of a phenomenon exists out there independently and could also be shaped by individuals' interpretations based on their experiences hence the pragmatic research paradigm.

Pragmatism allows researchers to combine two research approaches (quantitative and qualitative) to address real human situations. In effect, pragmatism utilizes a mixed method research approach which allows for the collection of rich and broad range of data by examining complex phenomena in social and natural context (Saunders et al, 2009, Creswell, 2009). By combing these two research approaches, pragmatism enabled the researcher to understand the breadth and depth of the phenomena being studied, thereby corroborating findings in a deeper manner (Saunders et al, 2009).

3.3 Study Population

All actively engaged farmers from the ages of eighteen (18) to sixty (60) years in the Eastern Region constituted the population of the study. An estimated total population of people who are into agriculture in the region is 724,001 (Ministry of Food and Agriculture, 2016). Farmers were also selected for the study because one way of applying sustainable environment is through agriculture. Farmers, therefore, play key roles in sustaining the environment since their activities directly hinges on environmental resources.

3.4 Study Design

The study is situated within the mixed methods approach to research. In assessing farmers' knowledge, attitudes and practices of sustainable environment activities in the

Eastern Region of Ghana, a single research approach (quantitative or qualitative) may be inadequate to develop comprehensive understanding of the problem (Klassen, Creswell, Clark, Smith and Meissner, 2012). According to Klassen et al. (2012), quantitative research focuses on statistical test while qualitative research looks at intrinsic meaning of data collected based on general trends and patterns. The concept of sustainable environment is complex and needs to be understood holistically and contextually. The mixed method research approach was therefore used to collect and generate data quantitatively and qualitatively.

The explanatory sequential mixed method using Quan-qual research methods were adopted for the study. Creswell (2009) emphasized that this type of mixed method allows the researcher to first conduct a quantitative study and then follow up with qualitative research to explain results in detail. This method was therefore chosen because it enabled the researcher to first of all collect quantitative data (numeric data) on the levels of farmers' knowledge, attitudes and practices of SEA and identify relationships that exist among their knowledge, attitudes and practices of SEA in relation to demographic characteristics (education, sex, age) as a first Phase before following up with a second phase of qualitative study. The qualitative phase enabled the researcher to explore farmers' knowledge, attitudes and practices of SEA to provide in-depth explanations for the quantitative study. By so doing the researcher was able to generalize findings on the entire population while explaining the farmers' knowledge, attitudes and practice of SEA in detail as well.

Creswell (2009) further explained that explanatory sequential mixed methods provide quantitative data and its analysis by giving a general understanding of the research

problem while the qualitative data and its analysis refines and explain statistical results by explaining participants view in-depth. This design was also chosen because of the researcher's general belief that existing reality of a phenomenon could also be refined by individual's personal circumstances and experiences.

3.5 Sample of the Study

The sequential design using the nested samples for quantitative and qualitative studies was used. Different sample sizes were thus selected from the same population for both the quantitative and qualitative studies (Collins, Onwuegbuzie and Jiao, 2006).

For instance, Yamane's formula for determining sample size was used to calculate the sample size for the quantitative study (Yamane 1967 cited in Israel, 1992). The formula was calculated as follows:

$$n = \frac{N}{1 + N (e)^2}$$

Where n = sample size, N= the population size and e = the level of precision.

Therefore, N = 118258 (accessible population for the three dominant farming districts),

e = .05

$$n = \frac{118258}{1 + 118258 (.05)^2}$$

$$= 398.65$$

Using this formula, the result for the sample size was 399. The researcher however approximated it to 400. A sample size of 400 (out of the accessible population of 118258) was therefore used for the quantitative study. Thirty (30) other farmers from the same population were also selected for the qualitative study. In all, 430 farmers were used for the study.

3.6 Sampling Procedures

3.6.1. Quantitative Sampling Methods

The multi-stage sampling methods; purposive, proportional quota and simple random sampling techniques were used to select farmers for the quantitative study. The specific use of these sampling approaches are explained below.

First of all, the researcher purposively selected three (3) districts in the Eastern Region that are dominant in food crops, livestock and cash crops productions. The most dominant crop production, cash crop and livestock agricultural activities according to the Ministry of Food and Agriculture (2016) are in the Fanteakwa, Kwaebibirem and Afram Plains districts respectively. These three districts were therefore purposively selected to constitute the broader study area (and also the accessible population of the study). The region is very large so each of these districts was selected purposively to represent each the three agricultural activities that the researcher is interested in studying (food/vegetable crop, cash crop and livestock). Due to the uneven nature of farmers' population in the selected districts, the proportional sampling technique was adopted as shown on Table 3.1.

Table 3.1: Proportional Allocation of Farmers for the Study Districts

Name of Districts	**Number of Farmers**	**Sampling Fraction**	**Proportionally Allocated Sample of Farmers**
Fanteakwa	40305	$\frac{40305}{118258} \times 400$	136
Kwaebibirem	34647	$\frac{34647}{118258} \times 400$	117
Kwahu Afram Plains South	43306	$\frac{43306}{118258} \times 400$	147
Total	**118258**		**400**

Having known the proportional samples for the districts, the researcher collected all the names of communities within the selected districts from the various district assembly offices. The researcher then used the simple random sampling technique to select five (5) actively engaged farming communities in each district to constitute the study areas. The technique was used due to the homogenous nature of communities in the district. This sampling technique was done by writing the names of all communities within these districts on pieces of papers, folded and reshuffled in a container. The researcher then randomly picked five (5) communities for each of the selected district as in Table 3.2.

Additionally, the uneven nature of the population of the communities called for another proportional sampling. Depending on the number of houses in each of the selected communities in the districts, a proportion of farmers were selected from each of the five

communities. This was done by dividing the number of houses in a community by the total number of houses in each selected communities by the proportional sample for the district. Thus:

$$\frac{\text{Number of houses in a community}}{\text{Total number of houses in all selected communities}} \times \text{Proportionally Allocated sample of Farmers for the District}$$

This is shown in Table 3.2 as follows:

Table 3.2: Proportional Allocation of Farmers in the Study Community

Name of Selected District	Proportionally Allocated Sample of Farmers for Selected District	Total Number of Sampled Communities	Name of Selected Community	Sampling Fraction	Proportionally Allocated Sample of Farmers for Selected District Area
Fanteakwa	136	6182	Begoro	3641 x 136 / 6182	80
			Osino	1029 x 136 / 6182	23
			Dwenase	511 x 136 / 6182	11
			Saaman	462 x 136 / 6182	10
			Abompe	539 x 136 / 6182	12
Kwaebibirem	117	7453	Kade	3121 x 117 / 7453	49
			Asuom	2273 x 117 / 7453	36
			Takyiman	766 x 117 / 7453	12
			Tweapease	585 x 117 / 7453	9
			Abodom	708 x 117 / 7453	11
Kwahu Afram Plains South	147	4897	Maame Krobo	2723 x 147 / 4897	82
			Tease	974 x 147 / 489	29
			Forifori	708 x 147 / 4897	21
			Nsogyaso	274 x 147 / 4897	8
			Asukese No. 2	218 x 147 / 7453	7

After obtaining the number of respondents for each of the study community, a household survey was conducted. This was done by obtaining the number of houses in the study communities from the district assembly offices and then confirmed from respective opinion leaders in these areas. An electronically generated random numbers was used to select specific households in the study communities until all the proportionally allocated sample for each community were obtained. In instances where more than one farmer was identified in a household, they were made to ballot and anybody who picked 'yes' became the respondent for the study. These methods were used because it ensured that all households had equal chances of being selected as well as all active farmers. It also helped to eliminate personal and researcher bias.

3.6.2 Qualitative Sampling Methods

The purposive sampling method was used to select 30 participants for three focused farming groups' discussions. Purposive sampling technique paying attention to maximum variations was thus used. The researcher considered maximum variation in using the purposive sampling technique in order to represent the widest variety of perspectives from the three farming groups; cash crop, livestock and food/vegetable crop (Koerber and McMichael, 2008).

In applying the purposive sampling technique, participants for the focus group discussion were selected using specific criteria; firstly, on the basis of staying in a community for a period of 5 years continuously. This number of years was considered because one would have been exposed adequately to community practices and views on sustainable environment activities within five years of continuous stay. Secondly, the person should not have participated in the quantitative study (1st Phase). This criterion

was also considered in order to avoid using farmers who were already exposed to the research.

The researcher identified ten farmers for each of the three farming groups to constitute participants for three focus group discussions. These farmers were selected on the basis that they had continuously lived in the community for five years and were not involved in the quantitative study. This purposive sampling method was again used on the basis of farmer accessibility, availability at any given time and their willingness to participate in the study.

In each community, enquiries were made from opinion leaders on farmers who qualified for the study based on the set criteria. The snowball sampling technique was subsequently used to obtain the required number of farmers (10) for the focus group discussions. Thus, a first contact was identified and each subsequent one was used to identify similar contacts until the required number of participants were obtained.

Krueger (2002) emphasized that a focus group discussion should consist of carefully recruited participants ranging from five to ten. In line with this, participants were carefully selected for three farming groups; namely, cash crop, vegetable/foods crops and livestock farmers. Each of these groups consisted of 10 participants with differences in educational backgrounds, age groupings and also mixed gender groups. These groupings were done to improve the quality of discussions on sustainable environment (Freitas, Oliveira, Jenkins and Popjoy as cited in Ochieng, Wilson, Derrick and Mukherjee, 2017).

3.7 Research Instruments

The researcher employed both quantitative and qualitative instruments for the study. A structured interview schedule was used for the quantitative study while a focus group discussion guide was used for the qualitative study. Even though Fraenkel and Wallen (2003) asserted that the common types of survey instruments are questionnaire and interview schedule, an interview schedule was identified as the most appropriate instrument for the study because communities in the study area were basically rural with low literacy rate. Most of the farmers are non-literate and semi-literate making it impossible for the use of a mailed questionnaire. The interview schedule was also adopted because it provided opportunity for the researcher to establish better rapport with respondents for required and detailed responses as well identifying participants for the qualitative study.

The focus group discussion guide was also chosen mainly because it is the frequently used qualitative tool to gain an in-depth understanding of a social issue. It also gave opportunity for the groups to brainstorm and bring out collective views on sustainable environment activities. This approach enabled the researcher to compare and contrast group responses as against individual responses during the survey. It also emphasized Ochieng, Wilson, Derrick and Mukherjee (2017) assertion that a focus group discussion aims at obtaining an in depth data from a purposively selected group of individuals rather than a statistically representative sample of a broader population.

3.7.1 Quantitative Research Instrument

A structured interview schedule was designed for a face to face interview. This was done to ensure that respondents stayed focused as far as the needed data was concerned. Items on the interview schedule therefore had predetermined answers in the form of Likert

scale questions. In addition to this, open ended questions were asked to allow for flexibility.

The interview schedule was organized into five sections taking into consideration the objectives of the study. The five sections included A, B, C, D and E. Section "A" was designed to find out biographical characteristics of respondents while section B was to identify the levels of farmers' knowledge about sustainable environment activities. Respondents were made to rank their knowledge level in different sustainable environmental activities on a 5-point Likert scale ranging from very low to very high levels. Section "C" on the other hand was designed to source answers to questions regarding the farmers' level of attitudes towards environment sustainable activities. Section "D" was also designed to identify the farmers' level of practices of sustainable environment activities. The last section, "E" focused on the farmers' views on measures to improve their knowledge, attitudes and practices of sustainable environment activities.

The interview schedule comprised both closed and open-ended questions. The open-ended questions allowed participants to freely express their opinions on the study while the closed ended questions also allowed for consistency of responses to enhance easy analysis (Baumgartner, Strong and Hensley, 2002).

In order to measure the levels of farmers' knowledge, attitudes and practices, most of the items on the interview schedule were in the Likert scale form. The knowledge levels of farmers on sustainable environmental activities was tested with a 5-point Likert scale that ranged from very low to very high. A 5-point Likert Scale was also designed to test for farmer's levels of attitudes towards sustainable environment activities and ranged

from strongly disagree to strongly agree. With regards to the levels of farmers' practices on sustainable environmental activities too, a 5-point Likert scale ranging from never to always was used. This helped the researcher to identify the specific levels of respondents' knowledge, attitudes and practices.

Before the main administration of instrument, items on the interview schedule were translated into the local language (Twi) and back into English. An earlier pre-test conducted informed the researcher the need to translate the instrument items into Twi; the common language among the people of Eastern Region. The translation was first done by the researcher into Twi after discussing with colleague PhD students. The researcher then gave the translated interview schedule to a professional Twi and English translator from the Bureau of Languages who also re-translated the items to English and back to Twi again. After this, the researcher compared the original interview schedule with the translated version by the translator and realized that the two measured the variables intended to be measured. The translation of the items into the local language ensured consistency in the reading of questions to respondents. It also enabled respondents to understand the questions; thereby providing requisite responses. It again, provided a means of checking for validity and reliability of the instrument.

3.7.2 Qualitative Research Instrument

A focused group discussion was also held. A structured focus group guide was therefore designed for this purpose. The focus group guide was structured into four sections; sections A, B, C and D.

Section A was designed to solicit for responses on farmers' level of knowledge on sustainable environment activities. Four items to determine farmers' level of knowledge were asked. These items looked at their knowledge on activities that sustain the environment and why they consider those activities to sustain the environment, activities that destroys the environment, community rules and regulations that promote sustainable environmental activities as well as regulating the use of environmental resources, sources and nature of education received on sustainable environment activities.

Section B was also designed to solicit for responses on farmers' attitudes towards sustainable environment activities. This section had three items focusing on farmers' attitudes towards sustainable environment activities. These items specifically looked at farmers' attitudes towards some sustainable environment activities, namely; recycling and reusing waste, tree planting, using manure, using ash and herbs as alternative pest control methods, desilting gutters and river banks, rotating crops, leaving farmlands to regain its strength and leaving cleared weeds on the land to serve as manure.

Section C focused on farmer's practices of sustainable environment activities. This section had three items that concentrated on the activities practiced in the community to sustain environmental resources and how the community practice these activities and steps taken by the community to address environmental problems.

The last section, D was designed to solicit responses on measures to enhance farmers' knowledge, attitudes and practices of sustainable environment activities. This section had three items which focused on measures to improve farmers' knowledge, attitudes and practices on sustainable environment activities.

3.8 Pretest

The interview schedule was pretested on thirty (30) randomly selected farmers from Brekuso in the Eastern Region of Ghana. This farming community was chosen because it did not form part of the three selected districts but rather homogenous to communities in the study area. A face to face interview was conducted for the 30 randomly selected respondents. The pretested data was subjected to thorough editing to ensure consistency and then coded for analysis using IBM SPSS version 24. The results were then used to test for validity and reliability. The reliability test of Cronbach Alpha co-efficient was tested to obtain a result of .973.

The pretest enabled the researcher to identify, correct and change unrealistic items on the instrument and also ambiguities that emanated from some of the responses. For instance, with regards to knowledge of SEA, an item that requested respondents to indicate sustainable environment activities from unsustainable ones were changed to find out their levels of knowledge on some listed sustainable environment activities using a Likert scale.

The pretest also enabled the researcher to estimate the needed time for the main study. The researcher used almost one day to conduct the pretest and from that estimated a maximum of two weeks for the actual study. The pre-test also enabled the researcher to estimate the number of research assistants needed for the data collection exercise. In all, four research assistants helped the researcher to collect data for the study.

The pretest again informed the researcher the need to translate all items into Twi to ensure consistency in the administration of the instrument. During the pre-test, the

researcher realized that questions were sometimes translated differently to different respondents, hence the translation of the instrument into Twi. After the translation, the researcher trained the research assistants and tested the translated instrument on the same farmers at Brekuso with the research assistants. The second pretest (post-test) conducted enabled the researcher to modify and correct some items on the translated instrument that were difficult to understand.

3.9 Validity of Research Instrument

Fraenkel and Wallen (2003) asserted that testing for validity of the main tool for data collection is the most important thing to consider in selecting instrument for data collection. In view of this, several measures were put in place to ensure validity of the instrument. First and foremost, the researcher ensured face validity of the instrument. This was done by first constructing the interview schedule based on the research objectives. The validation of the interview schedule was also ensured through an assessment by colleague Doctor of Philosophy students whose comments were very essential in rewording, correcting ambiguities and unrealistic items on the instrument. The researcher again gave the interview schedule to supervisors and experts who understood the topic through to the interview schedule to critically evaluate whether the questions captured the topic and objectives under investigation. Through rigorous assessment of the instrument by my supervisors and these experts, a number of criticisms and suggestions were raised to enable the researcher fine-tune items on the interview schedule.

The interview schedule was also validated through a pretest on thirty randomly selected farmers from Brekuso. The pretest enabled the researcher to check for the wording,

sequence of questions, length of interview schedule, clarity of instructions, effectiveness of the cover letter and estimated time for responses. On the basis of this, the interview schedule was translated into Twi and back into English with the help of experts from the Bureau of Languages.

The focus group discussion guide on the other hand was also tested on a group of six food crops farmers to check for the wording, sequence of questions, length of interview and clarity of questions. All these procedures were taken to ensure that the instruments elicited responses that measured variables intended to be measured.

3.10 Reliability of Research Instrument

In ensuring for the reliability of the instrument, very simple wording was used for easy understanding by respondents. Again, the interview schedule was pretested on thirty randomly selected farmers in Brekuso, a farming community in the Eastern Region, homogenous to the study communities. Two weeks after, a new instrument composed of reshuffled items was prepared. The new interview schedule was printed on a coloured paper different from the earlier one and again pretested on the same group of farmers at Brekuso with the excuse of seeking for further responses to the study. Comparism was done to test for consistency in the responses using the Kuddar Richardson formula 21 which proved a correlation ratio of 0.7. Internal consistency was again tested using the Cronbach Alpha reliability which also proved that the instrument was highly reliable (.973). The two pretests enabled the researcher to identify and modify items that were not clearly understood by respondents. It also enabled the researcher to modify items that respondents felt reluctant to answer. Moreover, the pretesting enabled the researcher to correct any inconsistencies in the instrument. For instance, a question requesting

respondents to classify some listed environmental activities into useful and harmful was revised into scaling and allowed respondent to specify their exact levels of knowledge as far as SEA was concerned. Additionally, a question that requested respondents to state their exact attitudes towards specific environmental activities was also modified into Likert scale questions.

The researcher also ensured reliability of the instrument by translating the items into Twi and back into English with the help of language experts from the Bureau of Languages. The translation of items into vernacular helped all research assistants to ask respondents the same questions to ensure uniformity of understanding and responses.

The data was subjected to thorough editing to remove contradictions, errors and inconsistencies before analyzing. All these approaches were taken to ensure reliability of the instrument and the study.

3.11 Trustworthiness of Data

The researcher ensured rigorous quantitative data through different validity and reliability processes while ensuring that of qualitative through trustworthiness of data. The trustworthiness of the qualitative data was therefore done by ensuring credibility, transferability, dependability and confirmability (Lincoln and Guba, 1985). These are discussed as follows:

Credibility: This refers to the confidence or 'truth' in the research findings. To ensure credibility of the findings, the researcher first of all spent adequate time to establish rapport with farmers in the study communities in order to understand environmental issues. Additionally, the researcher observed sustainable environment activities available

in the study communities to ensure that responses from participants were linked to realities in their environment.

***Transferability*:** Lincoln and Guba (1985) explained transferability as the application of the findings to other contexts. In line with this, detailed description of the Eastern Region; particularly the study area was provided to guide readers on the boundary of the study. Additionally, thorough description of the farmers' knowledge, attitudes and practices of SEA was captured to ensure evaluation of the conclusion to other similar settings.

Dependability: This refers to consistency in the findings and its ability to be repeated in the same study, another study or by another person. For this reason, responses on the KAP of farmers were explained in detail; especially during the categorization of the data in the analysis to ensure that no data was lost. Additionally, audio-taped responses were played over and over and discussed with research assistants before analysing the data.

Confirmability: This refers to the ability of the researcher to present the experiences of the participants as obtained rather than the views of the researcher or his/her biases in the data. Confirmability was therefore promoted of the study by keeping records of the data through audio-tape and field notes, transcribed and translated verbatim with support from expert translators from the Beaureau of Languages and also consulted recorded field notes over and over. Additionally, the researcher defined and explained themes in the analysis and supported them with verbatim responses from participants.

3.12 Data Collection Procedures

The researcher used both primary and secondary data for the study. The secondary data included relevant information from various documentary sources such as journal articles, reports from District Assembly, United Nations, Ministry of Food and Agriculture and Statistical Services. Data collection was also primarily elicited from farmers in the field. Two major forms of primarily data were collected. These were the quantitative data using structured interview schedule and a qualitative data using a focus group discussion guide.

Before the administration of the instruments, the researcher recruited three final year students and two graduates all within the School of Social Sciences who also hail from the Eastern Region to assist in the data collection exercise. These students were chosen because they were familiar with the norms and values of the people in the Eastern Region. The students' skills and knowledge on research acquired from their respective departments was also an added advantage for their selection. These research assistants were given three days intensive training exposing them to the purpose of the study paying particular attention to the study objectives. All items in the instrument were discussed one by one with them. The assistants were also given training on the data collection procedures specifically on interview techniques and skills. After which they were briefed on some ethical issues pertaining to research. These included rapport establishment, seeking the consent of respondents and letting them know the voluntary nature of the whole exercise.

For the purpose of consistency in the data collection, the researcher together with the research assistants conducted the second pretest on the ten randomly selected farmers at

Brekuso using the translated interview schedule as a guide. The corrections and modification based on the pretest were all discussed with the research assistants before administering the main instrument for the study. This was done to equip the research assistants with interview skills and techniques.

3.12.1 Quantitative Data Collection Procedures

Permission was first sought from the chiefs and some opinion leaders of the study area by presenting an introductory letter from the Department of Adult Education and Human Resource Studies. After obtaining permission from the chiefs of the study area, the researcher together with the assistants went round the study area introducing themselves to some community members about the purpose of their visit. During the introduction, appropriate days and time to conduct the interview were scheduled. From the interactions with community members, Fridays to Sundays were noted mostly to be the best days for the interviews, though interviews were conducted on some week days too (excluding market and farming days). This was done to ensure that the interviewers had enough time to establish good rapport with interviewees in order to enhance the solicitation of accurate responses for the study.

The research assistants conducted their respective interviews at the same localities with the researcher until the needed data was collected in each of the communities. At the end of each day's interview, the researcher together with the assistants discussed issues of common concern and the emerging themes. The discussions helped ensure uniformity in the conduct of the interview. At each interview, the interviewers read the questions to interviewees in Twi and gave ample time to respondents to answer. For ethical purpose, respondents were informed about the need to record their responses where necessary. All

the respondents gave their consent for recording their responses and also completed consent forms.

During the household survey, if a household with more than one prospective respondent was identified, the researcher with the help of the research assistants requested for the number of prospective farmers in the house from the various family heads and in such cases the potential respondents were made to ballot by picking from ballot papers with only one 'yes' and particularly number of "no" depending on the total number of potential respondents. This was done to ensure that all farmers had equal chances of being selected.

3.12.2 Qualitative Data Collection Procedures

In line with available resources for the study, three (3) dominant farming communities in each of the study districts were used for the qualitative study. For each community, farmers who qualified for the set of criteria were identified. On the basis of their accessibility, availability at any given time and their willingness to participate in a focus group discussion, appointments were booked for specific days, times and venues for the focus group discussions. Off farming days were booked for the focus group discussion. Tuesdays for example was identified as an off farming day for most communities. The contacts of such persons were then taken and used to mobilise them in a classroom, a church and a football field which served as venues for the discussions. For each of the focus group discussions, participants were selected from the same community so there was no need to transport them. The three focus discussion groups were labelled as A, B and C for livestock, food/vegetable and cash crop farmers respectively.

In each of the focus group discussions, the researcher served as the moderator and was assisted by two research assistants who supported with the quantitative study serving as recorders. Before the start of any of the focus group discussions, the moderator briefed the groups on the purpose of the discussions and were made to ask questions for clarification on anything that boarded them as far as the research was concerned. Participants' consents were sought again and approval was given. Participants were also made to sign an informed consent form to indicate that they had agreed and understood what the discussions were about.

The moderator then read each of the questions to the group and ensured that each participant responded to the questions and finally sought for the groups' consensus on each question. The research assistants then recorded and took notes of all the responses. Each of the focus group discussion lasted for an average period of 45 minutes. At the end of each of the focus group discussions, the moderator thanked participants, refreshed them and also gave them a contact number to be reached on for any clarification.

3.13 Ethical Considerations

The researcher took a number of ethics considerations into consideration to ensure that the results, findings and conclusion from this research were reliable and consistent. A number of official approaches were used.

First of all, approval to conduct this research was first obtained from the Ethics Committee of Humanities at the University of Ghana. An introductory letter was then collected from the Department of Adult Education and Human Resource Studies and added to a brief proposal to be presented to chiefs and other opinion leaders in the

various communities where respondents and participants would be engaged for the study prior to the data collection exercise. After which the consent of participants were sought by briefing them about the study and also made to complete the consent forms. In all cases, the researcher received approval.

The idea of confidentiality and anonymity was discussed with opinion leaders, respondents and participants before engaging them in the study. The researcher also used pseudo names for participants and also kept all information about participants very confidential. With regards to consent, respondents and participants were all adult so they freely decided to be part of the research or not.

3.14 Data Analysis

The research instruments, thus the interview schedule and focus group discussion guide used for the data collection exercise generated both quantitative and qualitative data. In view of this, both the quantitative and qualitative analytical techniques were used appropriately for analyzing the data.

3.14.1 Quantitative Data Analysis

The quantitative data was edited and coded to ensure consistency of responses. The data was then analysed using the computer software, IBM Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics (means, percentages and standard deviations) were used to determine the levels of farmers' knowledge, attitudes and practices of sustainable environment activities. The results were organised and presented in statistical tables. In order to establish the relationships among the biographical characteristics of farmers' and their knowledge, attitudes and practice levels of SEA as

well as the relationships within the various farming groups (food crops/vegetable farmers, livestock and cash crop farmers) in terms of KAP, inferential statistics of correlation and regression were used. A cross tabulation analysis was also done to determine the relationships existing among these variables for chi-square analysis. Regression was also used to determine the significance of relationships among these variables. All test of relationships was computed at 0.05 level of significance (95%), using the two-tail level of significance.

The open ended questions were divided into two; firstly, the responses were quantified to reflect the main themes expressed by respondents. Secondly, the descriptive statistics of percentages were used to analyze the data. The results were then presented in statistical tables.

3.14.2 Qualitative Data Analysis

With regards to the qualitative data from the focus group discussions, the audio tape recordings were transcribed and translated into English language as close as participants own words with the help of an expert from the Bureau of languages. The researcher then ensured member checks by crosschecking the transcribed data with some key participants of the focus group discussions. This was done to ensure that the data was a true reflection of participants' view. The researcher also took the opportunity to seek approval from participants to use their comments in the thesis. This he transcriptions and the researcher's notes were compared for consistency and then analysed thematically. The thematic analysis was done because Clarke and Braun (2013) highlight that it can be used to analyse transcripts of focus group interviews. Clarke and Braun (2013) steps for conducting thematic analysis was therefore used to analyse the data.

The thematic analysis was first done through familiarization of the researcher with the research data. This was done by reading and listening to audio recorded data over and over in order to be familiar with the data as expected in qualitative analysis. The transcribed data was then coded by generating precise labels for relevant features of the data that addresses the research questions. The researcher then extracted all the codes and their relevant data to search for appropriate themes. Requisite themes that addressed the research questions and the extracted data were constructed. The coded data relevant to all themes were then taken. The researcher then cross-checked the generated theme against the coded extract and the entire data collected from the field to ensure that the themes convincingly captured the entire data pattern. In doing this, themes were also checked for similarities and differences. In the end, similar themes were collapsed into a single one. The themes were then defined and named according to the research questions. The researcher completed the thematic analysis with write-ups. This was done by putting the analysed data together with specific data extracts about the data in line with the research questions.

The emerging themes supported with verbatim accounts from the focus group discussions in narratives were presented as results of the study. A comparative analysis between the quantitative and qualitative data was finally done to obtain key results from the field as in chapter four.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents results for both the quantitative and qualitative data for the study on Farmers' knowledge, attitudes and practices of Sustainable Environment Activities (SEA) in the Eastern Region of Ghana. This chapter is in two parts. The first part presents the quantitative results whereas the second part presents the qualitative results.

4.2 Presentation of Quantitative Results

This part focuses on data collected from the field which has been analyzed and presented in tables. The results are presented in order of the research objectives and questions as follows:

- Farmer's levels of knowledge, attitudes and practices of SEA in the Eastern Region with regards to sex, education and age.
- Levels of farmers' knowledge, attitudes and practices on SEA in the Eastern Region with reference to type of farming.
- Relationship between farmers' knowledge and attitudes towards SEA, knowledge and practices of SEA and attitudes and practices towards SEA.
- Farmers' views on measures to enhance their knowledge, attitudes and practices of SEA the Eastern Region of Ghana.

4.2.1 Demographic Characteristics of Respondents

Demographic characteristics of respondents were obtained and these covered their sex, education and age. These demographic characteristics of respondents were relevant as it helped in achieving the study objective by determining farmers' levels of knowledge, attitude and practices in relation to their sex, education and age as presented in

subsequent sections. Table 4.1 therefore shows the demographic characteristics of respondents.

Table 4.1: Demographic Characteristics of Respondents

Demographic Characteristics of Respondents	Frequency	Percentage
Sex		
Male	213	53.3
Female	187	46.8
Education		
No Formal Education	54	13.5
Primary/Junior High/Middle school	240	60.0
Secondary/High School	78	19.5
Tertiary	28	7.0
Age		
18-35 years	109	27.3
36 – 45 years	118	29.5
46-60 years	173	43.2
Type of Farming		
Cash Crop Farming	117	29.2
Food Crop/ vegetable farming	182	45.5
Livestock Farming	101	25.3

Source: Field work, 2018 **N = 400**

Table 4.1 revealed that the percentage of male respondents was 53.3% out of 400 total respondents, while that of the female respondents was 46.8%. In terms of the educational background of respondents, 86.5% had one form of formal education or another whiles 13.5% had no formal education. The ages of respondents have been categorized into three age brackets. The majority of respondents 43.3% (173) out of the total respondents fell within 46-60 years' age bracket, 29.5% (118) were also within 36-45 years' age

bracket while 27.3% (109) out of the total respondents were within 18-35years. On the type of farming too, the result showed that majority of the respondents 45.5% (182) out of the total respondents were food/vegetables farmers, 29.3% (117) of them were cash crops farmers, 25.3% (101) of them were livestock farmers.

4.2.2 Farmers' Levels of Knowledge, Attitudes and Practices of Sustainable Environment Activities

In order to determine farmers' levels of knowledge, attitudes and practices of SEA with regard to their sex, education and age, respondents' levels of knowledge, attitudes and practices of SEA were first determined before cross tabulating them with their biographical characteristics.

4.2.2.1 Farmer's Levels of Knowledge on Sustainable Environment Activities

Respondents were made to scale their knowledge levels on SEA on a 5-point Likert Scale instrument which ranged from very low, low, neutral, high to very high as presented on Table 4.2.

Table 4.2: Levels of Farmers Knowledge on Sustainable Environment Activities

Sustainable Environment Activities	**Percentages of Responses to Level of Knowledge**										**Mean**	**Standard Deviation**
	Very Low		**Low**		**Neutral**		**High**		**Very High**			
	f	***%***	***f***	***%***	***f***	***%***	***f***	***%***	***f***	***%***		
Recycling and re-using waste	38	9.5	37	9.3	15	3.8	121	30.3	189	47.3	3.97	1.318
Planting trees on empty lands and re-placing cut ones	15	3.8	20	5.0	12	3.0	102	25.5	251	62.8	4.39	1.024
Using manure as a major form of fertilizer	33	8.3	18	4.5	18	4.5	84	21.0	247	61.8	4.24	1.238
Use of alternative pest control: traditional methods	52	13.0	41	10.3	35	8.8	99	24.8	173	43.3	3.75	1.429
Desilting gutters and river banks	7	1.8	18	4.5	12	3.0	118	29.5	245	61.3	4.44	.888
Rotating crops at regular intervals	13	3.3	12	3.0	16	4.0	131	32.8	228	57.0	4.37	.941
Leaving farmlands to fallow to regain its strength	10	2.5	6	1.5	10	2.5	72	18.0	302	75.5	4.63	.822
Leaving cleared weeds on the land to serve as manure	12	3.0	9	2.3	9	2.3	57	14.3	313	78.3	4.63	.881
Mean Overall	**4.3 = High**											

Source: Field Work, 2018 **N= 400**

Table 4.2 shows that farmers' generally had high level of knowledge on SEA (with an overall mean score of 4.3). The highest means were recorded in the areas of farmers leaving farmlands to fallow to regain its strength and leaving cleared weeds on the land to serve as manure (mean of 4.63 and standard deviation of .822 and .881 respectively). The lowest level of knowledge was on use of alternative pest control and using traditional methods (mean=3.75 and SD=1.429).

It could also be seen from the table that a significant majority of the respondents (210 representing 77.6% of the total respondents) had high or very high knowledge of recycling and reuse of waste. The results imply that the majority of the respondents' knowledge on recycling and reuse of waste as a sustainable environment activity is far above average knowledge.

Regarding knowledge of respondents about planting and replacement of trees on empty land as a sustainable environment activities (SEA) a large number, 89.3% (353 respondents) had high or very high knowledge on the activity. A few respondents almost 4% had very limited knowledge of such activity. The result suggest that majority of the respondents were knowledgeable about planting and replacing trees.

Further analysis from the table shows that majority of the respondents 82.8% (representing 331 respondents) were highly knowledgeable on using manure as an environmentally sustainable activity (mean=4.24). Again, an overwhelming majority, 90.8% had high or very high knowledge of desilting drains as SEA. The result suggests that almost all of

respondents had far above average knowledge on desilting drains as SEA. Similarly, regarding crop rotation, a large majority (89.8%) were highly knowledgeable. This implies that a large majority of the respondents had far above average knowledge of crop rotation as SEA. However, on the use of alternative pest control using traditional methods, 23.4%, indicated that almost a quarter of respondents had limited knowledge about this activity.

In summary, Table 4.2 shows that farmers' generally had high knowledge on SEA as demonstrated by the grand mean of 4.3 on the five-point Likert Scale ranging from very low to very high.

4.2.2.2: Farmers' Levels of Knowledge on Sustainable Environment Activities with regards to their Sex

In order to obtain respondents' levels of knowledge on SEA with regards to their sex, a cross tabulation was conducted to find out if male and female farmers exhibit the same levels of knowledge about SEA. Table 4.3 therefore shows cross tabulation of respondents' level of knowledge on SEA and their sex.

Table 4.3: Cross Tabulation of Farmers' Sex and their Levels of Knowledge on Sustainable Environment Activities

Sustainable Environment Activity	Sex	Percentages of Responses to Level of Knowledge										χ^2	Sig. Level
		Very Low		Low		Neutral		High		Very High			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%		
Recycling and re-using waste	Male	19	8.9	21	9.9	11	5.2	76	35.7	86	40.4	11.773	.019
	Female	19	10.2	16	8.6	4	2.1	45	24.1	103	55.1		
Planting trees on empty lands and re-placing cut ones	Male	4	1.9	13	6.1	6	2.8	61	28.6	129	60.6	7.525	.111
	Female	11	5.9	7	3.7	6	3.2	41	21.9	122	65.2		
Using manure as a major form of fertilizer	Male	15	7.0	10	4.7	9	4.2	50	23.5	129	60.6	2.352.	.671
	Female	18	9.6	8	4.3	9	4.8	34	18.2	118	63.1		
Use of alternative pest control: traditional methods	Male	30	14.1	20	9.4	19	8.9	58	27.2	86	40.4	2.759	.599
	Female	22	11.8	21	11.2	16	8.6	41	21.9	87	46.5		
Desilting gutters and river banks	Male	15	2.3	10	4.7	7	3.3	67	31.5	124	58.2	2.367	.669
	Female	2	1.1	8	4.3	5	2.7	51	27.3	121	64.7		
Rotating crops at regular intervals	Male	5	2.3	5	2.3	8	3.8	81	38.0	114	53.5	6.700	.153
	Female	8	4.3	7	3.7	8	4.3	50	26.7	114	64.7		
Leaving farmlands to fallow to regain its strength	Male	3	1.4	2	0.9	8	3.8	51	23.9	149	70.0	16.801	.002
	Female	7	3.7	4	2.4	2	1.1	21	11.2	153	81.8		
Leaving cleared weeds on the land to serve as manure	Male	3	1.4	6	2.8	6	2.8	40	18.8	158	74.2	12.673	.013
	Female	9	4.8	3	1.6	3	1.6	17	9.1	155	82.9		

Source: Fieldwork, 2018 **N= 400**

With reference to farmers' sex and their level of knowledge on SEA, the Chi-square results pointed out that, there is a significant relationship between sex and recycling and reusing waste, leaving farmlands to fallow to regain its strength and leaving cleared weeds on the land to serve as manure with their p-value < 0.05 as indicated on Table 4.3.

The results from Table 4.3 further showed that male and female respondents differ in knowledge on recycling and reusing waste (79.2% for females and 76.1% for males), leaving farmlands to fallow to regain its strength (93.9% for males and 93% for females) and leaving cleared weeds on the land to serve as manure (93% for males and 92% for females). Female respondents were thus knowledgeable than males in recycling and reusing waste while male were also knowledgeable than females in the remaining two SEA.

4.2.2.3 Farmers' levels of Knowledge on Sustainable Environment Activity with regards to Education

In order to obtain respondents' level of knowledge on SEA with regards to their educational background, a cross tabulation was conducted to find out whether farmers with different educational backgrounds exhibited the same levels of knowledge on SEA. Table 4.4 therefore shows a cross tabulation of respondents' level of knowledge on SEA and their educational backgrounds.

Table 4.4: Cross Tabulation of Farmers' Educational Background with their Levels of Knowledge on SEA

Sustainable Environment Activity	**Educational Background**	**Percentages of Responses to Level of Knowledge**										χ^2	**Sig. Level**
		Very Low		**Low**		**Neutral**		**High**		**Very High**			
		f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	33.456	.001
Recycling and re-using waste	No formal Edu.	7	13.3	3	5.6	4	7.4	12	22.2	28	51.9		
	Basic Edu.	28	11.7	17	7.1	10	4.2	87	36.3	98	40.8		
	Secondary Edu.	3	3.8	13	16.7	-	-	.18	23.1	44	56.4		
	Tertiary Edu.	-	-	4	14.3	1	3.6	4	14.3	19	67.9		
Planting trees on empty lands and re-placing cut ones	No formal Edu.	2	3.7	7	130	5	9.3	10	18.5	30	55.6	37.392	.000
	Basic Edu.	9	3.8	4	1.7	6	2.5	77	32.1	144	60		
	Secondary Edu.	3	3.8	7	9.0	-	-	11	14.1	57	73.1		
	Tertiary Edu.	1	3.6	2	7.1	1	3.6	4	14.3	20	71.4		
Using manure as a major form of fertilizer	No formal Edu.	6	11.1	2	3.7	4	7.4	7	13.0	35	64.8	14.478	.271
	Basic Edu.	23	9.6	9	3.8	10	4.2	54	22.5	144	60.0		
	Secondary Edu.	3	3.8	3	3.8	3	3.8	19	24.4	50	64.1		
	Tertiary Edu.	1	3.6	4	14.3	1	3.6	4	14.3	18	64.3		
	Basic Edu.	37	15.4	23	9.6	22	9.2	70	29.2	88	36.7		
	Secondary Edu.	8	10.6	8	10.3	2	2.6	16	20.5	44	50.4		
	Tertiary Edu.	1	3.6	1	3.6	5	19.9	5	17.9	16	57.1		
Desilting	No formal Edu.	3	5.6	6	11.1	1	1.9	16	29.6	28	51.9	23.145	.027

gutters and river banks	Basic Edu.	3	1.3	9	3.8	7	2.9	82	34.2	139	57.9		
	Secondary Edu.	1	1.3	3	3.8	3	3.8	16	20.5	55	70.5		
	Tertiary Edu.	-	-	-	-	1	3.6	4	14.3	23	82.1		
Rotating crops at regular intervals	No formal Edu.	3	5.6	3	5.6	6	11.1	10	18.5	32	59.3	23.886	.021
	Basic Edu.	9	3.8	7	2.9	8	3.3	92	38.3	124	51.7		
	Secondary Edu.	1	1.3	1	1.3	2	2.6	20	25.6	54	69.2		
	Tertiary Edu.	-	-	1	3.6	-	-	9	32.1	18	64.3		
Leaving farmlands to fallow to regain its strength	No formal Edu.	2	3.7	4	7.4	2	3.7	8	14.8	38	70.4	23.096	.027
	Basic Edu.	6	2.5	1	0.4	6	2.5	43	17.9	184	76.7		
	Secondary Edu.	1	1.3	-	-	-	-	16	20.5	61	78.2		
	Tertiary Edu.	1	3.6	1	3.6	2	7.1	5	17.9	19	67.9		
Leaving cleared weeds on the land to serve as manure	No formal Edu.	4	7.4	2	3.7	5	9.3	5	9.3	38	70.4	29.507	.003
	Basic Edu.	5	2.1	5	2.1	4	1.7	31	12.9	195	81.3		
	Secondary Edu.	3	3.8	-	-	-	1.8	15	19.2	60	76.9		
	Tertiary Edu.	-	-	2	7.1	-	-	6	21.4	20	71.4		

Source: Field Work, 2018 **N=400**

Table 4.4 shows a cross tabulation of farmer's educational background and their level of knowledge on SEA. The chi square result indicated that there is a statistically significant relationship between educational background and recycling and reusing waste, planting trees on empty lands and replacing cut ones, use of alternative pest control as traditional methods, desilting gutters and river banks, rotating regular intervals, leaving farmlands to fallow to regain its strength and leaving cleared weeds on the farm to serve as manure with their p-values < 0.05. The result shows that there is generally a significant relationship between respondents' educational background and their level of knowledge on SEA. This means that the higher the education, the more knowledgeable the farmer is in terms of these activities.

For instance, the results in the activities, recycling and reusing waste, alternative pest control using traditional methods and rotating crops at regular intervals shows that the higher the education, the higher level of knowledge on SEA. With regards to recycling and reusing waste for example, the results revealed that farmers with no formal education had 74.1% level of knowledge as compared to 77.1% of basic, 79.5% of secondary and 82,2% of tertiary educations. Similarly, with regards to rotating crops at regular interval, the results pointed out 77.8% level of knowledge for no formal education as against 90% of basic, 94% of secondary and 96.4% of tertiary educations.

4.2.2.4 Farmers' Levels of knowledge on Sustainable Environment Activities with Regards to their Age

Knowledge, said to be a product of education and experience has been identified as an influencing factor in farmers' decisions regarding management and sustainable practices (Hothongcum, Suwunnamek and Suwanmaneepong, 2014). As a result, to obtain

respondents' level of knowledge on SEA with regards to their ages, a cross tabulation was conducted to identify whether farmers at different ages exhibited the same levels of knowledge on SEA. Table 4.5 therefore shows a cross tabulation of respondents' level of knowledge on SEA and their ages.

Table 4.5: Cross Tabulation of Farmers' Ages with their Level of Knowledge on Sustainable Environment Activities

Sustainable Environment Activities	Age	Percentages of Responses to Level of Knowledge										χ^2	Sig. Level
		Very Low		Low		Neutral		High		Very High			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%	10.481	.233
Recycling and re-using waste	18 – 35	11	10.1	7	6.4	5	4.6	32	29.4	54	49.5		
	36 – 45	9	7.6	9	7.6	5	4.2	29	24.6	66	55.9		
	46 – 60	18	10.4	21	12.1	5	2.9	60	34.7	69	39.9		
Planting trees on empty lands and re-placing cut ones	18 – 35	7	6.4	56	5.5	7	6.4	22	20.2	67	61.5	14.189	.077
	36 – 45	3	2.5	5	4.2	2	1.7	26	22.0	82	69.5		
	46 – 60	5	2.9	9	5.2	3	1.7	54	31.2	102	59.0		
Using manure as a major form of fertilizer	18 – 35	13	11.9	7	6.4	4	3.7	17	15.6	68	62.4	9.332	.315
	36 – 45	7	5.9	4	3.4	7	5.9	22	18.6	78	66.1		
	46 – 60	13	7.5	7	4.0	7	4.0	45	26.0	101	58.4		
Use of alternative pest control: traditional methods	18 – 35	16	14.7	12	11.0	14	12.8	20	18.3	47	43.1	16.323	.038
	36 – 45	9	7.6	7	5.9	8	6.8	40	33.9	54	45.8		
	46 – 60	27	15.6	22	12.7	13	7.5	39	22.5	72	41.6		
Desilting gutters and river banks	18 – 35	2	1.8	3	2.8	6	5.5	23	21.1	75	68.8	20.806	.008
	36 – 45	2	1.7	4	3.4	-	-	30	25.4	82	69.5		
	46 – 60	3	1.7	11	6.4	6	3.5	65	37.6	88	50.9		

Rotating crops at regular intervals	18 – 35	5	4.6	6	5.5	7	6.4	24	22.0	67	61.5	13.798	.087
	36 – 45	2	1.7	2	1.7	5	4.2	41	34.7	68	57.6		
	46 – 60	6	3.5	4	2.3	4	2.3	66	38.2	93	53.8		
Leaving farmlands to fallow to regain its strength	18 – 35	6	5.5	1	0.9	3	2.8	15	13.8	84	77.1	11.808	.160
	36 – 45	2	1.7	3	2.5	5	4.2	25	21.2	83	70.3		
	46 – 60	2	1.2	2	1.2	2	1.2	32	18.5	135	78.0		
Leaving Cleared weeds on the lands to serve as manure	18 – 35	5	4.6	3	2.8	4	3.7	10	9.2	87	79.8	6.362	.607
	36 – 45	2	1.7	2	1.7	2	1.7	21	17.8	91	77.1		
	46 – 60	5	2.9	4	2.3	3	1.7	26	15.0	135	78.0		

Source: Field Work, 2018 **N = 400**

Table 4.5 points out that there is statistically significant relationship between farmers' age and use of alternative pest control methods and distilling gutters and river banks with their p-values < 0.05. This results showed that 2 out of the 8 SEA had significant relation with age. It could therefore be concluded that generally farmers ages generally have no significant relation on their level of knowledge of SEA.

In spite of this, the results showed that within the two SEA activities which showed significant relationship between age and knowledge levels of respondents (use of alternative pest control methods and distilling gutters and river banks) middle age farmers within the ages of 36 to 45 had higher knowledge levels (79.7% and 94.9% respectively in both activities) as compared to the other age groups which recorded 61.4% and 89.9% (youth within the ages of 18 to 35) and 64.1% and 88.5% (elderly farmers within the ages of 46 to 60 years) respectively in the same activities.

In effect, it can be concluded that age of respondents generally had a modest significant relationship with level of their knowledge; the middle age groups within the ages of 36 to 45 had higher knowledge levels in the "use of alternative pest control methods and distilling gutters and river banks" than the other age groups. The result thus showed that irrespective of one's age, they had approximately the same knowledge level of SEA.

4.2.3 Farmer's Levels of Attitudes towards Sustainable Environment Activities

To identify farmers' level of attitudes towards SEA, respondents were made to scale their level of attitudes on a 5-point Likert scale which ranged from strongly disagree to strongly agree as depicted on Table 4.6.

Table 4.6: Levels of Farmers' Attitudes towards Sustainable Environment Activities

Attitudes towards Sustainable Environment Activities	Percentages of Responses towards Level of Attitude										Mean	Standard Deviation
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*		
Recycling and re-use of waste is a good practice and needs to be encouraged	12	3.0	7	1.8	13	3.3	100	25.0	268	67.0	4.51	.884
It should be compulsory for everyone to plant trees around his/her surroundings	7	1.8	12	3.0	12	3.0	91	22.8	278	69.5	4.55	.836
Manure should be used as the major form of fertilizer in Ghana	20	5.0	10	2.5	21	5.3	111	27.8	238	59.5	4.34	1.041
Traditional pest control methods (like ash application and herbs usage) must be encouraged rather than chemical pesticides	19	4.8	20	5.0	23	5.8	148	37.0	190	47.5	4.18	1.064
Two days in a month must be set aside for sanitation activities (like desilting gutters and weeding banks of rivers) in every community	2	.5	3	.8	17	4.3	109	27.3	269	67.3	4.60	.657
It is good to plant different crops together on the farm at the same time	15	3.8	30	7.5	30	7.5	118	29.5	207	51.8	4.18	1.096

Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	10	2.5	9	2.3	10	2.5	67	16.8	304	76.0	4.62	.851
leaving cleared weeds on the land is a good source of manure and needs to be encouraged	8	2.0	4	1.0	8	2.0	58	14.5	322	80.5	4.74	.864
Radio and television programmes must be used to educate farmers on environmental sustainability issues.	2	.5	2	.5	24	6.0	71	17.8	301	75.3	4.67	.658
Education on the environment and sustainable development must be provided to everybody	3	.8	6	1.5	10	2.5	80	20.0	301	75.3	4.68	.671
It is good to encourage others to plant trees around their surroundings	3	.8	5	1.3	10	2.5	88	22.0	294	73.5	4.66	.663
Anybody who engages in activities that destroy the environment (e.g. bush burning and galamsey' activities) must be punished severely	5	1.3	4	1.0	10	2.5	79	19.8	302	75.5	4.67	.694
It is the responsibility of every person to protect environmental resources	16	4.0	2	.5	5	1.3	54	13.5	323	80.8	4.67	.872
Overall Mean	**4.5 = strongly agree**											

Source: Field Work, 2018 **N=400**

Table 4.6 reveals that farmers' generally had a highly positive attitude towards SEA (with a general mean of 4.5). It can also be seen from the table that the mean values range from 4.18 to 4.74. The highest attitude was by leaving cleared weeds on the land to serve as a good source of manure (mean= 4.74 and a standard deviation of .864). This was followed by education on the environment and sustainable development must be provided to everybody with a mean of 4.68 and a standard deviation of .671. The lowest attitude was by traditional pest control methods (like ash application and herbs usage) being encouraged rather than chemical pesticides with a mean and standard deviation of 4.18 and 1.064 respectively.

4.2.3.1: Farmers' Levels of Attitudes towards Sustainable Environment Activities with Regards to their Sex

To determine farmers' levels of attitudes toward SEA with regards to sex, a cross tabulation was conducted to find out if males and females displayed the same levels of attitudes towards SEA as presented on Table 4.7 as follows:

Table 4.7: Cross Tabulation of Farmers' Sex with their Levels of Attitude on Sustainable Environment Activities

Attitudes Towards Engaging in Sustainable Environment Activities	**Sex**	**Percentages of Responses towards Level of Attitude**										χ^2	**Sig. Level**
		Strongly Disagree		**Disagree**		**Neutral**		**Agree**		**Strongly Agree**			
		f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*		
Recycling and re-use of waste is a good practice and needs to be encouraged	Male	5	2.3	5	2.3	8	3.8	54	25.4	141	66.2	2.001	.736
	Female	7	3.7	2	1.1	5	2.7	46	24.6	127	67.9		
It should be compulsory for everyone to plant trees around his/her surroundings	Male	1	0.5	2	0.9	6	2.8	58	27.2	146	68.5	14.851	.005
	Female	6	3.2	10	5.3	6	3.2	33	17.6	132	70.6		
Manure should be used as the major form of fertilizer in Ghana	Male	9	4.2	2	0.9	11	5.2	67	31.5	124	58.2	7.375	.117
	Female	11	5.9	8	4.3	10	5.3	44	23.5	114	61.0		
Traditional pest control methods must be encouraged rather than pesticides	Male	13	6.1	11	5.2	13	12.2	87	40.8	89	41.8	6.835	.145
	Female	6	3.2	9	4.8	10	5.3	61	32.6	101	54.0		
Two days in a month must be set aside for sanitation activities	Male	-	-	2	0.9	6	2.8	64	30.0	141	66.2	6.080	.193
	Female	2	1.1	1	0.5	11	5.9	45	24.1	128	68.4		
It is good to plant different crops together on the farm at the same time.	Male	11	5.2	19	8.9	19	8.9	60	28.2	104	48.8	5.907	.206
	Female	4	2.1	11	5.9	11	5.9	58	31.0	103	55.1		

Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	Male	6	2.8	5	2.3	7	3.3	39	18.3	156	73.2	2.448	.654
	Female	4	2.1	4	2.1	3	1.6	28	15	148	79.1		
Leaving cleared weeds on the land is a good source of manure and needs to be encouraged	Male	4	1.9	2	0.9	1	0.5	33	15.5	173	81.2	8.060	.153
	Female	4	2.1	2	1.1	7	3.7	25	13.4	147	78.6		
Radio and television programmes must be used to educate farmers on environmental sustainability issues.	Male	1	0.5	1	0.5	13	6.1	39	18.3	159	74.6	.127	.998
	Female	1	0.5	1	0.5	11	5.9	32	17.1	142	75.9		
Education on the environment and sustainable development must be provided to everybody	Male	1	0.5	4	1.9	4	1.9	48	22.5	156	73.2	3.326	.505
	Female	2	1.1	2	1.1	6	3.2	32	17.1	145	77.5		
It is good to encourage others to plant trees around their surroundings	Male	-	-	3	1.4	7	3.3	49	23.0	154	72.3	4.934	.294
	Female	3	1.6	2	1.1	3	1.6	39	20.9	140	74.9		
Anybody who engages in activities that destroy the must be punished severely	Male	2	0.9	3	1.4	5	2.3	46	21.6	157	73.7	2.135	.711
	Female	3	1.6	1	0.5	5	2.7	33	17.6	145	77.5		
It is the responsibility of every person to protect environmental resources	Male	11	5.2	1	0.5	3	1.4	30	14.1	168	78.9	1.958	.743
	Female	5	2.7	1	0.5	2	1.1	24	12.8	155	82.9		

Source Field Work, 2018 **N = 400** **df =12**

The computerized Chi-square results indicated that there is a statistically significant relationship between sex that it should be compulsory for everyone to plant trees around his/her surroundings with a p-value < 0.05. This shows that male had a higher or positive attitudes towards making planting trees around their surroundings compulsory compared to females. It could therefore be generally concluded that there is no significant relationship between farmers' sex and their level of attitudes towards SEA.

4.2.3.2: Farmers' Levels of Attitudes towards Sustainable Environment Activities with Regards to their Educational Background

To determine farmers' levels of attitudes towards SEA with regards to educational background, a cross tabulation was conducted to identify whether farmers with different educational backgrounds exhibited similar levels of attitudes towards SEA. This is presented on Table 4.8 as follows:

Table 4.8: Cross Tabulation of Farmers' Educational Background with their Level of Attitude towards Sustainable Environment Activities

Attitudes Towards Engaging in Sustainable Environment Activities	Educational Background	Percentages of Responses towards Level of Attitude										χ^2	Sig. Level
		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
		f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	17.742	.124
Recycling and re-use of waste is a good practice and needs to be encouraged	No formal Edu.	1	1.9	2	3.7	4	7.4	14	25.9	33	61.1		
	Basic	11	4.6	4	1.7	9	3.8	64	26.7	152	63.3		
	Secondary	-	-	1	1.3	-	-	17	21.8	60	76.9		
	Tertiary	-	-	-	-	-	-	5	17.9	23	82.1		
It should be compulsory for everyone to plant trees around his/her surroundings	No formal Edu.	1	1.9	4	7.4	3	9.3	12	22.2	32	59.3	17.742	.026
	Basic	4	1.7	7	2.9	5	1.3	63	26.3	163	67.9		
	Secondary	2	2.6	1	1.3	2	2.6	12	15.4	61	78.2		
	Tertiary	-	-	-	-	2	7.1	4	14.3	22	78.6		
Manure should be used as the major form of fertilizer in Ghana	No formal Edu.	4	7.4	2	3.7	7	13.0	4	7.4	37	68.5	30.629	.002
	Basic	15	6.3	7	2.9	13	5.4	73	30.4	132	55.0		
	Secondary	1	1.3	1	1.3	-	-	28	35.9	48	61.5		
	Tertiary	-	-	-	-	1	3.6	6	21.4	21	75.0		
Traditional pest control methods must be encouraged rather than	No formal Edu.	3	5.6	5	9.3	7	13.0	14	25.9	25	46.3	23.668	.023
	Basic	12	5.0	13	5.4	15	6.3	99	41.3	101	42.1		
	Secondary	2	2.6	1	1.3	1	1.3	27	34.6	47	60.3		

pesticides	Tertiary	2	7.1	1	3.6	-	-	8	28.6	17	60.7		
Two days in a month must be set aside for sanitation activities	No formal Edu.	-	-	1	1.9	3	5.6	14	25.9	36	66.7	4.000	.983
	Basic	2	0.8	2	0.8	9	3.8	66	27.5	161	67.1		
	Secondary	-	-	-	-	4	5.1	20	25.6	54	69.2		
	Tertiary	-	-	-	-	1	3.6	9	32.1	18	64.3		
It is good to plant different crops together on the farm at the same time.	No formal Edu.	1	1.9	3	5.6	7	13.0	15	27.8	28	51.9	24.860	.016
	Basic	11	4.6	19	7.9	12	5.0	81	33.8	117	48.8		
	Secondary	2	2.6	6	7.7	4	5.1	19	24.4	47	60.3		
	Tertiary	1	7.1	2	7.1	7	25.0	3	10.7	15	53.6		
Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	No formal Edu.	3	5.6	2	3.7	3	5.6	11	20.4	35	64.8	31.039	.002
	Basic	6	2.5	3	1.3	4	1.7	31	12.9	196	81.7		
	Secondary	-	-	2	2.6	0	-	21	26.9	55	70.5		
	Tertiary	1	3.6	2	7.1	3	10.7	4	14.3	18	64.3		
Leaving cleared weeds on the land is a good source of manure and needs to be encouraged	No formal Edu.	2	3.7	1	1.9	1	1.9	14	25.9	36	66.7	21.916	.110
	Basic	5	2.1	3	1.3	4	1.7	26	10.8	202	84.2		
	Secondary	1	1.3	-	-	2	2.6	12	15.4	61	78.2		
	Tertiary	-	-	-	-	1	3.6	6	21.4	21	75.0		
Radio and television programmes must be used to educate farmers on	No formal Edu.	-	-	1	1.9	8	14.8	15	27.8	30	55.6	22.060	.037
	Basic	1	0.4	1	0.4	13	5.4	34	14.2	191	79.6		
	Secondary	1	1.3	-	-	2	2.6	15	19.2	60	76.9		

environmental sustainability issues.	Tertiary	-	-	-	-	1	3.6	7	25.0	20	71.4		
Education on the environment and sustainable development must be provided to everybody	No formal Edu.	-	-	2	3.7	3	5.6	22	40.7	27	50.0	28.545	.005
	Basic	3	1.3	4	1.7	5	2.11	36	15.0	192	80.0		
	Secondary	-	-	-	-	2	2.6	17	218	59	75.6		
	Tertiary	-	-	-	-	-	-	5	17.9	23	82.1		
It is good to encourage others to plant trees around their surroundings	No formal Edu.	1	1.9	2	3.7	3	1.4	20	37.0	28	51.9	23.351	.025
	Basic	2	1.8	3	1.3	5	2.1	42	17.5	188	78.3		
	Secondary	-	-	-	-	2	2.6	22	28.2	54	69.2		
	Tertiary	-	-	-	-	-	-	4	14.3	24	85.7		
Anybody who engages in activities that destroy the must be punished severely	No formal Edu.	1	1.9	1	1.9	4	7.4	13	24.1	35	64.8	17.725	.124
	Basic	3	1.3	2	0.8	5	2.1	46	19.2	184	76.7		
	Secondary	1	1.3	-	-	-	-	19	24.4	58	74.4		
	Tertiary	-	-	1	3.6	1	3.6	1	3.6	25	89.3		
It is the responsibility of every person to protect environmental resources	No formal Edu.	1	3.7	1	1.9	4	7.4	8	14.8	39	72.2	25.459	.013
	Basic	1	5.0	1	0.4	1	0.4	30	12.5	196	81.7		
	Secondary	-	2.6	-	-	-	-	13	16.7	63	80.8		
	Tertiary	-	-	-	-	-	-	3	10.7	25	89.3		

Source Field Work, 2018 **N = 400**

Table 4.8 shows a cross tabulation of farmers' educational background with their level of attitudes towards sustainable environment activities. The chi-square results shows that there is a statistically significant relationship between educational background of farmers' and attitudes towards recycling and re-use of waste, planting trees around one's surroundings, use of manure as the major form of fertilizer, use of alternative pest control methods, planting different crops together on the farm at the same time, leaving cleared weeds on the land as a source of manure, use of radio and television programmes to educate farmers on sustainable environment, provision of environmental education to everybody, encouraging others to plant trees around their surroundings and the responsibility of every person to protect environmental resources with their p–values < 0.05. The table (4.8) shows that there is a significant relationship between respondents' educational background and their level of attitudes towards these outlined SEA. This means that the higher the educational level the more positive attitudes he or she has towards these activities.

For instance, with regards to attitudes towards making tree planting around surroundings compulsory, the results revealed that respondents with no formal education had 81.5%, those with basic education had 89.6%, 98.7% for those with secondary education and 100% for those with tertiary education. It could therefore be concluded that generally farmers with higher educational backgrounds and for that matter formal education had positive attitudes towards SEA than those with no formal educational background.

4.2.3.3: Farmers' Levels of Attitudes towards Sustainable Environment Activities with Regards to their Age

To determine farmers' level of attitudes toward SEA with regards to age, a cross tabulation was done to find out if farmers at different ages exhibited the same levels of attitudes towards SEA. Table 4.9 therefore shows a cross tabulation of respondents' level of attitudes towards SEA.

Table 4.9: Cross Tabulation of Farmers' Ages with their Level of Attitude towards Sustainable Environment Activities

Attitudes Towards Engaging in Sustainable Environment Activities	**Age**	**Percentages of Responses towards Level of Attitude**										χ^2	**Sig. Level**
		Strongly Disagree		**Disagree**		**Neutral**		**Agree**		**Strongly Agree**			
		f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	18.955	.012
Recycling and re-use of waste is a good practice and needs to be encouraged	18 – 35	4	3.7	3	2.8	5	4.6	20	18.3	77	70.6		
	36 – 45	4	3.4	2	1.7	6	5.1	20	16.9	86	72.9		
	46 – 60	4	2.3	2	1.2	2	1.2	60	34.7	105	60.7		
It should be compulsory for everyone to plant trees around his/her surroundings	18 – 35	4	3.7	4	3.7	9	8.3	14	12.8	78	71.6	36.354	.000
	36 – 45	2	1.7	3	2.5	2	1.7	19	16.1	92	78.0		
	46 – 60	1	0.6	5	2.9	1	0.6	59	33.5	108	62.4		
Manure should be used as the major form of fertilizer in Ghana	18 – 35	6	5.5	4	3.7	9	8.3	18	16.5	72	66.1	15.909	.044
	36 – 45	4	3.4	1	0.8	6	5.1	33	28.0	74	62.7		
	46 – 60	10	5.8	5	2.9	6	3.5	60	34.7	92	53.2		
Traditional pest control methods must be encouraged rather than pesticides	18 – 35	8	7.3	8	7.3	8	7.3	27	24.8	58	53.2	22.787	.004
	36 – 45	4	3.4	4	3.4	9	7.6	35	31.4	64	54.2		
	46 – 60	7	4.0	8	4.6	6	3.5	84	48.6	68	39.3		
Two days in a month must be set aside for sanitation activities	18 – 35	-	-	-	-	2	1.8	15	13.8	92	84.4	34.243	.000
	36 – 45	1	0.8	3	2.5	4	3.4	29	24.6	81	68.6		
	46 – 60	1	0.6	-	-	11	6.4	65	37.6	96	55.5		

It is good to plant different crops together on the farm at the same time.	18 – 35	6	5.5	10	9.2	5	4.6	23	21.1	65	59.6	15.990	.043
	36 – 45	4	3.4	8	6.8	13	11.0	29	24.6	64	54.2		
	46 – 60	5	2.9	12	6.9	12	6.9	66	38.2	78	45.1		
Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	18 – 35	6	5.5	6	5.5	2	1.8	15	13.5	80	73.4	16.041	.042
	36 – 45	2	1.7	2	1.7	5	4.2	21	17.8	88	74.6		
	46 – 60	2	1.2	1	0.6	3	1.7	31	17.9	136	78.6		
Leaving cleared weeds on the land is a good source of manure and needs to be encouraged	18 – 35	3	2.8	2	1.8	5	4.6	16	14.7	83	76.1	15.202	.125
	36 – 45	3	2.5	2	1.7	1	0.8	22	18.6	90	76.3		
	46 – 60	2	1.2	-	-	2	1.2	20	11.6	147	85.0		
Radio and television programmes must be used to educate farmers on environmental sustainability issues.	18 – 35	1	0.9	-	-	14	12.8	14	12.8	80	73.4	23.119	.003
	36 – 45	-	-	2	0.7	4	3.4	17	14.4	95	80.5		
	46 – 60	1	0.6	-	-	6	3.5	40	23.1	126	72.8		
Education on the environment and sustainable development must be provided to everybody	18 – 35	1	0.9	-	-	6	5.5	18	16.5	84	**77.1**	11.721	.164
	36 – 45	1	0.8	4	3.4	2	1.7	27	22.9	84	71.2		
	46 – 60	1	0.6	2	1.2	2	1.2	35	20.2	133	76.9		
It is good to encourage others to plant trees around their surroundings	18 – 35	1	0.9	4	3.7	5	4.6	19	17.4	80	73.4	12.249	.140
	36 – 45	1	0.8	1	0.8	2	1.7	25	21.2	89	75.4		
	46 – 60	1	0.6	-	-	3	1.7	44	25.4	125	72.3		

Anybody who engages in activities that destroys the environment (e.g. bush burning and galamsey activities) must be punished severely	18 – 35	2	1.8	2	1.8	4	3.7	20	18.3	81	74.3	11.482	.176
	36 – 45	1	0.8	2	1.7	3	2.5	15	12.7	97	82.2		
	46 – 60	2	1.2	-	-	3	1.2	44	25.4	124	71.7		
It is the responsibility of every person to protect environmental resources	18 – 35	3	2.8	-	-	2	1.8	15	13.5	89	81.7	12.618	.126
	36 – 45	4	3.4	2	1.7	3	2.5	11	9.3	98	83.1		
	46 – 60	9	6.2	-	-	-	-	28	16.2	136	78.6		

Source: Fieldwork, 2018 **N= 400** **df = 8**

Table 4.9 shows a cross tabulation of farmers' ages with their levels of attitude towards SEA. The computerized Chi-Square results indicated that there is a statistically significant relationship between farmers' ages and their attitude towards recycling and reuse of waste, making planting of trees compulsory for everyone around their surroundings, use of manure as a major form of fertilizer in Ghana, encouraging the use of traditional pest control methods, setting two days in a month aside for sanitation activities in every communities, planting different crops together on the farm at the same time, leaving some parts of farmlands unplanted to enable the land to regain its strength and using radio and television programmes to educate farmers' on environmental sustainability issues with their p-values < 0.05.

The result further indicated that the higher the age, the more favourable one's attitude in most of the SEA. For instance, most elderly respondents within the ages of 46 to 60 years (95.9%) had the most favourable attitudes towards making tree planting compulsory in their communities compared to 94.1% of middle age respondents and 84.4% of young respondents within age 18 to 35 years.

4.2.4 Farmer's Levels of Practices on Sustainable Environment Activities

To obtain the farmers' level of practices of SEA, respondents indicated their level of practices on a 5-point Likert scale which ranged from never to always as indicated in Table 4.10.

Table 4.10: Levels of Farmer's Practices on Sustainable Environment Activities

Practices of Sustainable Environment Activities	Percentages of Responses to Level of Practices										Mean	Standard Deviation
	Never		Low		Average		High		Always			
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
I use manure as a source of fertilizer	86	21.5	24	6.0	37	9.3	58	14.5	195	48.8	3.63	1.620
I reuse waste (like polythene) for other important activities (e.g. nursing seedlings)	79	19.8	32	8.0	45	11.3	95	23.8	149	37.3	3.51	1.532
I plant trees around my surroundings and available bare lands.	65	16.3	27	6.8	42	10.5	99	24.8	167	41.8	3.69	1.471
I encourage others to plant trees around their surroundings	64	16.0	34	8.5	52	13.0	110	27.5	140	35.0	3.57	1.442
I use traditional methods like ash and herbs as alternative pest control measures	102	25.5	36	9.0	71	17.8	78	19.5	113	28.3	3.16	1.554
I take part in communal activities for sustaining environmental resources in my community (e.g. desilting gutters, clearing and desilting river banks)	15	3.8	13	3.3	21	5.3	93	23.3	258	64.5	4.42	.998
I divide my farmlands and rotate crops at the same time	31	7.8	14	3.5	38	9.5	101	25.3	216	54.0	4.14	1.207
I leave some part of my farmland unplanted for the land to regain its fertility	21	5.3	11	2.8	26	6.5	78	19.5	264	66.0	4.38	1.079

Cleared weeds on my farmland are left to rot as a form of manure	19	4.8	16	4.0	24	6.0	66	16.5	275	68.8	4.41	1.083
I am a member of an environmental protection group and participate in their activities	155	38.8	39	9.8	21	5.3	45	11.3	140	35.0	2.94	1.779
I attend meetings for sustaining the environment	98	24.6	46	11.5	41	10.3	90	22.5	125	31.3	3.24	1.591
I attend environmental education training programmes	103	25.6	51	12.8	44	11.0	88	22.0	114	28.5	3.15	1.586
Overall Mean	**3.7 = High**											

Source: Field Work, 2018 **N=400**

Table 4.10 reveals that respondents generally practiced SEA on a higher level (with an overall mean score of 3.7). It can also be seen from the table that the mean values range from 2.94 to 4.42. The highest practice was taking part in communal activities for sustaining environmental resources in their communities (mean = 4.42 and a standard deviation of .998). This was followed by leaving cleared weeds on their farmland to rot as a form of manure (mean of 4.41 and a standard deviation of 1.083). The lowest activity they practiced was being a member of an environmental protection group and participating in their activities (mean 2.94 and standard deviation of 1.779).

4.2.5 Farmers' Levels of Practices on Sustainable Environment Activities with Regards to their Sex

To determine farmers' levels of practices of SEA with regards to sex, a cross tabulation was conducted to identify whether female and male respondents' practice SEA at the same level. The results are presented on Table 4.11 as follows:

Table 4.11: Cross Tabulation of Farmers' Sex with their Levels of Practices of Sustainable Environmental Activities

Practices of Environmental Sustainable Activities	Sex	Percentages of Responses to Level of Practices										χ^2	Sig. Level
		Never		Low		Average		High		Always			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%		
I use manure as a source of fertilizer	Male	43	20.2	10	4.7	29	13.6	33	15.5	98	46.0	12.055	.017
	Female	43	23.0	14	7.5	8	4.3	25	13.4	97	51.9		
I reuse waste (like polythene) for other important activities (e.g. nursing seedlings)	Male	42	19.7	17	8.0	26	12.2	54	25.4	74	34.7	1.633	.803
	Female	37	19.8	15	8.0	19	10.2	41	21.9	75	40.1		
I plant trees around my surroundings and available bare lands.	Male	28	13.1	16	7.5	26	12.2	63	29.6	80	37.6	10.565	.032
	Female	37	19.8	11	5.9	16	8.6	36	19.3	87	46.5		
I encourage others to plant trees around their surroundings	Male	28	13.1	19	8.9	28	13.1	72	33.8	66	31.0	11.101	.025
	Female	36	19.3	15	8.0	24	12.8	38	20.3	74	39.6		
I use traditional methods like ash and herbs as alternative pest control measures	Male	57	26.8	20	9.4	45	21.1	44	20.7	47	22.1	9.769	.045
	Female	45	24.1	16	8.6	26	13.9	34	18.2	66	35.3		
I take part in communal activities for sustaining environmental resources in my community (e.g. desilting gutters, clearing)	Male	7	3.3	13	6.1	13	6.1	55	25.8	125	58.7	15.990	.003
	Female	8	4.3	-	-	8	4.3	38	20.3	133	71.1		
I divide my farmlands and rotate crops at the same time	Male	15	7.0	7	3.3	23	10.8	59	27.7	109	51.2	2.919	.572
	Female	16	8.6	7	3.7	15	8.0	42	22.5	107	57.2		
I leave some part of my farmland unplanted for	Male	11	5.2	7	3.3	19	8.9	43	20.2	133	62.4	5.573	.233

the land to regain its fertility	Female	10	5.3	4	2.1	7	3.7	35	18.7	131	70.1		
Cleared weeds on my farmland are left to rot as a form of manure	Male	9	4.2	7	3.3	16	7.5	45	21.1	136	63.8	10.082	.039
	Female	10	5.3	9	4.8	8	4.3	21	11.2	139	74.3		
I am a member of an environmental protection group and participate in their activities	Male	78	36.6	19	8.9	12	5.6	36	16.9	68	31.9	15.149	.004
	Female	77	41.2	20	10.7	9	4.8	9	4.8	72	38.5		
I attend meetings for sustaining the environment	Male	51	24	28	13.1	24	11.3	47	22.1	63	29.6	2.970	.705
	Female	47	25.1	18	9.6	17	9.1	43	23.0	62	33.2		
I attend environmental education training programmes	Male	60	28.3	27	12.7	22	10.3	44	20.7	60	28.2	2.322	.803
	Female	43	23.0	24	12.8	22	11.8	44	23.5	54	28.9		

Source: Field Work, 2018 **N=400** **df = 4**

Table 4.11 presents a cross tabulation of farmers' sex with their level of practices towards sustainable environment activities. The chi square results indicated that there is a statistically significant relationship between farmers' sex and the use of manure as a source of fertilizer, planting trees around their surroundings and available bare lands, encouraging others to plant trees around their surroundings, using traditional methods as alternative pest control measures, taking part in communal activities for sustaining resources in their communities, clearing weeds on their farmland left to rot as manure and being a member of an environmental protection group and participating in their activities with their p-values < 0.05. This results indicates that 7 out of the 12 activities showed significant relationship between farmers' sex and their level of practices of SEA. It could therefore be concluded that both sexes exhibited different levels of practices so far as these SEA are concerned.

For instance, it could be seen from the results that more female farmers practiced the use of rotten weeds as manure (85.5%) higher than their male counterparts (84.9%). Similarly, the results indicated that more females attend meetings for sustaining the environment regularly (56%) than their male counterparts (51.7%).

Alternatively, more males are members of environmental protection groups and they participate in their activities than their female counterparts (45.4% lower practices of males against 51% lower practices of females).

4.2.5.1 Farmers' Levels of Practices on Sustainable Environment Activities with Regards to their Educational Background

To determine farmers' levels of practices of SEA, a cross tabulation was conducted to find out if farmers with different educational backgrounds practice the same level of SEA and this is presented on Table 4.12 as follows:

Table 4.12: Cross tabulation of Farmers' Educational Background with their Levels of Practices on Sustainable Environment Activities

Practices of Sustainable Environment Activities	Educational Background	Percentages of Responses to Level of Practices										χ^2	Sig. Level
		Never		Low		Average		High		Always			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%	28.787	.004
I use manure as a source of fertilizer	No formal Edu.	12	11.6	4	7.4	7	13.0	2	3.7	26	53.7		
	Basic	65	27.1	15	6.3	18	7.5	36	15.0	106	44.2		
	Secondary	7	9.0	4	5.1	7	10.3	18	23.1	42	53.8		
	Tertiary	2	7.1	1	3.6	5	17.9	2	7.1	18	64.3		
I reuse waste (like polythene) for other important activities. (e.g. nursing seedlings)	No formal Edu.	14	25.9	2	3.7	7	13.0	6	11.1	26	48.1	27.355	.007
	Basic	53	22.1	23	9.6	18	7.5	78	32.5	83	34.6		
	Secondary	8	10.3	2	2.6	12	15.4	12	15.4	44	56.4		
	Tertiary	4	14.3	5	17.9	5	17.9	3	10.7	14	50.0		
I plant trees around my surroundings and available bare lands.	No formal Edu.	13	24.1	2	3.7	7	13.0	6	11.1	26	48.1	36.535	.000
	Basic	43	17.9	18	7.5	18	7.5	78	32.5	83	34.6		
	Secondary	5	6.4	5	6.4	12	15.4	12	15.4	44	56.4		
	Tertiary	4	14.3	2	7.1	5	17.9	3	10.7	14	50.0		
I encourage others to plant trees around their surroundings	No formal Edu.	11	20.4	7	13.0	10	18.5	12	22.2	14	25.9	30.023	.003
	Basic	46	19.2	13	5.4	26	10.8	77	32.1	78	32.5		
	Secondary	5	6.4	9	11.5	14	17.9	14	17.9	36	46.2		

	Tertiary	2	7.1	5	17.9	2	7.1	7	25.0	172	42.9		
I use traditional methods like ash and herbs as alternative pest control measures	No formal Edu.	12	22.2	9	16.7	4	7.4	9	16.7	20	37.0	28.549	.005
	Basic	75	31.3	15	6.3	48	20.0	47	19.6	55	22.9		
	Secondary	13	16.7	10	12.8	12	15.4	17	21.8	26	33.3		
	Tertiary	2	7.1	2	7.1	7	25.0	5	17.1	12	42.9		
I take part in communal activities for sustaining environmental resources in my community	No formal Edu.	6	11.1	-	-	5	9.3	9	16.7	34	63.0	25.448	.013
	Basic	5	2.1	6	2.5	10	4.2	61	25.4	158	65.8		
	Secondary	2	2.6	4	5.1	3	3.8	19	24.4	50	64.1		
	Tertiary	2	7.1	3	10.7	3	10.7	4	14.3	16	57.1		
I divide my farmlands and rotate crops at the same time	No formal Edu.	7	13.0	5	9.3	4	7.4	12	22.2	26	48.1	16.942	.152
	Basic	20	8.3	7	2.9	23	9.6	63	26.3	127	52.9		
	Secondary	1	1.3	1	1.3	10	12.8	18	23.1	48	61.5		
	Tertiary	3	10.7	1	3.6	1	3.6	8	28.6	15	53.6		
I leave some part of my farmland unplanted for the land to regain its fertility	No formal Edu.	3	5.6	2	3.7	4	7.4	11	20.4	34	63.0	16.810	.157
	Basic	13	5.4	6	2.5	12	5.0	50	20.8	159	66.3		
	Secondary	2	2.6	2	2.6	4	5.1	15	19.2	55	70.5		
	Tertiary	3	10.7	1	3.6	6	21.4	2	7.1	16	57.1		
Cleared weeds on my farmland are left to rot as a form of manure	No formal Edu.	4	7.4	3	5.6	3	5.6	13	24.1	31	57.4	14.244	.285
	Basic	14	5.8	10	4.2	14	5.8	34	14.2	168	70.0		
	Secondary	1	1.3	2	2.6	3	3.8	13	16.7	59	75.6		
	Tertiary	-	-	1	3.6	4	14.3	6	21.4	17	60.7		

I am a member of an environmental protection group and participate in their activities	No formal Edu.	15	27.8	4	7.4	5	9.3	8	14.8	22	40.7	15.076	.237
	Basic	105	43.8	25	10.4	12	5.0	23	9.6	75	31.3		
	Secondary	26	33.3	9	11.5	4	5.1	11	14.1	28	35.9		
	Tertiary	9	32.1	1	3.6	0	0.0	3	10.7	15	53.6		
I attend meetings for sustaining the environment	No formal Edu.	9	13.1	9	16.7	4	7.4	18	33.3	19	35.2	18.004	.262
	Basic	-	-	65	27.1	30	12.5	46	19.2	69	28.8		
	Secondary	1	1.3	18	23.1	8	5.1	21	26.9	26	33.3		
	Tertiary	-	-	5	17.9	3	10.7	5	17.9	11	39.3		
I attend environmental education training programmes	No formal Edu.	11	20.4	7	13.0	3	5.6	13	24.1	20	37.0	9.902	.826
	Basic	64	26.7	30	12.3	30	12.5	51	21.3	65	27.1		
	Secondary	21	26.9	11	14.1	7	9.0	18	23.1	20	25.6		
	Tertiary	6	21.4	3	10.7	4	14.3	6	21.4	9	32.1		

Source: Field Work, 2018 **N=400** **df =12**

Table 4.12 presents a cross tabulation of farmers' educational backgrounds with their levels of practices towards SEA. The Chi-square results indicated that there a statistically significant relationship between farmers' educational background and their practices of using manure as a source of fertilizer, reusing waste for other important activities, planting trees around their surroundings and available bare lands, encouraging others to plant trees around their surroundings, using traditional methods as alternative pest control measures and taking part in communal activities for sustaining environmental resources in their communities with p-values <0.05. It could therefore be concluded that farmers with different educational backgrounds exhibit different levels of practices of SEA as far as these activities are concerned.

For instance, the chi-square results showed that farmers with secondary and tertiary educational background use manure as a source of fertilizer (59.0%) more than those with no formal and basic and tertiary educational background (48.9% respectively). On the other hand, farmers with basic educational background take part in communal activities for sustaining environmental resources in their communities regularly (91.2%) than those with secondary and tertiary educational backgrounds (88.5% and 71.4% respectively). Likewise, farmers with tertiary educational backgrounds encourage others to plant trees around their surroundings regularly (67.9%) than those with no formal, basic, and secondary educational backgrounds (48.1%, 64.6% and 64.1% respectively)

4.2.5.2 Farmers' Levels of Practices on Sustainable Environment Activities with Regards to their Age

To determine farmers' levels of practices toward SEA in relation to their age a cross tabulation was conducted to identify whether farmers' at different ages exhibited the same level of practices of SEA. The results are then presented on Table 4.13 as follows:

Table 4.13: Cross tabulation of Farmers' Ages with their Level of Practices on Sustainable Environment Activities

Practices of Sustainable Environment Activities	**Ages**	**Percentages of Responses to Level of Practices**										χ^2	**Sig. Level**
		Never		**Low**		**Average**		**High**		**Always**			
		f	***%***	***f***	***%***	***f***	***%***	***f***	***%***	***F***	***%***	14.339	.073
`I use manure as a source of fertilizer	18 – 35	24	22.0	8	7.3	9	8.3	13	11.9	55	50.0		
	36 – 45	21	17.8	3	2.5	10	8.5	13	11.0	71	60.2		
	46 – 60	41	23.7	13	7.5	18	10.4	32	18.5	69	39.9		
I reuse waste (like polythene) for other important activities. (e.g. nursing seedlings)	18 – 35	20	18.3	12	11.0	14	12.8	27	29.8	36	33.0	9.470	.304
	36 – 45	41	23.7	11	9.3	15	12.7	32	27.1	42	35.6		
	46 – 60	79	19.8	9	5.2	16	9.2	36	20.8	71	41.0		
I plant trees around my surroundings and available bare lands.	18 – 35	25	22.9	8	7.3	9	8.3	21	19.3	46	42.2	8.949	.347
	36 – 45	15	12.7	9	7.6	16	13.6	28	23.7	50	42.4		
	46 – 60	25	14.5	10	5.8	17	9.8	50	28.9	71	41.0		
I encourage others to plant trees around their surroundings	18 – 35	24	22.0	11	10.1	10	9.2	22	20.2	42	38.5	15.600	.048
	36 – 45	14	11.9	14	11.9	18	15.3	39	33.1	33	28.0		
	46 – 60	17	15.0	9	5.2	24	13.9	49	28.3	65	37.6		
I use traditional methods like ash and herbs as alternative pest control measures	18 – 35	32	29.4	8	7.3	13	11.9	25	22.9	31	28.4	10.545	.229
	36 – 45	25	21.2	9	7.6	20	16.9	27	22.9	37	31.4		
	46 – 60	45	26.0	19	11.0	38	22.0	26	15.0	45	26.0		
I take part in communal activities for sustaining environmental resources in my community	18 – 35	6	4.1	3	2.8	7	6.4	16	14.7	77	70.6	15.720	.047
	36 – 45	5	4.2	6	4.2	10	8.5	29	24.6	68	57.6		
	46 – 60	4	2.3	4	1.7	4	2.3	48	27.7	113	65.3		

I divide my farmlands and rotate crops at the same time	18 – 35	9	8.3	5	4.6	8	7.3	24	22.0	63	57.8	9.029	.340
	36 – 45	7	5.9	6	5.3	9	7.6	27	22.9	69	58.5		
	46 – 60	15	8.7	3	1.7	21	12.1	50	28.9	84	48.6		
I leave some part of my farmland unplanted for the land to regain its fertility	18 – 35	11	10.1	3	2.8	8	7.3	10	9.2	77	70.6	32.927	.000
	36 – 45	5	4.2	5	4.2	15	12.7	28	23.7	65	55.1		
	46 – 60	5	2.9	3	1.7	3	1.7	40	23.1	122	70.5		
Cleared weeds on my farmland are left to rot as a form of manure	18 – 35	5	4.6	6	5.5	10	9.2	9	8.3	79	72.5	15.984	.043
	36 – 45	7	5.9	4	3.4	6	5.1	30	24.4	71	60.2		
	46 – 60	7	4.0	6	3.5	8	4.6	27	15.6	125	72.3		
I am a member of an environmental protection group and participate in their activities.	18 – 35	46	42.2	6	5.5	12	11.0	12	11.0	33	30.3	15.922	.044
	36 – 45	40	33.9	12	10.2	4	3.4	13	11.0	49	41.5		
	46 – 60	69	39.9	21	12.1	5	2.9	20	11.6	58	33.5		
I attend meetings for sustaining the environment	18 – 35	25	22.0	12	11.0	12	11.0	25	22.9	35	32.1	4.357	.930
	36 – 45	31	26.3	12	13.6	14	11.9	22	18.6	39	33.1		
	46 – 60	41	23.7	12	12.7	15	8.7	43	24.9	57	29.5		
I attend environmental education training programmes	18 – 35	31	28.4	8	7.3	11	10.1	30	27.5	29	26.6	13.623	.191
	36 – 45	25	21.2	19	16.1	19	16.1	20	16.9	35	29.7		
	46 – 60	46	26.6	24	13.9	14	8.1	38	22.0	50	28.9		

Source: Field work, 2018 **N = 400** **df = 8**

Table 4.13 depicts a cross tabulation of farmers' age with their level of practices of SEA. From the table, the computerized chi-square results revealed that there is a statistically significant relation between farmer's age and their practices of encouraging others to plant trees around their surroundings, taking part in communal activities for sustaining environmental resources in their communities, leaving some parts of their farmland unplanted for the land to regain its fertility, leaving cleared weeds on their farmland to rot as a form of manure and being a member of an environmental protection group and participating in their activities' with p-values < 0.05. This means that the higher ones' age, the higher that person's level of practices of SEA in these activities.

For instance, elderly farmers within the ages of 46 to 60 years practiced leaving cleared weeds on their farmlands to rot as manure regularly (87.9%) than the other age groups. Similarly, the elderly often practiced leaving some part of their farmlands unplanted for the land to regain its fertility regularly (93.6%) than those in the other age. Elderly farmers therefore practiced SEA regularly than those in the other age groups as far as these activities are concerned.

4.2.6 Levels of Farmers' knowledge, Attitudes and Practices of Sustainable Environment Activities with Regards to type of farming

Farmers levels of knowledge, attitudes and practices of SEA with regards to type of farming are presented as follows:

- Farmers' level of knowledge on SEA with regards to type of farming
- Farmers' level of attitudes towards SEA with regards to type of farming
- Farmers' level of practices of SEA with regards to type of farming

4.2.6.1: Levels of Farmers' Knowledge on Sustainable Environment Activities with regards to Type of Farming

Hothongcum, Suwunnamek and Suwanmaneepong (2014) identified knowledge as an organized information obtained from education and individual's experiences used by individuals to arrive at decisions regarding their practices. As a result, to obtain farmers' level of knowledge on SEA with regards to type of farming across tabulation and chi-square analysis was conducted to find out if different type of farmers exhibits the same levels of knowledge on SEA. The results are presented on Table 4.14 as follows:

Table 4.14: Cross tabulation of Type of Farming with Level of Farmers' Knowledge on Sustainable Environment Activities

Sustainable Environment Activities	Type of Farming	Percentages of Responses to Level of Knowledge										χ^2	Sig. Level
		Very Low		Low		Neutral		High		Very High			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%	21.511	.006
Recycling and re-using waste	Cash crop	6	11.1	16	13.7	1	0.9	37	31.6	57	48.7		
	Food/vegetable crop	24	13.2	18	9.9	11	6.0	55	30.2	74	40.7		
	Livestock	8	7.9	3	3.0	3	3.0	29	28.7	58	57.4		
Planting trees on empty lands and re-placing cut ones	Cash crop	5	4.3	5	4.3	2	1.7	26	22.2	79	67.5	14.351	.073
	Food/vegetable crop	9	4.9	13	7.1	6	3.3	55	30.2	99	54.4		
	Livestock	1	1.0	2	2.0	4	4.0	21	20.8	73	72.3		
Using manure as a major form of fertilizer	Cash crop	6	5.1	3	2.6	6	5.1	22	18.8	80	68.4	15.600	.048
	Food/vegetable crop	22	12.1	13	7.1	7	3.8	42	23.1	98	53.8		
	Livestock	5	5.0	2	2.0	5	5.0	20	19.8	69	68.3		
Use of alternative pest control: traditional methods	Cash crop	11	9.4	16	13.7	6	5.1	27	23.1	57	48.7	27.429	.001
	Food/vegetable crop	31	17.0	19	10.4	13	7.1	56	30.8	63	34.6		
	Livestock	10	9.9	6	5.9	16	15.8	16	15.8	53	52.5		
Desilting gutters and river banks	Cash crop	-	-	4	3.4	4	3.4	39	33.3	70	59.8	11.749	.163
	Food/vegetable crop	7	3.8	10	5.5	5	2.7	54	29.7	106	58.2		
	Livestock	-	-	4	4.0	3	3.0	25	24.8	69	68.3		

Rotating crops at regular intervals	Cash crop	1	0.9	4	3.4	5	4.3	37	31,6	70	59.8	10.559	.228
	Food/vegetable crop	10	3.8	7	3.8	6	3.3	65	35.7	94	51.6		
	Livestock	2	2.0	1	3.0	5	5.0	29	28.7	64	63.4		
Leaving farmlands to fallow to regain its strength	Cash crop	1	0.9	1	0.9	3	2.6	21	17.9	91	77.8	6.447	.597
	Food/vegetable crop	7	3.8	4	2.2	3	1.6	36	19.8	132	72.5		
	Livestock	2	2.0	1	1.0	4	4.0	15	14.9	79	78.2		
Leaving Cleared weeds on the lands to serve as manure	Cash crop	5	4.3	4	3.4	1	0.9	16	13.7	91	77.8	4.963	.761
	Food/vegetable crop	5	2.7	4	2.2	5	2.7	29	15.9	139	76.4		
	Livestock	2	2.0	1	1.0	3	3.0	12	11.9	83	82.2		

Source: Field work, 2018 **N = 400** **df = 8**

Table 4.14 shows a cross tabulation of type of farming with level of farmers' knowledge on Sustainable Environmental Activities. The computerized chi-square results discovered that there is statistically significant relation between type of farming and recycling and reusing of waste, using manure as a major form of fertilizer and use of alternative pest control (traditional methods) with a p-values < 0.05.

The results further point out that livestock farmers were more knowledgeable in recycling and re-using waste (80.1%) than cash crop and food/vegetable crops (50.3% and 70.9% respectively). Similarly, livestock farmers had higher levels of knowledge in planting trees on empty lands and replacing cut ones (93.1%) than the other farming groups (89.7% for cash crop and 84.2% for food/vegetable farming). It could therefore be concluded that livestock farmers are more knowledgeable in SEA than the other farming groups.

4.2.6.2: Farmers' Levels of Attitudes towards Sustainable Environment Activities with Regards to Type of Farming

Attitudes have been recognized as one of the major predictors of behaviours (Azjen, 1991 and Fishbein, 2000). One's attitudes or minds set is therefore said to influence his/her behaviour. The study therefore sought to find out whether type of farming (food/vegetable, cash crop and livestock farmer) influence one's level of attitudes towards SEA. This was done by cross tabulating type of farming with levels of farmers' attitudes towards SEA. This is presented on Table 4.15 as follows:

Table 4.15: Cross Tabulation of Type of Farming with Farmers' Levels of Attitude towards Sustainable Environment Activities

Attitudes Towards Engaging in Sustainable Environment Activities	Type of Farming	Percentages of Responses towards Level of Attitude										χ^2	Sig. Level
		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
		f	%	*f*	%	*f*	%	*f*	%	*f*	%	30.182	.000
Recycling and re-use of waste is a good practice and needs to be encouraged	Cash crop	1	0.9	1	0.9	1	0.9	44	37.6	70	59.8		
	Food/vegetable	10	5.5	5	2.7	4	2.2	37	20.3	126	69.2		
	Livestock	1	1.0	1	1.0	8	7.9	19	18.8	72	71.3		
It should be compulsory for everyone to plant trees around his/her surroundings	Cash crop	-	-	6	5.1	4	3.4	33	28.2	74	63.2	17.138	.029
	Food/vegetable	7	3.8	5	2.7	3	1.6	37	20.3	130	71.4		
	Livestock	-	-	1	1.0	5	5.0	21	20.8	74	73.3		
Manure should be used as the major form of fertilizer in Ghana	Cash crop	4	3.4	5	4.3	2	1.7	45	38.5	61	52.2	21.402	.006
	Food/vegetable	14	7.7	4	2.2	12	6.6	45	24.7	107	58.8		
	Livestock	2	2.0	1	1.0	7	6.9	21	20.8	70	69.3		
Traditional pest control methods must be encouraged rather than pesticides	Cash crop	2	1.7	10	8.5	4	3.4	47	40.2	54	46.2	15.934	.043
	Food/vegetable	14	7.7	8	4.4	10	5.5	68	37.4	82	45.1		
	Livestock	3	3.0	2	2.0	9	8.9	33	32.7	54	53.5		
Two days in a month must be set aside for sanitation activities	Cash crop	-	-	1	0.9	4	3.4	43	36.8	69	59.0	26.495	.001
	Food/vegetable	1	0.5	1	0.5	2	1.1	39	21.4	139	76.4		
	Livestock	1	1.0	1	1.0	11	10.9	41	26.7	61	60.4		

It is good to plant different crops together on the farm at the same time.	Cash crop	5	4.3	11	9.4	4	3.4	41	35.0	56	47.9	16.943	.031
	Food/vegetable	10	5.5	16	8.8	14	7.7	47	27.8	95	52.2		
	Livestock	-	-	3	3.0	12	11.9	30	29.7	56	55.4		
Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	Cash crop	-	-	4	3.4	1	0.9	18	15.4	94	80.3	16.233	.039
	Food/vegetable	8	4.4	5	2.7	3	1.6	30	16.5	136	74.7		
	Livestock	2	2.0	-	-	6	5.9	19	18.8	74	73.3		
Leaving cleared weeds on the land is a good source of manure and needs to be encouraged	Cash crop	-	-	1	0.9	3	2.6	15	12.8	98	83.8	21.818	.016
	Food/vegetable	8	4.4	3	1.6	2	1.1	29	12.6	146	80.2		
	Livestock	-	-	-	-	3	3.0	20	19.8	76	75.2		
Radio and television programmes must be used to educate farmers on environmental sustainability issues.	Cash crop	1	0.9	1	0.9	8	6.8	25	21.4	82	70.1	9.012	.341
	Food/vegetable	1	0.5	1	0.5	8	4.4	36	19.8	136	74.7		
	Livestock	-	-	-	-	8	7.9	10	9.9	83	83.2		
Education on the environment and sustainable development must be provided to everybody	Cash crop	-	-	1	0.9	3	2.6	21	17.9	92	78.6	6.188	.626
	Food/vegetable	1	0.5	4	2.2	3	1.6	39	21.4	135	74.2		
	Livestock	2	2.0	1	1.0	4	4.0	20	19.8	74	73.3		
It is good to encourage others to plant trees around	Cash crop	-	-	-	-	4	3.4	31	26.5	82	70.1	14.667	.066
	Food/vegetable	3	1.6	5	2.7	2	1.1	39	21.4	133	73.1		

their surroundings	Livestock	-	-	-	-	4	4.0	18	17.8	79	78.2		
Anybody who engages in activities that destroys the environment (e.g. bush burning and galamsey activities) must be punished severely	Cash crop	-	-	1	0.9	2	1.7	31	26.5	83	70.9	8.356	.400
	Food/vegetable	4	2.2	2	1.1	4	2.2	31	17.0	141	77.5		
	Livestock	1	1.0	1	1.0	4	4.0	17	16.8	78	77.2		
It is the responsibility of every person to protect environmental resources	Cash crop	2	1.7	1	-	-	-	22	18.8	92	78.6	16.469	.036
	Food/vegetable	12	6.6	-	-	2	1.1	24	13.2	144	79.1		
	Livestock	2	2.0	1	1.0	3	3.0	8	7.9	87	86.1		

Source: Field work, 2018 **N = 400** **df = 8**

Table 4.15 shows a cross tabulation of type of farming and level of farmers' attitude towards SEA. The chi-square results disclosed that there is a statistically significant relationship between type of farming and attitude towards recycling and re-use of waste, making planting of trees around one's surroundings compulsory, the use of manure as a major form of fertilizer, setting two days in a month aside for sanitation activities in every community, planting different crops together on the farm at the same time, leaving cleared weeds on the land as a source of manure and being the responsibility of every person to protect environmental resources with their p-values < 0.05. This means that farmers with different type of farming exhibit different levels of attitudes towards SEA.

For instance, the results indicated that livestock farmers had favourable attitudes towards making planting of trees around one's surroundings compulsory (94.1%) than cash crop and food/vegetable crop farmers (92% for cash crop and 91.7% for food/vegetable crop farmers). Cash crop farmers on the other hand had the most favourable attitudes towards the use of manure as a major form of fertilizer (90.7%) than the other farming groups (90.1% for livestock and 83.5% for food/vegetable farming). Food and vegetable farmers also had the highest attitudes towards setting two days in a month aside for sanitation activities in every community (97.8) than cash crop and livestock farmers (95.8% and 87.1 respectively).

4.2.6.3 Farmers' Levels of Practices on Sustainable Environment Activities with Regards to Type of Farming

To determine farmers' levels of practices toward SEA in relation to type of farming, a cross tabulation was conducted to identify whether farmers with different type of farming practiced SEA at the same level. The results are presented in Table 4. 16 as follows:

Table 4.16: Cross tabulation of Type of Farming with Farmers' Levels of Practices on Sustainable Environment Activities

Practices of Sustainable Environment Activities	Type of Farming	Percentages of Responses to Level of Practices										χ^2	Sig. Level
		Never		Low		Average		High		Always			
		F	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	37.862	.000
I use manure as a source of fertilizer	Cash crop	17	14.5	9	7.7	16	13.7	21	17.9	54	46.2		
	Food/vegetable	60	33.0	13	7.1	10	5.5	20	11.0	79	43.4		
	Livestock	9	8.9	2	2.0	11	10.9	17	16.8	62	61.4		
I reuse waste (like polythene) for other important activities. (e.g. nursing seedlings)	Cash crop	13	11.1	5	4.3	15	12.8	26	22.2	58	49.6	28.965	.000
	Food/vegetable	52	28.6	20	11.0	19	10.4	42	23.1	49	26.9		
	Livestock	14	13.9	7	6.9	11	10.9	27	26.7	42	42.6		
I plant trees around my surroundings and available bare lands.	Cash crop	13	11.1	5	4.3	10	8.5	32	27.4	57	48.7	35.078	.000
	Food/vegetable	43	23.6	20	11.0	24	13.2	40	22.0	55	30.2		
	Livestock	9	8.9	2	2.0	8	7.9	27	26.7	55	54.5		
I encourage others to plant trees around their surroundings	Cash crop	10	8.5	8	6.8	21	17.9	35	29.6	43	36.8	43.018	.000
	Food/vegetable	49	26.9	19	10.4	22	12.1	46	25.3	46	25.3		
	Livestock	5	5.0	7	6.9	9	8.9	29	28.7	51	50.5		
I use traditional methods like ash and herbs as alternative pest control measures	Cash crop	21	17.9	17	14.5	28	23.9	16	13.7	35	29.9	34.361	.000
	Food/vegetable	66	36.3	11	6.0	29	15.9	34	18.7	42	23.1		
	Livestock	15	14.9	8	7.9	14	13.9	28	27.7	36	35.6		
I take part in communal activities for sustaining environmental resources in my community	Cash crop	5	4.3	2	1.7	6	5.1	32	27.4	72	61.5	6.057	.641
	Food/vegetable	8	4.4	7	3.8	7	3.8	38	20.9	122	67.0		
	Livestock	2	2.0	4	4.0	8	7.9	23	22.8	64	63.4		

I divide my farmlands and rotate crops at the same time	Cash crop	1	0.9	3	2.6	11	9.4	38	32.5	64	54.7	26.306	.001
	Food/vegetable	26	14.3	8	4.4	15	8.2	43	23.6	90	49.5		
	Livestock	4	4.0	3	3.0	12	11.9	20	19.8	62	61.4		
I leave some part of my farmland unplanted for the land to regain its fertility	Cash crop	3	2.6	3	2.6	6	5.1	18	15.4	87	74.4	9.257	.321
	Food/vegetable	14	7.7	6	3.3	11	6.0	40	22.0	111	61.0		
	Livestock	4	4.0	2	2.0	9	8.9	20	19.8	66	65.3		
Cleared weeds on my farmland are left to rot as a form of manure	Cash crop	2	1.7	6	5.1	5	4.3	17	14.5	87	74.4	14.764	.064
	Food/vegetable	13	7.1	10	5.5	9	4.9	31	17.0	119	65.4		
	Livestock	4	4.0	0	0.0	10	9.9	18	17.8	69	68.3		
I am a member of an environmental protection group and participate in their activities.	Cash crop	37	31.6	12	10.3	5	4.3	20	17.1	43	36.8	24.684	.002
	Food/vegetable	91	50.0	15	8.2	11	6.0	15	8.2	50	27.5		
	Livestock	27	26.7	12	11.9	5	5.0	10	9.9	47	46.5		
I attend meetings for sustaining the environment	Cash crop	13	11.1	20	17.1	11	9.4	36	30.8	37	31.6	39.841	.000
	Food/vegetable	66	36.3	20	11.0	16	8.8	32	17.6	47	25.8		
	Livestock	18	17.8	6	5.9	14	13.9	22	21.8	41	40.6		
I attend environmental education training programmes	Cash crop	24	20.5	17	14.5	13	11.1	26	22.2	37	31.6	16.774	.080
	Food/vegetable	60	33.0	25	13.7	15	8.2	38	20.9	43	23.6		
	Livestock	18	17.8	9	8.9	16	15.8	24	23.8	34	33.7		

Source: Field work, 2018 **N = 400** **df = 8**

Table 4.16 shows a cross tabulation of type of farming and level of farmers' practices of SEA. The chi-square results showed that there is statistically significant relationship between type of farming and using manure as a source of fertilizer, reusing waste (like polythene) for other important activities, planting trees around their surroundings and available bare lands, encouraging others to plant trees around their surroundings, using traditional methods like ash and herbs as alternative pest control measures, dividing their farmlands and rotating crops at the same time, being a member of an environmental protection group and participating in their activities and attending meetings for sustaining the environment with their p-values < 0.05. The results show that livestock farmers practiced these outlined SEA regularly than the other farming types as far as these activities are concerned.

For instance, livestock farmers practiced using manure as a source of fertilizer regularly (78.2%) than cash crop and food/vegetable crop farming (64.1% and 54.4% respectively). Food/vegetable farmers had the least level of using traditional methods like ash and herbs as alternative pest control measures (42.3%) as compared to 29.9% and 38.9 % least level of practices for livestock and cash crop farmers respectively.

4.2.7 Relationship between farmers' Knowledge and Attitudes towards SEA, Knowledge and Practices of SEA and Attitudes and Practices towards SEA

To obtain the relationships between farmers' knowledge and attitude towards SEA, knowledge and practices towards SEA and attitudes and practices of SEA, a multiple regression and correlation analyses were conducted.

4.2.7.1 Multiple Regression Analysis

Multiple regression was used by the researcher to predict the value of the variables based on the value of two or more other variables. The study therefore analysed and presented multiple regression analysis between practice of SEA as dependent variables and knowledge on SEA, and attitudes towards SEA as independent variable. The results are presented on Table 4.17 as follows:

Table 4.17: Multiple Regression Analysis between Practice of SEA as Dependent Variables and Knowledge Level on SEA and Attitudes Towards SEA as Independent Variable

Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	**F**	***Df***	△**R** ^{2}	Collinearity Statistics	
	B	Std. Error	**ß**						**Collinearity**	**Tolerance VIF**
Practice of SEA	-.305	.401		-.762	.447	94.038	3	.416	-	-
Knowledge Level of Farmers on SEA	.066	.007	.464	9.070	.000				.564	1.774
Attitudes of Farmers on SEA	.404	.088	.234	4.576	.000				.562	1.780

Source: Fieldwork, 2018 **N= 400**

Table 4.17 shows that multicollinearity were less than 1.0 and Variance Inflation Factor (VIF) values were also lower than the cut-off value of 2.5 required for smaller samples. In this regard, the study concluded that multicollinearity was not a threat to the findings of the study. It also indicated that the regression model (Practices of SEA, Knowledge about SEA and Attitude towards SEA) significantly explained large (R^2 = 41.6%) practical effect of the variance in the practice of SEA variable at F (*P*) = .000. Knowledge towards practice was higher than attitude towards practice. This means that the farmers had higher knowledge of SEA, it did not reflect their attitudes towards practice.

Further findings revealed that farmers' knowledge on SEA (β = .464; p≤ .000) and Farmers Attitude on SEA (β = .234, p ≤ .00) contributed significantly and positively to the variance in the farmers' practices on SEA. This means that the more knowledgeable and positive attitudes they had, the higher their levels of practices of SEA.

4.2.7.2 Correlation Analysis

The parametric measure seeks to measure the strength and direction of linear relationship between pairs of continuous variables. This section therefore evaluates whether there is statistical evidence for a linear relationship among variables (Practice of SEA, Knowledge of SEA and Attitude towards SEA on one hand and KAP against sex, educational background and age) in the population, represented by a population correlation coefficient, ρ ("rho"). The Pearson Correlation used in this case was to find out the association between the variables. The results are presented on Tables 4.18 and 4.19.

Table 4.18: Correlation between Practice of SEA by Farmers, Knowledge of Farmers on SEA and Attitude of Farmers towards SEA

		Practice	Knowledge Level	Attitude
Practice	*r*	1	.620**	.542**
	sig. (2- tailed)		.000	.000
Knowledge Level	*r*	.620**	1	.661**
	sig. (2- tailed)	.000		.000
Attitude	*r*	.542**	.661**	1
	sig. (2- tailed)	.000	.000	

N = 400 ** Correlation is significant at the 0.05 level (2-tailed)

The analyzed data as shown on Table 4.18 explains correlation analyses between three variables (knowledge, attitudes and practices). The results showed a positive statistical linear relationship between practice of SEA and Knowledge level of farmers with a p-value <.05. The results further showed a significant positive linear relationship between practice and attitude. There was also a significant relationship between knowledge and practice of SEA. Finally, Table 4.18 indicate a positive statistically significant relationship between farmers' levels' of knowledge and attitudes towards SEA. This means that higher knowledge of SEA leads to highly positive attitudes towards SEA. In conclusion, knowledge and attitude of farmers are positively related to their practices of SEA. This means that higher knowledge and positive attitudes towards SEA leads to higher practices of SEA.

Table 4.19: Correlation Between KAP of SEA in Relation to Selected Demographic Data

Variables	**Sex**	**Educational Background**	**Age**	**Type of farming**
Knowledge *r*	-.029	.126**	- .006	.031
sig. (2- tailed)	.564	.012	.903	.530
Attitude *r*	-.017	.179**	.068	.039
sig. (2- tailed)	.741	.000	.178	.437
Practice *r*	.037	.116**	.027	.038
sig. (2- tailed)	.464	.020	.594	.449

N = 400 **** Correlation is significant at the 0.05 level (2-tailed)**

Table 4.19 indicates that there was no statistically significant relation between knowledge of SEA and sex, age and type of farming with their p-values >.05. However, the computerized result showed a significant statistical relation between knowledge and educational background of farmers (p-value <.05). This implies that education plays a critical role in relation to farmers' knowledge of SEA. As such, the higher the educational background of farmers, the higher their level of knowledge of SEA and vice versa.

The results further revealed that there was no statistical significant relation between attitude of farmers towards SEA and sex, age and type of farming (p-values >.05). Conversely, the computerized analysis indicated a significant relationship between attitude of farmers towards SEA and educational background (p-value <.05). This implies that educational background has an impact on farmers' attitudes towards SEA.

The correlational results also discovered that there was a statistical significant relation between practice of farmers on SEA and educational background with p-value <.05. However, the results also showed that there was no statistical significant relation between farmer's practice of SEA and sex, age and type of farming. It could therefore be deduced that educational background determines the practice of farmers.

In effect, the correlation results on Table 4.19 shows that farmers educational background plays a major role in determining their levels of knowledge, attitudes and practices of SEA. It is also worth noting that sex, age and type of farming has little influence on knowledge, attitudes and practices of SEA. Other factors may have influence these.

4.2.8 Farmer's views on measures to enhance their Knowledge, Attitudes and Practices on Sustainable Environment Activities

To obtain farmer's view on measures to enhance their knowledge, attitude and practices, respondents were made to suggest measures they think could enhance their knowledge, attitudes and practices towards SEA. The suggested measures to enhance farmers' knowledge, attitudes and practices are presented on Tables 4.20, 4.21 and 4.22 as follows:

Table 4.20: Measures to Enhance Farmers Knowledge on SEA

Measure	***f***	**%**
Education on good farming practices	163	32.7
Use of traditional farming methods	20	4.0
Punishing offenders who destroys the forest and land	13	2.6
Use of radio and television for environmental education	55	11.0
Awareness creation on environmental sustainability	38	7.6
Establishment of institutions in communities to provide regular education	8	1.6
Rules and regulating the use of natural resource	38	7.6
Integrating environmental sustainability in school curriculum	9	1.8
Provision of incentives/logistics	67	13.5
Education by expert facilitators	54	10.8
Involving community members in decisions regarding the environment	17	3.4
Training on sustainable farming practices	16	3.2
Total	498	100.0

Source: Fieldwork, 2018, * Multiple Response, N = 400**

Table 4.20 points out that the highest suggested measure to enhance farmers' knowledge on SEA was education on good farming practices which recorded 32.7% (163). This was followed by provision of incentives/ logistics which also scored 13.5% (67). On the other hand, the least scored measure to enhance farmers' knowledge on SEA was establishment of institutions in communities to provide regular education which scored 1.6% (8).

Table 4.21: Measures to Enhance Farmers Attitude towards SEA

Measure	***f***	**%**
Law enforcement on sustainable environment activities	56	11.5
Punishing offenders	82	16.9
Attitudinal Change on indiscriminate garbage disposal	36	7.4
Provision of waste bins by government	36	7.4
Awareness creation on sustainable environment	63	13
Establishing places of convenience	12	2.5
Establishing specific community institutions to provide education	24	4.9
Education by media	44	9.1
Training of community members on managing natural resources	17	3.5
Forming community groups	21	4.3
Supervision by extension officers	37	7.6
Restoring town council activities	20	4.1
Motivation/ encouragement from community leaders and members	30	6.2
Rewarding people who sustain the environment	4	0.8
Leadership by example	4	0.8
Total	486	100.0

Source: Fieldwork, 2018, * Multiple Response, N = 400**

Table 4.21 revealed that the highest suggested measure to enhance farmers' attitudes towards SEA was punishing offenders who go against environmental practices representing 16.9%. This was followed by law enforcement on sustainable environment activities from 56 farmers representing 11.6%. (56). However, the least suggested measure to enhance farmers' attitudes towards SEA were rewarding people who sustain the environment and leadership by example with 0.8% each.

Table 4.22: Measures to Enhance Farmers Practices of SEA

Measures	***f***	**%**
Enforcement of afforestation law	70	14.8
Laws against grazing animals on open lands	27	5.7
Reporting victims to appropriate authorities	11	2.3
Settings days for regular communal activities	92	19.5
Forming environmental groups in communities	52	11.0
Radio and television education	33	7.0
Punishing offenders	35	7.4
Encouragement from community leaders	42	8.9
Provision of incentives/logistics by government	27	5.7
Provision of alternative livelihoods by government/community leaders	18	3.8
Education on traditional methods of farming	21	4.4
Education by Experts	45	9.5
Total	473	100.0

Source: Fieldwork, 2018, * Multiple Response, N = 400**

Table 4. 22 points out that setting days for regular communal activities was the highest suggested measure to enhance farmers' practices of SEA representing 19.5%. Another good measure for enhancing farmers SEA practices was enforcement of afforestation laws (14.8%). There were also other measures mentioned but the least recorded suggestion by farmers to enhance their practices of SEA the provision of alternative livelihoods by government/community leaders with 3.8% (18).

4.3 Presentation of Qualitative Results

The qualitative results are also presented in the order of the following objectives

- Farmers' knowledge, attitudes and practices of SEA in the Eastern Region.
- Farmers' knowledge, attitudes and practices of SEA in the Eastern Region affects type of farming.

- Farmers' views on measures to enhance their knowledge, attitudes and practices of SEA the Eastern Region of Ghana.

The indication of A, B and C in the results represents the three groups of farmers used for the focus group discussion which included livestock, food/vegetable and cash crop farmers respectively.

4.3.1 Farmers' Knowledge, Attitudes and Practices of SEA in the Eastern Region.

This section has been categorized into farmers' knowledge, attitudes and Practices of SEA*:*

4.3.1.1 Farmers' Knowledge on Sustainable Environment Activities

Farmers' knowledge on SEA was explored with questions on activities that sustain/destroy environmental resources, laws/beliefs that regulate the use of environmental resources, sources of their environmental knowledge and their specific knowledge on some SEA. With regards to the question on which activities sustain environmental resources in their communities and why those activities sustain resources in their communities, the focus group discussion held among the three farming groups brought out a number of responses which were thematised as follows:

- Replanting trees
- Leaving cleared weeds on the land
- Planting appropriate crops on specific lands
- recycling
- Leaving unsuccessful yield on the land to rot as manure
- Manure production
- Land fallowing
- Mixed cropping

The responses provided by the three groups of farmers confirmed that all the three groups had fair knowledge on SEA. This was reflected in the various explanations given. Sample of responses are presented in the order of the listed activities. For replanting trees, the following response was provided by a participant from group C (cash crop farmer as follows):

Because we are building and continuously cutting trees for this purpose, we need to replace trees after cutting so that we do not destroy the lands…cocoa farms for example need shade all the time and must therefore have trees planted around them. Because of this, we normally plant trees in our cocoa farms and even around streams in our farms. These trees help to absorb harmful substances like insecticides spray that may damage our crops, land and water bodies… (Group C, R2).

Planting trees in this regard may have also been done to prevent drying, cooling and flooding.

For the activity, leaving cleared weeds on the land, a participant from group B (food/ Vegetable farmers) explained that:

It is important for us to leave all cleared weeds on the land for our own good. It serves as a cover to direct sunshine and also protect animals in the soil which continuously add nutrients to the soil … (Group B, R4).

In terms of planting appropriate crops on specific lands, a participant from group B elaborated that:

Every farmer must be able to identify the kind of specific crops that supports his/her land. By so doing we will be able to use the land for the cultivation of the right crops instead of damaging the forest and lands available to us for our preferred crops. For example, because thick forest does not support cereal crops like maize, some farmers end up destroying the forest just to plant maize. This is however a bad practice (Group B, R 9).

One of the participants in group A, elaborated on recycling as follows:

Even though many people may say that they do not have knowledge on this, many of our routine practices revolves on it. For example, many of our domestic waste are recycled into compost, like throwing left over foods in our gardens… (Group A, R7).

The act of leaving unsuccessful crops on the land to rot as manure was heighted by a participant from group B as follows:

…not all planted crops yield successfully so in most cases, many of us leave those one to rot to add nutrient to soil during harvesting… (Group B, R. 4)

With regards to manure production, a livestock farmer from group A said the following:

I keep as many animals as possible all the time to enable me produce enough compost for other farming activities. Even though I am mostly into livestock rearing, I also have a garden on which I plant a variety of food stuffs to feed my goats, pigs and cattle as well as my family. For this reason, I do not joke with animal droppings produced by all the animals (goats, pigs, cattle and poultry). I wake up every morning to clean their rooms and end up piling their droppings in my backyard to fertilise my garden. Since I am also one of the major livestock keepers in this community most farmers also come to me to request for compost to be used as fertilizer for their farms. I therefore have to produce enough compost for myself and the entire community so that we reduce the extent of fertilizer application on our farms. I am also able to raise some income out of this… (Group A, R1).

A food/vegetable crop farmer in relation to land fallowing explained:

If you farm any forest, you do not need to farm it continuously but rather it is important to leave the forest to rest after some number of years. You do not continuously farm the forest until all the nutrient is lost. You can leave the land to rest for a period of two to four years to enable the land to regain its fertility. By this the land can gain its fertility to support crop growth (FGF, R3).

Finally, mixed cropping was described by a participant from Group B as follows:

Those of us into food/vegetable crop farming often cultivate variety of food crops mainly to earn a living. Meanwhile, such a practice also protects our lands from excessive loss of nutrients from planting of the same type of crop at the same time. Although this may not be known to all us, it is an important activity that protects our lands indirectly for continuous use (Group B, R5).

The above statements confirmed that all the three groups of farmers; food/vegetable, cash crop and livestock had knowledge about sustainable environment activities. To strongly affirm their knowledge on SEA, farmers were also asked to list some activities they considered to destroy the environment. Among the key activities mentioned were as follows:

- Cutting trees
- Continuous farming through population growth
- Bush fires
- Charcoal production
- Pesticides and weedicides usage
- Grazing
- Wild life hunting
- Galamsey activities

These were outlined activities identified by the farmers to destroy environmental resources in their communities. Some specific responses to these activities were as follows:

Even though there are community rules regulating the use of resources like trees, some deviants hide in the forest to cut big trees for construction and building purposes. This mostly prevails in the middle parts of the forest. As a result, the outskirts of our forest are bushy but have bare lands within the middle parts which are rather supposed to be thicker (Group C, R3).

*Continuous farming as a result of growing population is something currently destroying our forest and lands. Because the population is growing rapidly, we cannot stop or reduce farming activities since we need to feed our families and others. We therefore end up farming continuously which ends up destroying the lands and forest. In the past, lands were left to regain its strength for a long time before using for farming but now we continuously farm on the lands (*FGL R3).

Another response from a participant from group B (food/vegetable farmer) on bush fires/charcoal production was as follows:

One of the major problems in our community is bushfires. This is mainly caused through burning of refuse dumps and at times charcoal production. The burning of refuse dump in our community most at times spread the fire to our farms. As a result, our farms are destroyed. We also sometimes burn cleared weeds on our farms and this also destroys the soil fertility of the land.

For pesticides and weedicide usage, a cash crop farmer emphasized that:

Cash crops farms like cocoa cannot be successful without spraying. Cocoa plants are often attacked by inserts and the only way to keep them are by spraying. Even though we are very much aware that spraying is harmful to the land and even to our health, we have no option than to do it (Group C, R2).

With regards to grazing, a livestock farmer stressed that:

One of the common problems in this community is grazing because in almost every house, you will find animals. Some people leave their animals to graze openly in the environment. This causes a problem because the animals end up destroying crops and even plants that serve as cover crops to the soil (Group A, R7).

With regards to wild life hunting, a food/vegetable farmer highlighted the following:

Some young men in our community who are popularly called as "kyenokyenofo" (meaning wild life hunters) go about setting fires in the bush all in the name of wildlife hunting. Their actions have chased most wildlife away from our forest. In the past wildlife was so common that you could even see some around homes. Meanwhile, these days they are hard to come by because of our actions (Group B, R7).

Finally, for small scale mining activities (galamsey activities), a livestock farmer explained that:

A number of people in nearby communities have abandoned farming as their major activity for galamsey practices since they claim it provides them with better livelihoods than farming could do. Some have even sold their farmlands to be used for small scale mining activities and they have no option than to join such activities. Such farmers are only thinking of their gains today and ignoring the future (Group A, R9).

Additionally, with regard to their knowledge on belief systems and laws regulating the use of resources in their communities, the results showed that a number of community sanctions together with other belief systems controlled the use of resources in the farmers' respective communities. Key among them were as follows:

- ***Taboo days against farming***

  The focus group discussions revealed that all the communities had specific days set aside for resources like land and forest to regain fertility, hence farmers were prohibited to go to farm on such days. It came out that this belief system was strongly adhered to by farmers in that failure to obey attracted sanctions from

community leaders and spiritual forces. The ability of the farmers to link this belief system to resource conservation and sustainability showed that they had adequate knowledge on SEA. This could be inferred from the following responses:

For so many years now, Tuesday have been set aside for non-farming activities. Nobody is expected to go to farm to do any farming activity. Failure to comply attracted fines to the chief and spiritual attacks from ancestors. The issue of spirituality in my view are used to scare people from such an act and also done to help the land to rest and gain fertility on Tuesday (Group C, R 6).

This was also confirmed by a livestock farmer as follows:

Fridays are observed as holidays in this town, Maame Krobo. The day is set aside to honour the land (asaase yaa) to continuously supply soil nutrients to promote our farming activities. As a result, Fridays are used for all forms of non-farming activities. It is generally believed that failure to do so attracts punishment from the gods. The actual implication of this is to help conserve the land (Group A, R 7).

Finally, a food/vegetable farmer also emphasized that:

It is a taboo to farm here on Thursdays because the day is set aside to honour our ancestors for more blessings and bumpy harvest. As a result, nobody goes to farm on this day… (Group B, R3).

- ***Laws on river bodies***

The focus group discussions also brought to bear that communities with existing water bodies had clearly outlined laws governing them like the prohibition of swimming and washing in and around water bodies and communal activities for cleaning and desilting of drainage systems. It came up from the discussions that sanctions were given to individuals who flouted such laws. Interestingly, all the discussions confirmed that the rationale for such laws were for the protection of water bodies in their community which clearly showed that they had a fair knowledge on SEA. This could be inferred from a cash crop farmer's response as follows:

We shouldn't forget that the source of water here in our community is also a major source of water for other neighbouring communities. When one water body is destroyed, it does not only affect this community rather other communities are affected as well. That

is the main reason why we often assemble to clean the banks of river bodies. We mostly do this in the dry season when the rivers are drying up so that we conserve them. In the raining season the river cleans itself by washing away the banks (Group C, R8).

Similarly, a cash crop farmer responded by saying that:

… washing in water bodies is often prohibited in many communities mainly to prevent pollution of the water bodies for domestic use and consumption by all (Group B, R 10)

A livestock farmer on the other hand explained that:

Because access to pipe-borne water is a major problem in this community, a number of regulations are set to protect available water sources. For example, sharing of river bodies with animals is banned. As a result, anybody whose animals are seen drinking directly form rivers are punished severely (Group A, R 5).

In relation to the question on farmers' knowledge on specific SEA, it emerged from the focus group discussion that the farmers had adequate knowledge on activities namely; tree planting, using manure, desilting drainage systems and water bodies, crop rotation, land fallowing and leaving cleared weeds on the farm to serve as manure. On the other hand, knowledge about specific activities like recycling and reusing waste as well as using ash and herbs as alternate pest control methods were limited. A few farmers had detailed knowledge about these while the majority were ignorant about them. Evidence from the few with limited knowledge could be seen from the following responses:

I have heard that these days of computer age, most of our domestic waste and human waste are transformed into useful product. A friend even informed me that the ordinary toilet are reused for the production of gas … (Group B, R1).

On the use of alternative pest control methods, a livestock farmer reported that:

Ash is sometimes spread in our gardens and sometimes around our house to prevent ants from attacking us or our crops… (Group A, R 7).

In summary, the results from the focused group discussions showed that generally all the farmers had high level of knowledgeable on SEA without any specific differences. Knowledge levels on SEA were additionally found to be community related rather than

the individual. This shows that the communities exposed inhabitants to general environmental issues. From the discussions, it was observed that both male and female farmers, farmers with different educational backgrounds and ages had similar knowledge levels on SEA mainly because they are all in the same communities.

This result corroborated the quantitative results which also showed no significant relationship between farmers' level of knowledge with regards to sex and age. In effect, both the quantitative and qualitative results confirmed that irrespective of one's sex and age, they had the same knowledge of SEA.

4.3.1.2 Farmers' Attitudes towards Sustainable Environment

Farmers' level of attitudes towards SEA was also explored with a question on their individual and community's attitudes towards SEA, namely recycling and reusing waste, tree planting, using manure, using ash and herbs as alternate pest control methods, desilting gutter and river banks, rotating crops, leaving farmlands to regain its strength and leaving cleared weeds on the land to serve as manure. The responses given by the farmers on these specific SEA from the three focus group discussions held revealed their level of attitudes towards SEA. These are presented as follows:

- **Recycling and reuse of waste:** With regards to this SEA, the discussions showed that most farmers had positive attitudes towards recycling and reuse of waste. The various responses provided from the focus group discussions emphasized that recycling and reusing waste was a very good activity to their communities and also contributed to preservation of resources in their communities. Most of them explained that it was important to gather and reuse waste like polythene and animal droppings for farming and other activities than just littering the

environment with such waste. Evidence of this could be seen from a response by a cash crop farmer as follows:

These days we use polythene bags for almost everything. The environment as a result gets littered with polythene; especially pure water rubbers. Because these rubbers end up destroying resources like lands, most of us go round collecting and gathering and even selling them for extra income… (Group C, R9).

Similarly, a livestock farmer added by saying that:

Poultry droppings and cow dung are not just disposed off but collected in sacks for usage by other farmers, particularly vegetable farmers as fertilizer. Additionally, since some of us are also food crop farmers, we apply some of the droppings to our backyard gardens as a major form of fertilizer. Most people in our communities prefer using these because they are organic in nature (Group A, R10).

- **Tree Planting**: The focus group discussions revealed that the farmers had positive attitudes towards tree planting as a sustainable environment activity. They explained that trees are planted for several purposes among which were serving as wind breaks and providing shades to humans and crops. For these reasons, the farmers expressed interest towards tree planting as a major form of SEA in order to obtain such benefits. Evidence of this could be seen from a response by a food/vegetable farmer as follows:

Trees are one of the most important natural resource that human beings can boost of. This is because it is used for different purposes like serving as shades for human and plants, serves as windbreaks, used for construction purposes. For this reasons we are always encouraged to plant trees around our houses and even replace cut ones (Group B, R4).

- **Manure usage**: In relation to this activity, the focus group discussions revealed that the farmers had positive attitudes towards manure usage. Manure according to them was used in many instances such as on grassland or unfertile lands as well as using it to ward off animals from eating crops. For these and many other reasons, the focus group discussion revealed that the farmers create manure from any opportunities at their disposals for usage. Their attitude towards manure

usage could be inferred from a response by a food crop farmer transcribed verbatim as follows:

Unlike chemical fertilizers that are sources of diseases to humans, manure from animal droppings and decayed substances do not provide any sickness and it is the commonest type of fertilizer in our community. As a result, we keep some lands as refuse dumps and this is a major source of manure to our community (Group A, R6).

- **Using ash and herbs as alternate pest control methods**: Unlike the other SEA, most farmers had negative attitudes towards using ash and herbs as alternative pest control methods. Ignorance on the part of most farmers about this activity contributed to negative attitudes towards this. This was expressed when some farmers complained that they had no idea about ash and use of any traditional methods but would practice when exposed to them. Others also explained that such an activity could be practiced only when there is access to large quantities of ash which in reality may be difficult to obtain in large quantities. Evidence of these were expressed by two cash crop participants as follows:

I think there are trial moments for everything. For some of us even though we have no idea about ash usage, when we are educated on it, we can practice to test. If it becomes successful then why not but if it fails, then we abandon it … (Group C, R4).

Contrastingly, another participant from the same group commented that:

How can we rely on this practice? Tell me the quantity of ash you can produce a day to supply to even your garden not to talk of your farm. The truth is that in reality this practice is not possible since some of us own large farms and may require large quantities of ash to do so which may be impossible (Group C, R2).

Desilting gutter and river banks: Evidence from the focus group discussion showed the farmers were abreast of the rationale for distilling drainages and banks of rivers. Their responses also revealed that this was one of the regular SEA often practiced in the communities. All the focus group discussions therefore showed that the farmers had positive attitudes towards distilling drainage systems and river banks. Evidence of this could be inferred from a response from a cash crop farmer as follows:

The rivers in our communities remain the main sources of water bodies for our communities and neighboring one. As a result, distilling river bodies and gutters continue to be one of our regular communal labour activities. We ensure that our gutters and rivers are clean always. In addition to this, there are community sanctions against any activity that may destroy water bodies in the communities. Apart from this too, each person serve as watch dog over others on how water bodies are used for daily activities (Group C, R5).

- **Crops Rotation Practices:** It emerged from the focus group discussions that crop rotation was one of the SEA that the farmers had positive attitudes towards. Responses from the farmers showed that dividing their farms into sections allowed them to cultivate variety of crops so that they can harvest different crops at the same time. An evidence of this from a food/vegetable farmer was as follows:

If you could follow us to inspect our various farms, you could see that crop rotation is a popular practice by almost all of us. Even though we do not consciously divide our farms, we end up planting variety of crops on the same land. Thus grouping same crops together at the same place and changing the crops planted at the same location in subsequent seasons as means to reduce attacks by *insects* (Group B, R5).

- **Leaving farmlands to regain its strength**: The focus group discussions brought to bear that land fallowing was one of the highly recognized SEA by the farmers. It came up from the discussions that the farmers had positive attitudes towards this activity. This was inferred from their responses when they explained that the

ability of a farmer to leave his/her land unfarmed for about a year or two enables the land to regain its fertility. Some of them as a result recommended this activity for every farmer. Other farmers also raised concerns that the difficulty of getting multiple lands for farming these days have reduced such practices. Nevertheless, it was concluded that land fallowing could still be practiced on single lands when divided into sections.

- **Leaving cleared weeds on the land to serve as manure:** The three focus group discussions revealed that leaving cleared weeds on the farm was a major source of manure for the land and needs to be practiced by farmers. In spite of this general consensus, other farmers raised concerns that this activity was not relevant all the time, especially in the thick forest. For such farmers cleared weeds on grasslands and thick forest do not always had to be left on the land but burnt to prevent early growth of the weeds. In effect, even though the farmers generally had positive attitudes towards leaving cleared weeds on the land, some felt that such a practice was not relevant in all situations. This could be seen from the following contrasting responses two cash crop farmers provided:

If your farm is within a thick forest, then when you clear the farmland, you cannot say you are leaving the cleared weeds and trees on the land to serve as manure. The tress will interfere with the cultivation of your crops so I think that even though the practice is good, it does not apply to all areas (Group C, R3).

On the other hand, another member of the group opposed by saying:

I do not agree with you, leaving cleared weeds on the land is a good practice and can apply everywhere; forest and grasslands. Different techniques will however be applied in these different areas. For example, for the forest areas, a farmer only needs to pick or gather the big trees for other purposes rather than leaving them on the land to distort cultivation (Group C, R6).

Another contrasting view was expressed by a food/vegetable farmer who explained:

Who says burning cleared weeds is a wrong act? If you people may care to know, anytime you burn cleared weeds, the ash adds ammonia to the soil to enrich it for bumper harvest (Group B, R2).

In summary, the results from the focused group discussions revealed that farmers generally had positive attitudes towards all the outlined SEA. The results showed that attitudinal levels towards SEA were community related than personality status of the individual. It was found out that the farmers generally adhered to community beliefs, norms and practices and therefore had positive attitudes towards activities of communal benefits despite the few nuances.

Interesting, age was found to influence the level of farmers' attitudes towards SEA. The results from the focus group discussions revealed that younger farmers had positive attitudes towards SEA than the elderly ones. It was evident from the discussions that older farmers believed that they had acquired much farming experiences so relied on the accumulated ecological knowledge and practices whereas the younger ones felt that they needed to explore new ways of doing things to secure resources for future use. This is could be inferred from a younger food/vegetable farmers' response to attitudes towards manure usage as follows:

… some of us are not fortunate to be given education like others to be able to perform any other work apart from farming. We therefore have no option to believe and rely on things considered to preserve our resources for the future. Again, unlike our parents who have farmed for a long time and know the in and out, we need to add new things to what we know (Group B, R1).

On the other hand, an older participant from the same group responded by saying:

Young farmers of today would want to explore anything because they have not experience environmental calamities of the past like the famine periods in the 80s. They therefore go about destroying the environment by cutting trees and setting bush fires aimlessly without. No experienced farmer would ever do some of these things (Group B, R10).

These results were consistent with that of the quantitative results which also revealed no significant relationship between farmers' level of attitudes with regards to sex but a significant relationship between farmers' educational backgrounds. The quantitative

results on educational backgrounds and age in relation to farmers' level of attitudes thus contradicts the qualitative findings. This was so because unlike the individual responses in the quantitative study which indicated differences in attitudes with regards to age and education, the focus group discussion revealed communal attitude instead of individual's attitude. In effect, the focus group discussions revealed that attitude was more of community.

4.3.1.3 Farmers' Practices of Sustainable Environment Activities

Farmers' level of practices on SEA was explored with a question on their practices of specific outlined SEA, namely, recycling and reusing waste, tree planting, using manure, using ash and herbs as alternate pest control methods, desilting gutter and river banks, rotating crops, leaving farmlands to regain its strength and leaving cleared weeds on the land to serve as manure. The results from these have been summarised under the outlined SEA as follows:

- **Recycling and reuse of waste:** With regards to this SEA, the results showed that most farmers always practiced recycling and reusing of waste in their respective communities. The focus group discussions indicated that the animal droppings and polythene (pure water rubbers) were the most common waste recycled and reused by the farmers. It was emphasized that the farmers often used animal droppings to fertilise their land while pure water rubbers were also collected to nurse palm seedlings. This was reflected in a response by a female livestock farmer as follows:

I spread animal droppings like cow dung and poultry droppings at my backyard which is grassland. When I apply the droppings on the grassland, I am able to cultivate different types of crops (both forest and grassland crops all the time). Again, most farmers who are vegetable and food crops farmers in this community often come to me to collect animal droppings for their farms (Group A, R2).

In support of this, a female cash crop farmer also explained instances under which they recycled and reused waste as follows:

Normally pure water rubbers and other polythene bags are collected by most of us to nurse our cocoa and palm trees because we do not have money to buy the seedlings. We also use some of the rubbers to mix weedicides to spray the farm. Others too melt the polythene bags to seal broken plastic buckets in their homes (Group C, R3)

- **Tree Planting**: With regards to tree planting as a SEA, the focus group discussions revealed that even though all the farmers had positive attitudes towards planting trees in their communities, not all of them practiced it. Responses emanating from the discussions showed that most people plant trees when seedlings are freely provided by agricultural extension officers for planting. Apart from this most of them are reluctant to planting trees. Some of them indicated that not all trees were good for planting that was why they do not regularly plant them. This was evident in a response by a male cash crop farmer as follows:

What we all have to know is that not all trees are qualified for planting. Trees that demand much soil nutrients are not good for planting because they may compete with crops for survival. Also you do not need so many trees in cocoa farms but some few ones to serve as shades to the cocoa and land. It is therefore important to select the right trees to plant since some of the trees end up killing the cocoa plants. Trees with huge canopies are not needed since they end up preventing sunlight from reaching our crops and lands (Group C, R7*).*

- **Manure usage**: This activity was identified as one of the most frequently practiced SEA by farmers. It came up from the focus group discussions that the farmers frequently applied animal dropping to infertile lands and grasslands to enable them to cultivate variety of crops. Additionally, food and vegetable farmers indicated that they had reserved community land as refuse dump where all organic waste are left to decompose to serve as manure for the entire community. Many of the farmers indicated that they often fetch soil from such

dumps to nurse seedlings for cultivation. Additionally, some farmers indicated that they use manure to spray their crops; especially those at their backyards to prevent animals from feeding on them. One of the interesting responses on the usage of manure by a food/vegetable crop farmer was as follows:

In this community (Osino), we apply manure so much to our lands that has been mined by galamsey operators and areas with sand winning activities. What we normally do is to collect refuse from our homes and refuse dumps to fill these destroyed lands to enable us to continuously use them for farming activities. (Group B, R9).

- **Using ash and herbs as alternate pest control methods**: Unfortunately, this activity was identified to be the least practiced SEA. Unlike the other SEA, most farmers had indicated limited knowledge about this practice and therefore do not practice it. The few farmers who indicated that they practiced this explained that they practiced it occasionally since they cannot get ash in abundance to be practicing it always. Interestingly, a farmer indicated that he does not practice this activity because it was wrong to mix it with organic substances. His response is as follows:

There are a number of organic sprays and others that are used in spraying farm lands. In such cases you cannot apply ash which is an acidic substance to the land since mixing the two could destroy crop growth (Group C, R 10).

- **Crops Rotation Practices:** Responses that emanated from the discussions showed that the farmers often divide their farms into sections to cultivate variety of crops so that they could have access to different crops at the same time. This was identified as a regular activity of food/vegetable crop and cash crop farmers. A cash crop farmer added that even though they are mainly into cash crop, they practice crop rotation often in order to provide them with different yields so as to

make a living. According to him, cash crops are seasonal and as a result, cannot be relied upon wholly. He explained it this way:

Farming is our dominant activity we rely upon for a living. Cash crops like oil palm and cocoa cannot therefore be the only crop we cultivate for a living. Even though we are mainly into cash crop farming, we also cultivate some food crops on small scale to feed our families. Such crops are therefore rotated seasonally… (Group C, R5).

- **Leaving farmlands to regain its strength**: The focus group discussions revealed that land fallowing or leaving lands to regain its strength was also one of the highly practiced SEA by the farmers. It emerged from the discussions that most farmers with multiple lands often left it for about 2 to 3 years to regain its strength before resuming farming. Farmers who had limited lands also left their lands for a maximum of 1 year to regain its strength before resuming farming. On the other those with just a farmland try to divide their lands into sectors and allow some sectors to regain its strength while other sectors were farmed. These are indicated in responses by a cash crop and food/vegetable crop respectively as:

Some of us are only migrants who have come here for farming purposes. We therefore depend on hired lands and others provided to us for sharing of farm produce (abunu). In this case, even though we know that farmlands must be left for a period of 2 to 3 years to regain strength, we are unable to practice it because of limited land accessibility. The best I normally do is to leave small portions of the land unfarmed for a period and resume to it later (Group C, R10).

Farmlands must be left to regain fertility for a minimum period of 2 years. I practice this very often and anytime I resume farming on the land, am able to have a bumper harvest … (Group B, R1).

Leaving cleared weeds on the land to serve as manure: From the focus group discussions most farmers leave cleared weeds on the farm to serve as a practice. Farmers who practiced this saw it as a major source of manure to lands and therefore constantly engaged in it. Nevertheless, some farmers also indicated that they do not practice this activity because their lands are grassland and forest in nature so leaving cleared weeds

on the land means giving themselves double work since those cleared weeds could germinate rapidly. As a result, these farmers explained that they often burnt cleared weeds which even add ammonium as additional soil nutrients to their lands. Evidence could be seen from contrasting responses from a food/vegetable and cash crop farmers respectively as follows:

Ideally, all cleared weeds on the farm should be left to rot as a form of manure to enrich the land. Burning cleared weeds will end up destroying animals in the land and render the land infertile. Due to this, I spread cleared weeds on the land for a short period after weeding in order to get fertile land to support my crops (Group B, R8).

My farm is a grassland and it is difficult for me to practice land fallowing. I used to leave cleared weeds to rot on my farm some years ago but realized that it was giving me extra work. The unburnt weeds end up regimenting quickly; sometimes it happens immediately after weeding even before cultivating my crops. I could therefore not rely on such a practice again (Group C, R6).

The results above show that most of the farmers practiced many of these SEA regularly. However, concerning level of farmers practices towards SEA, there were variations in responses by a male and female food/vegetable crop farmers. Some female farmers practiced methods suggested by extension officers than males. This is evident in the following responses as follows:

*Madam, I always want the best for my community so anytime we are trained by" agric" officers about any new activity, I stop all my previous practices to practice only that so that it helps improve my crops. For example, we were educated some time ago not to burn clear weeds on our farms to serve as manure for our crops and ever since I do not remember the last time I burnt weeds on my farm (*Group B, R7, female participant*).*

On the contrary, a male farmer's response showed otherwise as follows:

We often receive education from officers not to burn weeds on our farms. I don't believe in all those school theories. I continuously burn weeds on my farm and anytime I do that crops at the burnt areas yield bigger crops than unburnt areas. I will therefore continuously burn cleared (FG R2 from a male farmer).

These variations confirmed the quantitative results that revealed statistically significant relationships between sex and level of farmers practices of SEA.

4.3.2 Farmers' Knowledge, Attitudes and Practices of SEA in the Eastern Region with Reference to Type of Farming

Farmers' level of knowledge, attitudes and practices of SEA was explored with questions on their knowledge, attitudes and practices of some outlined SEA within three focus group discussions held for the three types of farming groups (food/vegetable farmers, cash crop farmers and livestock farmers). This section has been categorized into three to cover level of farmers' knowledge, attitudes and practices of SEA with regards to type of farming as follows:

4.3.2.1 Farmers' Knowledge on SEA with Reference to Type of farming

Different questions pertaining to farmers' level of knowledge on activities that sustain and those that even destroy environmental resources were asked in order to ascertain farmer's level of knowledge on SEA in relation to type of farming. Even though the discussions showed that all the three categories of farmers had appreciable level of knowledge on SEA, the result showed differences in the knowledge level as far as the three groups of farmers were concerned. The discussions showed that livestock farmers had higher levels of knowledge in most outlined SEA than the other two farming groups. The various responses by the farmers showed that livestock farmers had detailed knowledge on almost all the outlined SEA activities compared to the other farming group. This was so because most of the livestock farmers also practiced the other types of farming even though on smaller scales. Their practices in other types of farming therefore gave them the leverage over some activities like recycling, manure usage and planting trees.

This result was consistent with that of the quantitative study which showed a statistically significant relationship between type of farming and level of farmers' knowledge on SEA (indicating specifically that livestock farmers had higher levels of knowledge on SEA as compared to the other two farming groups).

4.3.2.2 Farmers' Attitude Towards SEA with Reference to Type of Farming

Farmers' level of attitudes towards SEA was also explored with a question on specific outlined SEA, namely recycling and reusing waste, tree planting, using manure, using ash and herbs as alternate pest control methods, desilting gutter and river banks, rotating crops, leaving farmlands to regain its strength and leaving cleared weeds on the land to serve as manure. Responses emanating from the three focus group discussions revealed there are differences in attitudes towards SEA by the three groups of farmers. Just like the knowledge levels of farmers on SEA, livestock farmers were found to have positive attitudes towards all the outlined SEA activities than cash crop and food/vegetable farmers who also had positive attitudes but minimal as compared to that of livestock farmers.

This result also corroborated that of the quantitative results which indicated that a greater percent of livestock farmers (86.1%, 87) had the highest level of attitude towards the responsibility of every person to protect environmental resources as against 79.1% (144) food/vegetable farmers and 78.6% cash crop farmers on the same activity. Food/vegetable farmers on the other hand had the least level of attitude towards the use of manure as a major form of fertilizer in Ghana and the use of traditional pest control methods.

4.3.2.3 Farmers' Practices of SEA with Reference to Type of Farming

Farmers' level of practices on SEA was explored with a question on their practices of specific outlined SEA, namely, recycling and reusing waste, tree planting, using manure, using ash and herbs as alternate pest control methods, desilting gutter and river banks, rotating crops, leaving farmlands to regain its strength and leaving cleared weeds on the land to serve as manure.

Responses from the focus group discussions showed that all the three farming groups practiced most SEA; namely, recycling and reusing waste, using manure, distilling gutters and river banks, land fallowing and leaving cleared weeds on the land to serve as manure. In spite of this, some specific responses from some farmers revealed differences in the level of practices of SEA among the three groups. For instance, a response from a food/vegetable crop farmer as follows indicated a lower level of practices in some SEA among that farming group.

Ah madam, so you expect me to carry animal droppings from home to the farm to apply on the land which contains food crops that will be harvested for food? No it will not happen. Even though some of my colleagues have been doing that, "mennfa mmoa agayanan ngu aduan a medi ase da" (meaning, I will never spread animal droppings around crops that I will consume. That is the more reason why fertilizers are available for some us to apply on our farms. (Group B, R7).

Surprisingly, this response was supported by two other food/vegetable crop farmers during the focus group discussion.

Another response from a livestock farmer in the focus group discussion also revealed that even though livestock farmers were very knowledgeable and had positive attitudes towards SEA, they do not often get the chance to practice all the outlined SEA. His response was as follows:

Even though some of us have farms or gardens to practice all that have been discussed, some us are limited. This is because we are solely into livestock rearing without any

*farming so we do not get the chance to practices all that we know. Nevertheless, we encourage other farming groups to employ sustainable measures by suppling manure free of charge to them (*Group A, R9).

This response was supported by two other participants in the same group.

On the other hand, four other participants from the same group supported a response made by one of their counterparts as follows:

I have the opportunity to practice many of these activities in my backyard garden, purposely to support my animals… (Group A, R2)

It came out of the focus group discussions that livestock farmers often practice SEA than the other groups). This result supported the quantitative results which showed that many livestock farmers practiced SEA regularly that cash crop and food/vegetable farmers.

4.3.3 Explanations on Farmers' Views on Measures to Enhance their Knowledge, Attitudes and Practices of Sustainable Environment Activities

Farmers' views on measures to enhance their knowledge attitudes and practices of SEA was explored with a question on what they think can be done to improve their knowledge, attitudes and practices of SEA. This section has been categorised into three, namely, farmers' views on measures to enhance their knowledge of SEA, farmers' views on measures to enhance their attitudes towards SEA and farmers' views on measures to enhance the practices of SEA.

4.3.3.1 Farmers' views on Measures to Enhance their Knowledge of SEA

With regard to farmers' views on measures to enhance their knowledge of SEA, a number of responses emanated from the three focus group discussions held. These responses were thematised and presented as follows:

- Education
- Raising Awareness
- Community involvement in decision making
- Training

Education on sustainable environment: Education emerged as one of the major measures the farmers' identified as a factor that could improve their knowledge levels on SEA. Education on sustainable environment, according to the farmers, could be done through various forms namely:

- ***House- to- house:*** Some of the farmer's explained that even though agricultural extension officers at times came to provide education on some of these issues to them, only individuals in groups or who attend such meetings benefited from such education. Environmental education according to such farmers would only be effective when conducted on a house-to-house basis for all to benefit to promote a common good. Evidence of responses were as follows:

I get to know from some neighbours who are part of farming associations that they are educated on some farming practices and since am not a member of any group, I do not benefit directly even though at times some friends share whatever their knowledge gained with me (Group B, R4).

In support of this, another respondent from the same group added:

The best these educators can do is to provide house to house education since in every house you can find a farmer… (Group B, R3).

- ***Through media:*** In contrast to this, other farmers were of the view that environmental education through radios and television programmes were the best media for education. According to these groups of farmers, it would be best for environmental education to be regularly broadcast in different local languages on

popular radio and television programmes at convenient times to enable all persons to benefit from it.

- ***Religious bodies***: Another major platform which some farmers mentioned could be used for environmental education was religion through religious leaders. Those farmers explained that religion (Christian and Islamic religions) occupy a major aspect of Ghanaians lives and could be used as a major platform to propagate environmental education. They added that religious leaders are highly respected in our communities and will make a great impact when tasked to provide environmental education as part of their routine activities. This is evidence from the following responses:

Almost every person in Asuom belongs to one religion or the other. The mosque and churches for example could be used as platforms to provide environmental education to us… (Group C, R8).

In support of this another participant from the same group added that:

These religious leaders are highly respected by their followers. Followers therefore regard any information from their leaders as ultimate. In line with these, religious leaders could be trained by extension officers to provide environmental education to their community members (Group C, R6).

- ***Peer Education***: Other farmers were also of the view that they were best informed when their colleagues provided them with the necessary information. For that matter they specified that environmental education by extension officers should be complemented by peers who were capable of doing so. They therefore advocated that during environmental education programmes, participants who perform well should be uniquely trained to be used as resource persons for their own communities and for neighbouring ones. This is evident in some responses made by participants from the livestock group as follows:

We rely on our friends for most information. We could therefore rely on our friends for environmental education on best practices. That is one of the easiest way of promoting sustainable activities (Group C, R6).

In support of this, another participant from the same group emphasized that:

To successfully promote peer education, educational providers should identify community members with unique skills during any education programme. Such individuals could be given extensive training to be better place to educate their peers (Group C, R3).

- ***Education by Expert*:** Provision of environment education by expert/resource persons was also outlined as a means of enhancing farmers' Knowledge on SEA. Some farmers were of the view that environmental sustainability is a technical issue and needs to be handled by expert educators. It came up from the discussions that there are times extension officers sent to provide education to farmers end up selling their own products and doing other things apart from providing them with the requisite education as formal in this statement.

You are all talking about education, education but have not paid attention to the kind of education provided to us. Some extension officers are incapable of providing requisite environmental education so they only go round to market their products to farmers instead… (Group B, R7).

This was in line with a response from a livestock farmer as follows:

Extension officers require regular training programmes to refresh them on emerging environmental issues to be better placed in extending environmental education to us (Group A, R4).

Awareness raising on Sustainable Environment: A couple of farmers mentioned that their first time of hearing about certain SEA like that of traditional use of ash and trees as alternative pest control measures was through the focus group discussions. As a result, they emphasized that regular awareness raising could help improve their knowledge levels on SEA if promoted. These farmers clarified that the awareness raising could be done through community or fora as well as being broadcast through radio and television stations. These were evident from the following responses:

I never knew that ash and some plants could be used as pest control measure until today. If this information is provided to us from time to time, we will be informed to practice sustainable farming (Group B, R3).

Similarly, another participant from group C confirmed this by saying:

I have gained much information from today's discussions on best environmental practices and I think this could be repeated in our community gatherings as a form of education to some us who are ignorant on some of these issues or better still broadcast on radio and TV stations (Group C, R 10).

***Community involvement in decision making*:** Active involvement of community members in decision making was also expressed by the farmers as a means of improving their knowledge levels on SEA. Most of the participants in the focus group discussions lamented they have representatives who often take community decisions on their behalf. Meanwhile, according to them decisions on sustaining their environment or any other common good must actively involve the entire community members in meetings such as durbars to give opportunity for all members to express their interest before arriving at a final decision. They added that by so doing, the entire community will be committed to whatever decision taken. According to them, this will also create opportunity for the less privilege individual to also learn. Examples of such responses include:

… it is true that we have leaders who represent us at decision making in Forifori. These leaders however should not be made to represent the entire community on decisions regarding the environmental issues since we depend on the environment differently. Rather the entire community members must be assembled in a way to take decisions on some of this issues… (Group A, R10).

In support of this, another participant from the same group also added:

I support what you are saying because each person is bound by a decision that he/she takes. This means that if all of us are involved in taking decisions on environmental issues, we will have no option than to undertake best practices for our community to develop rapidly (Group A, R9).

***Training on SEA*:** Another measure highly indicated by farmers to enhance their knowledge apart from education was training. Many of the farmers voiced out that they

could not attain any form of formal education and have since relied on traditional practices and experiences for their routine activities. In view of this, they suggested that requisite environmental training should be regularly provided to them to enhance their skills of practicing sustainable environment activities.

In summary, all the suggested measures by farmers to enhance their knowledge levels of SEA were consistent with that of the quantitative study which also identified 12 measures with education emerging as the dominant one. Similarly, the correlation results revealed that education plays a major role in determining farmers' levels of knowledge about SEA. In effect, the qualitative result complemented that of the quantitative, consequently leading to the major finding: regular education through different media was the most effective way of enhancing farmers' knowledge about SEA.

4.3.3.2 Farmers' views on Measures to enhance their Attitudes towards SEA

Just like views to enhance the knowledge levels of farmers', a number of responses also came up from the three focus group discussions on farmers' views to enhance their attitudes towards SEA. These are thematised and presented as follows:

- Punishing offenders
- Law enforcement
- Environmental Groups Formation
- Restoration of the town council system
- Motivation from community leaders
- Supervision from extension officers

Punishing Offenders who go against sustainable environment: Punishment emerged as one of the major views of farmers to enhance their attitudes towards SEA. The

discussions emphasized that humans are fallible and no matter what effort is invested into the promotion of SEA, people will still go against outlined rules and regulations. For this reason, most of the farmers were of the view that punishing offenders was a major antidote to environmental degradation. This could be inferred from a voice of a livestock farmer as follows:

Discipline is a major thing that is lacking in most communities today. Some people go about doing whatever they want without being punished. Failure to punish them severely lure many others especially, the youth into similar acts. These days you will find farmers selling or using their farmlands for galamsey activities because they consider that to be lucrative. I think that anybody caught destroying the environment in any form should be properly deal with without any discrimination just like the way galamsey operators when caught nowadays are prosecuted by the law. (Group A, R1).

In support of this, a food/vegetable crop farmer added that:

In order to get all culprits of environmental degradation there is the need to create community watch dogs in every community to serve as security checks against people who destroy the environment. The government can do this by deploying some unemployed graduates as watch dogs against insanitary activities in Osino community (Group B, R 2).

Enforcing Environmental laws: Even though law enforcement is related to punishment, it emerged as a distinct measure that could enhance farmers' attitudes towards SEA from the focus group discussions. Some farmers expressed their concerns about dormant laws in the country and communities. According to them, failure to enforce all these laws have resulted in a number of indiscipline practices and behaviours that are affecting them greatly today. For instance, it was emphasized that there are a number of national and community laws against cutting down forest trees and galamsey activities, yet still find forest and water bodies heavily destroyed. According to them, enforcement of these laws could go a long way to enhance their attitudes towards SEA. This could be seen from a voice as follows:

I don't understand why many environmental laws in the country are not implemented accordingly. I may not know all these laws in the country but am very sure about laws against tree cutting and galamsey activities. In spite of this, you will find that most of our

forest are depleted through these two activities. If culprits are severely dealt with, I don't think we will still be facing some of these issues (Group B, R4)

Environmental Group Formation in Communities: The formation of environmental groups in communities was also emphasized. The farmers raised concerns about the absence of specific environmental groups in communities to co-ordinate environmentally friendly activities. They explained that even though some of their communities have some farming associations, those specifically for the environment were missing. According to them, forming community environmental groups will force them to practice sustainable activities all the time since the groups will serve as watch dogs. The groups in their views could also help to invite resource persons to provide them with requisite education and training needed to promote sustainable environment. Evidence of some responses were as follows:

There are farmers' association in most communities that champion the interest of their members. Meanwhile, specific groups like that on environment are not popular in many communities to champion sustainable environmental practices in those communities. The formation of such group could boost our attitudes towards engaging in better practices in and outside our communities (Group A, R5).

Similarly, a female farmer emphasized:

*If environmental groups are formed in every community, group leaders with support from opinion leaders can invite resource persons to provide regular education to the groups. Even though we cannot have every community member joining the group, some of us can serve as ambassadors of the environment to educate our peers (*Group B, R3).

Restoration of the town council system: Although, restoration of town council system is related to law enforcement and punishment of offenders, it came out from the focus group discussions distinctly. Some farmers' believed that the town council systems in the past was a major check on negative environmental behaviours and practices. They explained that the disgrace and fines for victims were enough reasons to inculcate into

them positive attitudes for better environmental practices. These farmers added that the environment is currently destroyed because the activities of town councils were no more. They therefore indicated that if this system were restored, there will be improvement in attitudes towards sustaining the environment.

I quite remember in the past when people go about cleaning their environment any time they heard "tankas aba ooo" (meaning, the town councilors are in*). That era kept people on their toes to keep their environment clean to save them from punishment. The same thing can be enforced to keep deviants on check* (Group C, R4).

This was supported by a response from another group as follows:

The use of tankas (town counselors*) in the past is one the acts that has promoted communal activities in most villages up to today. In the same way, that system can be restored but not to check only sanitation issues at home but also inspect community environmental resources and punish culprit appropriately* (Group A, R1).

Motivation from community leaders: From the focus group discussions, some farmers were of the view that their attitudes toward SEA could be enhanced through community leaders' motivations. According to them, community leaders like chiefs, elders, politicians and religious leaders could help promote sustainable environment in their communities by either motivating members who actively promote sustainable environment or being directly involved in carrying out the activities themselves. This motivation according to them could be in any form; receiving recognitions or receiving physical rewards for good works done. They emphasized that this could help boost their morale and also encourage others into such ventures. This could be summed up from a livestock farmer who remarked as follows:

Just like the way National Farmers' Day is celebrated for awarding best farmers in the country, I think one of the best ways to enhance our attitudes for SEA is by acknowledging and awarding every farming association. All farmers belong to associations so selections for these awards can be made from our local associations so that we livestock farmers in rural and deprived communities could also be considered for the award rather than the rich and well known farmers in cities always being celebrated (Group A, R7).

Supervision from extension officers: Additionally, some farmers thought their attitudes towards SEA could be enhanced by receiving regular supervision form extension officers. These farmers explained that environmental activities were often carried out by employing their routine traditional practices hence the need for supervision. The supervision according to them could serve as a check on their activities and also inform them about modern and best practices.

In summary, all these suggested measures by farmers to enhance their attitudes towards SEA were in support of the quantitative study which revealed 15 measures within which those of the qualitative were embedded. The qualitative results therefore augmented that of the quantitative study.

4.3.3.3 Farmers' Views on Measures to Enhance their Practices towards SEA

To enhance farmers' practices of SEA, the farmers were made to discuss the measures they think can improve their practices of SEA in their communities. A number of responses emerged from the three focus group discussions on farmers' views to enhance their practices of SEA. These were thematised and presented as follows:

- Regular Communal Labour
- Provision of logistics
- Training
- Law enforcement

Regular Communal Labour: Setting days for regular communal labour in communities emerged as the highest measure considered by farmers to enhance their practices of SEA. It emerged from the focus group discussions that communal labour were days set aside by communities to engage in series of activities to maintain environmental sanitation as

well as protect environmental resources from destruction. According to the farmers, such days bring all community members together to undertake important communal activities. The farmers therefore believed that setting different days for communal labour could help promote SEA in their respective communities. It was emphasized that two up to four days be set aside in every month to regulate sustainable environment activities. These were reported as follows:

Communal labour is one of the forms of actions taken by almost the entire community to maintain sanitation at Forifori. This is because it is mainly organized on off farming days in which no major activities are undertaken by individuals. Again, failure to take part in the sanitation activities without permission attracted punishment of fines. In view of this all active persons come together to clean the entire community on such days (Group A, R8).

In support of this, another participant from the same group added:

Because we all know the benefits derived from communal labour, I am suggesting that multiple days be set aside to undertake regular communal activities to maintain sanitation and also conserve resources for our benefit (Group A, R4).

Provision of logistics: Similarly, some farmers were of the view that the provision of farming logistics and incentives could enhance their practices of SEA. Different logistics namely, storage facilities, lands and dams/wells were identified as some basic needs of farmers needed to be provided by government or community leaders to help improve their practices of SEA. These could be inferred from respondents as some voices transcribed verbatim as follows:

We are often being told to use organic fertilizer rather than chemical fertilizer to support plant growth. Meanwhile no effort is being made to support the production of animal dropping in abundance. The provision of storage facilities to livestock farmers will ensure that they all produce manure in abundance to support plant growth. We often pile animal droppings in the open air or sacks which continue to cause air pollution. It is therefore important for government to provide us with any container or system that will enable us to produce manure in abundance to support crop production (Group C, R10).

In addition to this, leasing of lands was also suggested by another livestock farmer as follows:

We are sometimes aware of the effects of our negative practices to the environment. we however have no option than to continue doing it. For example, many of us are using small hired lands for our livestock keeping. We therefore have no option practice unsustainable activities like openly grazing animals in the open air. If the government can lease larger lands to us for farming, most of these negative practices could be stopped (Group A, R7).

With regards to the creation of dam/wells in communities, a food/vegetable crop farmer had this to say:

The government must provide well/dams in deprived communities as major water supply for activities instead of relying on available water bodies in communities for all activities. This will enable us to continuously farm throughout the year, position us to enter into mixed farming and even stop sharing water bodies with animals (Group B, R2).

Training: Training on sustainable farming practices was also identified as a measure to enhance farmers' practices of SEA. From the focus group discussions some farmers do not have requisite skills to protect the environment. Participants explained that many of them were stuck to their traditional practices because they lack the skills for most modern practices. In view of this, they emphasized the need for training on both traditional and modern farming methods to acquaint them with the requisite skills needed to carry out SEA. This could be inferred from a farmer who indicated:

Many livestock farmers are not aware or even do not know how to create additional feed for their animals. They only rely on the open environment for grass and other feed for their animals. Continuous cutting of grass from open environment or openly grazing animals in the environment destroys it. We therefore need training on how to be able to grow grass and other feed for our animals. By so doing, pressure on the environmental resources will be reduced and we can also produce enough feed for our animals even in the dry season (Group A, R1).

Law enforcement: Enforcement of environmental laws was also identified as one of the measures that could enhance farmers' practices of SEA to regulate the use of environmental resources. According to the farmers, failure to punish individuals who destroy the environment has contributed to continuous environmental destructions in the

Region. It was therefore emphasized that offenders should be duly punished to serve as deterrent to others as indicated in the response that follows:

We all know that humans by nature are deviants… The best way to handle deviancy is to punish offender severely without any discrimination. This can teach such individuals the greatest lesson of their lives and also stop others from doing same (Group C, R2).

All the above outlined measures identified by the farmers to enhance the practice of SEA in the qualitative result were also heighted in the quantitative results. The qualitative resulted in effect complemented that of the quantitative results on farmers' explained views to enhance their practices of sustainable environment activities.

4.4 Summary of Results

The study revealed a number of results, among which were as follows:

- Respondents generally had high levels of knowledge on SEA (mean of 4.3).
- Respondents generally had a highly positive levels of attitude towards SEA (mean of 4.5).
- Respondents generally practiced SEA at high levels (mean of 3.7).
- Male and female respondents generally had no significant differences in knowledge, attitudes and practices of SEA. Meanwhile, female respondents practiced more specific SEA like recycling and re-use of waste regularly than their male counterparts.
- Respondents with higher educational backgrounds were more knowledgeable and had more favourable attitudes towards SEA than those with lower educational backgrounds. In spite of this, respondents exhibited different levels of practices as far as educational backgrounds were concerned.

- There was generally no significant relationship in respondents' age with their levels of knowledge on SEA (p = - .006). In spite of this, the middle age respondents were more knowledgeable in using alternative pest control methods and distilling drainages and river banks than the other age groups while the elderly respondents had the most favourable attitudes and practiced SEA regularly compared to the other age groups.
- Livestock farmers had the highest level of knowledge and practiced SEA regularly than cash crop and food/vegetable crop farmers whereas all the farming groups exhibited different levels of attitudes towards SEA.
- Respondents' level of attitudes towards SEA were much of community based.
- There was a highly statistically significant relationship between respondents' levels of knowledge and attitude (r = .661 at a significant level of .000). There was also a highly statistically significant relationship between respondents' levels of knowledge and practices ((r = .620 at a significant level of .000). Finally, the result showed a highly statistically significant relationship between respondents' attitudes and practices of SEA ((r = .542 at a significant level of .000)
- Respondents' levels of knowledge and attitudes towards SEA positively influenced their levels of practices of SEA.
- Education on good farming practices, punishing of offenders and setting specific days for regular communal activities were the highest suggest measures identified by respondents to enhance their knowledge, attitudes and practices of SEA respectively.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

This chapter discusses the results of the study. The presentation follows the order of the objectives and in relation to reviewed literature. The discussion is therefore presented in line with the following objectives:

- Farmer's levels of knowledge, attitudes and practices of SEA in the Eastern Region with regards to sex, education and age.
- Levels of farmers' knowledge, attitudes and practices on SEA in the Eastern Region with reference to type of farming.
- Relationship between farmers' knowledge and attitudes towards SEA, knowledge and practices of SEA and attitudes and practices of SEA.
- Farmers' views on measures to enhance their knowledge, attitudes and practices of SEA the Eastern Region of Ghana.

5.2 Farmer's levels of knowledge of Sustainable Environment Activities

Knowledge according to Waitling and Zhou (2011) is obtained from concepts and principles which are acquired from experiences, education and investigation. Knowledge is therefore one of the key educational products needed to enrich one's experiences. Knowledge, said to be a product of education and experience has been identified as an influencing factor in farmers' decisions regarding management and sustainable practices (Hothongcum, Suwunnamek and Suwanmaneepong, 2014) Inferably, the provision of requisite environmental education will provide high environmental knowledge and experiences.

Farmers' levels of knowledge on SEA are discussed in relation to their sex, education and age in the following specific areas:

- Farmers' level of knowledge on SEA with regards to sex
- Farmers' level of knowledge on SEA with regards to education
- Farmers' level of knowledge of SEA with regards to age

5.2.1 Farmers' Levels of Knowledge on SEA with Regards to Sex

The study results showed that the overall level of farmers' knowledge on SEA was high (overall mean score = 4.3). This could be as a result of the farmers' experiences gained from their constant farming practices as well as education received from extension officer.

In spite of this, farmers' level of knowledge on SEA regarding sex showed slight differences in knowledge level on specific activities. For example, male farmers were much knowledgeable in leaving farmlands to fallow to regain its strength and leaving cleared weeds on the land to serve as manure ($p = 0.002$ and 0.013 respectively) than their female counterparts (93.9% and 93% high and very high males knowledge levels scores as against 93% and 92% females high and very high knowledge level scores). Female farmers on the other hand were much knowledgeable in recycling and reusing waste ($p = 0.019$) than their male counterparts (79.2% level of female knowledge against 76.1% level of male knowledge on the activity). The study therefore revealed that there is generally no significant relationship between male and female farmers' sex in relation to their level of knowledge on SEA.

The differences in knowledge levels for males and females in these specific activities could be attributed to a number of reasons. For instance, during the focus group discussions, one of the commonest recycling activities explained by some females were re-use of domestic and plastic waste. The high female farmer's level of knowledge in recycling could therefore be attributed to their constant handling of domestic waste than males. Likewise, male farmers' higher level of knowledge in land fallowing and production of manure from cleared weeds could also be explained from their constant engagement in farming practices. Farming is generally a male dominated area so male farmers could accumulate much knowledge from their constant farming practices than females who at times provide supportive farming roles. Again, lands are mostly owned by males than females and as such could have much knowledge from land fallowing practices and males.

These results correspond with the research findings by Michalous, Creech, MacDonald & Kahlke (2009) in their study on the people's knowledge, attitude and behaviour about sustainable development in Manitoba which found out that gender had no relation to individuals' knowledge on sustainability. In spite of this findings, these authors argued that gender inequality plays a major role in sustainable development. Similarly, the study results confirmed another research finding on the knowledge, awareness, attitudes and practices towards environment among students in the University of Kebangsaan Malaysia (Hassan, Rahman and Abdullah, 2012) which also found out that there was no significant difference between male and female students' knowledge on the environment.

In spite of this, the study results contradict findings of Sign and Hensel (2013) in their study which sought to measure the knowledge index of paddy farmers in India after a

scientific intervention on sustainable agricultural practices. Contrastingly, the study found out that significant differences existed between male (mean difference=31.28) and female farmers (mean difference=33.96) knowledge index. Their findings thus indicated a major difference between male and female knowledge level on specific sustainable agricultural practices before and after a scientific intervention. Female knowledge levels were found to be higher than that of the males after the scientific intervention of extension education.

Even though, the present study also confirms the fact that males and female farmers have knowledge level differences as far as sustainable knowledge on specific sustainable environment activities (leaving farmlands to fallow to regain its strength, recycling and reuse of waste and leaving cleared weeds on the land to serve as manure) are concerned, the study revealed no major difference between males' and females' general knowledge levels on SEA. The minor differences could be attributed to differences in resource accessibility and management by males and females (Rico, 1998). In many cultures, males generally have access to natural resources due the patriarchal nature of their communities. Males therefore tends to exercise much control over these resources than their female counterparts. In effect both males and females tend to accumulate knowledge over the natural resources that they have control over.

This result corresponds to the theoretical underpinnings of the study. The Integrative Model of Behavioral Prediction (Fishbein, 2000) basically assumes that behaviours can be predicted directly and indirectly by a number of factors; among which are intention, skills and environmental constraints (direct factors) and background variables (like demographic data). The study results indicated that being male or female influenced

farmers level of knowledge on specific activities like leaving lands to fallow and recycling and reuse of waste.

5.2.2 Farmers' Levels of Knowledge on SEA with Regards to Education

The study results showed that there is generally a significant relationship between farmers' educational background and their level of knowledge on sustainable environment activities. The study results specifically revealed that farmers with low educational backgrounds (No formal education) had lower level of knowledge on SEA than those with higher formal educational background. For instance, with regards to the activity, "leaving cleared weeds on the land to serve as manure", farmers with no formal education, 79.7% had higher level of knowledge as against 94.2% of those with basic education, 96.1% secondary education and 92.8% of those with tertiary education.

Formal education thus enhances in individual's requisite knowledge, skills and attitudes towards improvement in the conditions of life. Even though farmers with no formal educational background may have environmental knowledge, those with formal education had higher because they may be equipped with educational programmes integrated with environmental issues. For instance, in Ghana, environmental education is integrated into basic and secondary education curricula and is also an elective course at the tertiary levels.

This result supports the findings of Waitling and Zhou (2011) in a study which sought to determine whether people had positive or negative attitudes towards sustainability and how knowledge levels affect people's attitudes. They found out from their study that education and knowledge about sustainability play an important role in developing

positive attitudes towards sustainability. According to them, highly educated individuals are much rational about sustainability than the less educated. Education according to them therefore plays a key role in promoting sustainable environment.

The study result also confirmed Rico (1998) who asserted that broadly based education and training received by individuals is a key factor in the initiation of any sustainable development process. According to Rico (1998), the type and level of education received by people become the pointers to the opportunities that people have both to minimize or resist the negative impact of environmental problems on their lives and to develop methods for using and managing resources that ensure that these are protected and that the process is a sustainable (p. 12).

From their assertions, it could be seen that the type and level of ones' education goes a long way to promote the extent to which he/she promotes sustainable environment activities. The study results indicated that farmers with no formal education have the least level of knowledge in most of the SEA. Even though these farmers lack formal education, they may be informally or non-formally educated from their values and community extension education from agricultural extension officers. Unlike the informal and non-formal education, formal education has structured systems in place (for example curriculum integrated with environmental issues) to enforce and streamline one's knowledge level.

This is also highlighted in the concept of education for sustainability when Laurie, Nonoyama-Tarumi, Mickeown and Hopkin (2016) alluded that education for sustainability promotes academic gains as well as enhancing individuals' capacities to

support sustainable development. Additionally, it could be stressed that primary and secondary education are expected to ensure that all pupils acquire the knowledge, skills and values needed for being responsible citizens. In effect an integration of all these educational forms (Formal, non-formal and informal) are necessary for sustainability purposes.

The study results also confirm the Integrative Model of behaviour prediction (Fishbein, 2000) which underpins the study. Fishbein (2000) emphasized that behaviours are indirectly influenced by some demographic characteristics, among which he alluded as socio-economic variables. Education in this case forms part of the socio-economic variables which according to him tend to indirectly shape behaviour through one's belief systems in forming attitudes towards the performance of a behaviour.

The study found out that education play a major role in determining farmers' knowledge levels of sustainable environment activities. Thus, farmers who received formal education might have read from other sources of SEA or head these through the radio and television where these issues were discussed in English rather than the local languages.

5.2.3 Farmers' Levels of Knowledge of SEA with Regards to Age

The study results showed that even though farmers age generally had no significant relationship with their level of knowledge ($r = -.006$, $p = 0.903$); the middle age farmers (36 to 45 years) were more knowledgeable in using alternative pest control methods and distilling drainages and river banks (79.7% and 94.9% respectively in both activities)

than the other age groups (61.4% and 89.9% for youth within 18 to 35 years and 64.1% and 88.5% for elderly within 46 to 60 years).

This result is a reflection of the situation in many rural communities of Ghana. Farming is generally perceived to be an occupation of the middle-age and elderly whereas white collar job is perceived to be for the youth. As a result, many of the educational and training programmes targeting farmers are highly attended by the middle-age farmers and elderly who end up gaining much knowledge as compared to the younger ones. Additionally, active participation of the middle age groups in communal and farming activities enable them to accumulate much experience and knowledge over time which may probably be a contributory factor to their higher knowledge levels in specific SEA than the other age groups.

Studies have also confirmed that age is also a determinant of individual's level of knowledge in decision making (Singh and Hensel, 2013). For instance, the result is consistent with the findings of Michalous, Creech, MacDonald and Kahlke (2009) in their study which sought to find out people's knowledge, attitudes and behaviours about sustainable development. Their study found out that age had a modest positive correlation with the knowledge on sustainable development. The study emphasized that the aged in many instances has much sustainability experiences than the younger.

The study result is also consistent with the theoretical underpinnings of the study. The Integrative Model of Behavioural Prediction (Fishbein, 2000) generally assumes that behaviours can be predicted directly by personal habits (skills and intentions) together

with environmental constraints and indirectly by background variables among which is age which may influences the knowledge levels indirectly.

The study thus revealed that farmers age generally had no significant relationship with their level of knowledge; however, to some extent middle-age groups farmers were more knowledgeable in the use of alternative pest control methods and distilling gutters and river banks.

5.3 Farmers levels of Attitudes towards Sustainable Environment Activities

Attitude which is defined as the 'degree' to which execution of behavior is positively or negatively (or favorably or unfavorably) evaluated by an individual is seen as one of the key variables which indirectly influence the performance of a behaviour/action/practice (Fishbein, 2000; Fishbein and Yzer, 2003 and Borges, Lansink, Ribeiro and Lutke, 2014).

Farmer's levels of attitudes on SEA are discussed in relation to their sex, education and age in the following specific areas:

- Farmers' levels of attitudes on SEA with regards to sex
- Farmers' levels of attitudes on SEA with regards to education
- Farmers' levels of attitudes of SEA with regards to age

5.3.1 Farmers' Levels of Attitudes towards SEA with Regards to Sex

The study results showed that farmers generally had highly positive attitudes toward SEA (mean = 4.5). The results specified that farmers' had the highest attitude towards leaving cleared weeds on the land to serve as a good source of manure (mean= 4.74 and

a standard deviation of .864). It also indicated their lowest attitudes towards the use of traditional pest control methods (like ash application and herbs usage) with a mean and standard deviation of 4.18 and 1.064 respectively. The use of manure from rotten weeds was regarded from the focus group discussion as one the most common practices of SEA in their communities. Their highest attitudes towards this activity may have therefore been shaped by their constant usage of it since individuals generally tend to develop positive attitudes towards activities considered to be good by them. Their lowest attitudes towards the usage of traditional pest control measure on the other hand could be explained from their limited knowledge in such practices as revealed in the focus group discussions.

In spite of this, the study results revealed that even though farmers' levels of attitudes towards SEA was generally not significantly correlated to sex, male farmers had highly positive attitudes (95.7%) towards making everyone plant trees around his/her surroundings compulsory than their female counterparts (88.29%). It could therefore be seen from the study results that even though attitudes generally influence individuals behaviour, males and female do have much differences in their levels of attitudes towards SEA.

Surprisingly, planting trees around surroundings happened to be one out of the thirteen SEA that showed a significant relationship between farmers' sex probably because of the numerous benefits derived from planting trees. Trees are planted in most Ghanaian communities to serve as wind breaks, provide shade, serve as places of relaxation for people and rest place for animals, serve as working place for some women, provide fruits (like orange and mangoes) and even palm trees for meals and brooms.

This study result is contrasted by a study conducted in Manitoba which sought to find out people's knowledge, attitudes and behaviours about sustainable development by Michalos, Creech, MacDonald & Kahlke (2009). Unlike the present study, Michalos, Creech; MacDonald & Kahl2009) found out that being woman is positively associated with having a favourable attitude toward sustainable development than being a man. The focus group discussion further supported the assertion that attitude towards SEA was more of community association. This implies that being a male or female does not have much relations to individual's attitudes towards environmental sustainability but highly influenced by communal attitude.

The difference in findings about the relations between gender and attitude towards sustainability in these two studies could be explained by the differences in population and research designs used. Michalos; Creech; MacDonald & Kahlke (2009) study was conducted using two sets of population (Manitoba household survey and Manitoba student survey) whereas the present study focused on a single population of farmers with both survey and focused group discussions. The contextual difference could also be a contributory factor for the contrasting findings. While Michalos; Creech; MacDonald & Kahlke (2009) study was conducted in Manitoba, Canada with enlightened population, the present study was conducted in rural communities in the Eastern Region of Ghana with mixed educational levels.

Similarly, the study result contrasted findings by another study conducted among students in the University of Kebangsaan Malaysia on the knowledge, awareness, attitudes and practices towards the environment (Hassan, Rahman and Abdullah, 2011). Contrastingly, this study found out that there were significant differences in terms of

attitudes between males and female students with female students having higher attitude towards the environment compared to male students. The differences in these research findings could be attributed to the differences in population and research designs used. While the former focused on an enlightened student population using only quantitative research design (questionnaire), the later focused on less enlightened farmers using both quantitative and qualitative research designs (Questionnaire and focus group guide). Additionally, the contextual differences (Malaysia and Ghana) could also be a contributory factor to the differences in research findings.

This study indicated that some communities either had highly favourable or moderately favourable attitudes towards SEA which tends to influence entire community members' attitudes. This explains why sex generally had no significant relationship with farmers' attitudes towards SEA. With reference to this, sex cannot be used as a background variable to predict farmers' sustainable environment activity behavior as specified by the theoretical underpinning of the study (Integrative Model of Behavioral Prediction, Fishbein, 2000).

5.3.2 Farmers' Levels of Attitudes towards SEA with Regards to Education

Education is generally considered to be a major component that instills better attitudes towards enacting sustainable activities or behaviours among people (Nnabue and Asodike, 2010; Yauntari, Gestel, Straleen, Widianarko, Sunoko and Shorbib, 2015 and Hirsh, 2014). In support of this, the study results revealed that there is generally a significant and positive relationship between respondents' educational background and their level of attitudes towards sustainable environment activities ($r = .179$). The results thus indicated that farmers with higher educational background and for that matter

formal education had positive attitudes towards SEA than those with no formal educational backgrounds. For instance, with regards to attitudes towards making tree planting around surroundings compulsory, the results revealed that respondents with no formal education had 81.5%, those with basic education had 89.6%, 98.7% for those with secondary education and 100% for those with tertiary education (χ^2 = 17.742, p = 0.026, df = 12).

This result supports with a number of study findings (Bedural, 2018; Tang, 2018 and Aini et al, 2006). For instance, Aini, Laily, Nurizan, Azizah, Zuroni, and Norhasmah, (2006) found sustainable knowledge, attitudes and practices among Malaysians that highly educated respondents had more positive attitude than the less educated ones. Education in this regards (Both formal and non-formal) raises awareness and instills in individuals' requisite environmental knowledge and better attitudes to be translated into positive practices, although not always do people translate better attitudes into best behaviours.

Similarly, Bedural (2018) in a study examining the association between the educational attainment of Filipinos and their values, attitudes and actions towards the environment identified that educational attainment significantly influenced their values, attitudes and actions towards the environment. The study specifically found out that those with higher education expressed more positive values and attitude towards the environment than those with lower education. In addition to this, Tang (2018) also found out that education for sustainable development had positive effects on attitudes and perceptions of teachers and students.

The association between education and environmental attitudes is also emphasized by the theoretical underpinning of the study (The Integrative Model of Behaviour Prediction by Fishbein, 2000 respectively). The strong relationship between education and better environmental attitudes therefore stems from the fact that favourable environmental attitudes are built from environmental knowledge/awareness which are embedded in educational components.

Additionally, the Integrative Model of Behaviour Prediction also emphasized that apart from these variables directly influencing a behaviour, behaviours are also influenced indirectly by some background variables like demographics and socio-economic factors such as education influencing people's environmental attitudes. In essence, the provision of requisite environmental education directly and indirectly builds favourable environmental attitudes in individuals.

5.3.3 Farmers' Levels of Attitudes towards SEA with Regards to Age

Research has also shown that individuals of different ages hold different environmental attitudes and perform environmental behaviors of different kinds and to varying degrees. In support of this, the study results showed that there is no significant relationship between farmers' age and their level of attitudes towards SEA (correlational result of r = .068, p= 0.178). In spite of this, the results specified that in most cases elderly farmers within the ages of 46 to 60 years had the most favourable attitudes towards SEA than the other age groups. For instance, most elderly respondents within the ages of 46 to 60 years (95.9%) had the most favourable attitudes towards making tree planting compulsory in Ghana compared to 94.1% of middle age respondents and 84.4% of young respondents within age 18 to 35 years (χ^2 = 36.354, p = .000, df= 8).

This result could be explained on the basis that elderly people out of their accumulated experiences on the environment in particular among environmental hazards could therefore have a higher attitude towards sustainable environment activities. This age group has experienced a number of environmental hazards in the past out of degradation activities like bush fires and other unsustainable practices. Key among this was the famine periods in the 80s which created enormous challenges in the country. Having been exposed to some of these disasters, elderly farmers may not like to go through such experiences again, hence developing the most favourabe attitudes towards making tree planting compulsory for every Ghanaian. Tree planting is obviously linked to food crops conservation and as such may be highly supported by the elderly to avoid challenges of the past. This is supported by the saying that, the last man will die if the last plant dies.

This results however contradicts the findings by Waiting and Zhou (2011) in a study on whether people have positive or negative attitudes towards sustainability and how knowledge levels affect people's attitudes. On the contrary, their research discovered that age plays no role towards having positive attitude towards sustainability. These contrasting finding could be attributed to the differences in context and population used for the studies. Whereas the current study used farmers in rural areas of the Eastern Region in Ghana, the later used student population.

5.4 Farmer's levels of Practices of Sustainable Environment Activities

Practices popularly known as behaviours in enacting activities in most studies is said to be highly influenced by knowledge, attitudes and skills of individuals (Fishbein and Yzer, 2003; Borges, Lansink, Ribeiro and Lutke, 2014). It is also related to the concept of public participation in sustainable development which according to Tottimeh (2017)

could be direct (being part of decision making and implementation processes or indirect (being represented in groups).

An individual's biographic data are said to influence the performance of his or her behaviour indirectly (Fishbein, 2000). Different studies have shown that people at different ages tend to have different attitude and behaviour towards sustaining the environment. The strength and direction of age-effects observed across studies has been inconsistent. Different studies have shown contrasting finding on the relationship existing between age and sustainable practices The study results indicated that farmers generally practiced SEA at higher levels (mean =3.7). The highest practiced SEA was recorded by taking part in communal activities for sustaining environmental resources in their communities (mean = 4.42 and a standard deviation of .998) while the lowest practiced SEA was being a member of an environmental protection group and participating in their activities (mea = 2.94 and standard deviation of 1.779).

These results are a reflection of what pertains in most Ghanaian communities. One of the most common practice in many rural communities is communal activities/labour, popularly referred to as 'oman adwuma'. Most rural communities in Ghana have specific days set aside for undertaking environmental activities like desilting drainages, clearing bushy environment, among others. It is therefore not surprising that communal activities emerged as the highest practiced SEA. On the other hand, being a member of an environmental protection group and participating in their activities was the least practiced possibly because environmental groups are not formed in most communities to enable farmers to champion sustainability agenda. In support of this, the focus group discussion revealed that farmers do not participate in environmental group activities

because such groups do not exist in their communities. Additionally, forming environmental groups also emerged as one of the suggested measures to enhance farmers' practices of SEA.

Farmer's level of practices on SEA are discussed in relation to their sex, education and age in the following specific areas:

- Farmers' levels of practices of SEA with regards to sex
- Farmers' levels of practices on SEA with regards to education
- Farmers' levels of practices of SEA with regards to age

5.4.1 Farmers' Levels of Practices on SEA with Regards to Sex

With regards to farmers practice of SEA in relation to sex, the results discovered that there is a negative non-significant relationship between farmers' sex and their level of practices of SEA (correlational result r = -037). Males and females thus exhibited different levels of practicing SEA; although females in most instances practiced most activities regularly. For instance, it could be seen from the results that more males are members of environmental protection groups and they participate in group activities than their female counterparts (45.4% lower practices of males against 51% lower practices of females, p = 0.004). This could be as a result of the traditional roles of males in decision making. Decision making since time immemorial has been a male domineering area, in spite of the few changes in recent times. Farming groups in many rural communities in Ghana are the decision makers in the community as far as issues about their type of farming is concerned. Alternatively, more female farmers used rotten weeds as manure (85.5%) higher than their male counterparts (84.9%) with a p-value of 0.039. Women may be doing so because of their traditional knowledge of compost which are mainly

generated domestically. The collection and management of domestic waste is a feminine than a masculine activity, hence the higher participation of female farmers in using rotten weeds as manure. In addition to this, the females may be practicing this activity than males because of the low purchasing power of women in buying chemical fertilizer.

The study result is consistent with the assertion that women have always been and remain the influencing agents for quality life and well-being of their families and as such play primary roles of care giving and managing of natural resources for families and communities (UNESCO, 2002). Similarly, Rico (1998) emphasized that access to and control of environmental resources determines who damage the environment more or protect it. It is evident in most Ghanaian cultural practices that males have greater access and control over natural resources (for example land) than their female counterparts. This could explain why female farmers tend to practice most SEA regularly than males in the Eastern Region although the difference is insignificant. It also confirms the general notion that women protect while men damage.

The result also confirms by findings of a study in Manitoba which found out that being female was positively associated with sustainability behaviours index than being male (Michalos; Creech; MacDonald & Kahlke, 2009). Their findings indicated that gender plays a major role in sustainable development where females are major actors of sustainable activities than males. Although, this study result showed that both male and female farmers exhibited divergent levels of practicing specific SEA, the correlational results revealed no correlation between sex and level of practicing SEA.

In addition to this, the study result is contrasted by a contention by Mabawonku when he alluded that women are also responsible for much of the environmental destruction taking place in the rural and urban areas (Mabawonku as cited in Egaga and Aderibigbe, 2015). This assertion is however arguable. The fact that women played major roles in the different aspect of the rural economy over the centuries does not make them actors of environmental destruction. As emphasized above, women by nature are care takers and good managers and may not be responsible for much environmental destruction as opined by Mabawonka**.** Even if it is so then may not be applicable to the Eastern Region of Ghana.

From the study, it could be seen that sex cannot be used to predict the level of farmers practices of sustainable environment activities in the Eastern Region of Ghana. Male and female farmers exhibited different levels of practicing SEA in the region. In this regard, sex as demographic variable cannot predict farmers' levels of practicing SEA as implied by the theoretical underpinning of the study (Integrative Model of Behavioural Prediction, Fishbein, 2000).

5.4.2 Farmers' Levels of Practices of SEA with Regard to Education

Education, said to be an enhancing factor of knowledge, attitudes and skills in an individual within a cultural setting is a major influencing factor to practicing SEA. This is emphasized when Tottimeh (2017) highlighted that participation is mostly reinforced by empowerment. According to him, the ability to ensure that individuals have the powers to really influence decision and also have the technical skills are requisite tools for practicing sustainable activities and effectively. In this regard, the study result shows that there is a statistical significant relationship between farmers' educational

backgrounds and their levels of practices of SEA (correlational result = .116, $p < 0.05$), in which the highly and formally educated in most cases (basic, secondary and tertiary education) practiced SEA regularly (59.2%, 76.9% and 71.4% respectfully) than the less formally educated ones (57.4%) in specific activities like using manure as a source of fertilizer. The less educated may not be using manure as fertilizer possibly because they feel it is too cheap to be of quality. Again, they may be of the view that faeces could affect the quality and health of their produce. This was evident in the focus group discussion when some food/vegetable crop farmers asserted that they will never apply faeces to food crops to be consumed. It also emerged from the focus group discussion that some of the farmers do not use manure because it cannot be produced in large quantities to be sufficient for their entire farms.

This result is consistent with a number of authors assertions on the relation of education to sustainable environmental practices (Bedural, 2018; Hirsh, 2014 and Michalous, Creech, MacDonald and Kahlke, 2009). For instance, Hirsh (2014) is of the view that knowledge on environmental issues and awareness of information play critical role in promoting sustainability practices. According to him people with greater knowledge and environmental awareness are more likely to act in a sustainable manner than those without it. Education in this regard raises awareness and also provide requisite environmental knowledge needed to practice SEA regularly.

The study results also correspond to findings in different related research works (Bedural 2018; Tang, 2018 and Waitling and Zhou, 2011). In a much recent study by Bedural (2018) on the examination of association between the educational attainment of Filipinos and their values, attitudes and actions towards the environment, found out that Filipinos' educational attainment significantly influenced their environmental actions in which

those with higher education actively take actions for the environment than those with lower education. Likewise, Tang (2018) found education for sustainable development contributing to students' commitment and willingness to practicing sustainable development.

This study together with others therefore highlights education as a key factor to effective interaction between farmers and the environment. This implies that in spite of the numerous macro international and national agenda for promoting sustainable environment (for example political and socio-economic interventions) education remains key and conscious efforts to strengthen educational reforms nationwide. Environmental education ought to take precedence in both formal and non-formal sectors; particularly within the non-formal sector through diverse means to in order to enhance the micro-factors within individuals (knowledge, attitudes and skills) needed to promote sustainable environment.

Contrastingly, Aini et al (2006) found otherwise in their study which showed that sustainable knowledge, attitudes and practices among Malaysians was different. Unlike the others, these researchers found out that highly educated respondents had more positive attitudes which were not translated into more sustainable practices. Their data further indicated that although the less educated ones had slightly lower environmental knowledge and less positive attitude towards the environment, they were more involved in the adoption of sustainable practices. These findings re-emphasize the fact that practicing sustainable environment activities are influenced both directly and indirectly by micro factors (knowledge, attitudes and skills) and indirectly by macro factors

(external variables like demographics and socio-economic variables) including education as implied by Fishbein (2000) in the Integrative Model of Behavioural Prediction.

Additionally, these contrasting findings draw attention to the fact that areas where research findings indicate significant relation between education and sustainable environmental practices require much emphasis on the promotion of requisite environmental education and awareness whereas those areas with research findings showing no relation between these two variables requires much concentration on other external factors rather than education. In the case of Malaysia, Aini et al (2006) asserted that there was the need to pay attention to technology and environmental rules and regulations. Evidence from the current study may suggest on the other hand a much more elaborative environmental education to be provided to farmers in the Eastern Region to improve their levels of practices of SEA.

The results further revealed that respondents with tertiary education participated less in communal activities for sustaining environmental resources in their community and leaving some part of their farmland unplanted for the land to regain its fertility with 71.4% as against farmers with other levels of education regular practice. Farmers with tertiary educational backgrounds may not be practicing communal activities because most often than not people with very high formal educational backgrounds often employ others (mostly, individuals with very low or no formal educational backgrounds) to provide labour on their farms for them while they carryout supervisory roles and at times do knowledge impartation to these individuals. Such farmers may be referred to as absentee farmers. As evident in most communities, less educated individuals work

mainly by employing their physical strength/energy while the highly educated also apply their mental faculty than their physical strength.

From the study, it could be seen that there is a statistically significant relationship between farmers' educational backgrounds and their levels of practices of SEA, the highly educated farmers in most cases practiced SEA regularly than the less educated ones.

2.4.3 Farmers' levels of Practices of SEA with Regards to Age

The study results revealed that there is no significant relationship between farmers age and their levels of practising SEA ($r = .027$, $p > 0.05$). The results specifically indicated that elderly farmers practiced specific SEA regularly than the other age groups. For instance, a greater percent of the elderly farmers (93.6%) within the ages of 46 to 60 always practiced leaving some part of their farmlands unplanted for the land to regain its fertility as against young farmers within 18 to 35 years (79.8%) and middle age respondents within 36 to 45 years (78.8%) practising in the same activity always ($\chi^2 = 32.927$, $p < 0.05$). This could be so due the fact that land ownership in Ghana is mostly in the hands of elderly people than the younger ones. As a result, they could be rotating farming on different lands to ensure that overused lands regain fertility. Additionally, elderly farmers may have much farming experiences than the younger ones and may be abreast of the benefits of practicing land fallowing.

This result is consistent with the findings of Wiernik, Ones and Dilchert (2013) which indicated that older people are more likely to sustain environmental resources than younger ones in their examination of existing data from 1970 to 2010. According to

them, older people have positive environmental attitude which are translated into sustainability practices. This study however shows that older people have favourable attitudes and always practiced SEA than the other age groups. This result is not surprising because the elderly in most Ghanaian communities are more conservative in nature than the youngsters. Additionally, farming in most rural Ghanaian communities are considered to be the work of the elderly while white collar jobs are considered to be for the younger groups. Elderly people therefore tend to sustain natural resources to enable them to support their farming activities.

On the contrary, the study result is contrary to Fransson and Garling (1999) assertion that younger people are more concerned with environmental conservation than older people. According to them, younger people tend to support environmental conservation actions than the older ones since the older people most often perceive environmental solutions as threat to their livelihood activities. This is however, not applicable to the study area. This is because farming is generally perceived to be an occupation for the elderly in most Ghanaian communities and as such tend to preserve resources to support their farming activities than the younger people who often think of today and what they will need from the environment to survive.

This result is consistent with the theoretical assumptions of the theories of Planned Behaviour (Ajzen, 1991) and Integrative Model of Behavioural Prediction (Fishbein, 2000) study which basically assumes that individuals perform a behaviour with their behavioural intentions influenced by their attitudes and knowledge. This implies that farmers with favorable environmental attitudes are expected to perform sustainable activities always.

5.5 Levels of Farmers' Knowledge, Attitudes and Practices of SEA in the Eastern Region with Reference to Type of Farming

Farmers levels of knowledge, attitudes and practices of SEA are discussed in relation to type of farming of farming in the following specific areas:

- Farmers' level of knowledge on SEA with reference to type of farming
- Farmers' level of attitudes towards SEA with reference to type of farming
- Farmers' level of practices of SEA with reference to type of farming

5.5.1 Farmers' Levels of Knowledge on SEA with Reference to Type of Farming

The study results revealed that there is no statistically significant relationship between level of knowledge and type of farming ($r = .031$, $p > 0.05$). In spite of this, the chi-square result indicated that there is a statistically significant relationship between level of farmers' knowledge and recycling and reusing of waste, using manure as a major form of fertilizer and use of alternative pest control (traditional methods) with a p-values < 0.05. The result further showed that livestock farmers had the highest level of knowledge in recycling and reusing waste and using manure as a major source of fertilizer with 87.1% (cash crop farmers) and 73.9% (food/vegetable farmers).

This could be as a result of the series of farming practices livestock farmers engaged in. The focus group discussion revealed that one of the commonest recycling practices by farmers was the use of animal droppings to serve as manure. It is evident that livestock farmers are the highest producers and suppliers of compost which is obtained from their animals. Their continuous production of compost may have therefore provided them with adequate recycling knowledge. Similarly, livestock farmers may also tend to use the compost produced from animals in their backyard gardens as a form of fertilizer. This

was supported by the focus group discussion which revealed that livestock farmers mostly practice recycling from the use of compost as fertilizer in their gardens. Additionally, livestock farmers also engage themselves in other type of subsistence farming in many Ghanaian communities' as revealed in the focus group discussion. This therefore could give them much privilege over the other farming groups, hence their higher level of knowledge in this aspect of SEA.

This result is consistent with Azman et al (2013) view that knowledge enables farmers to understand how to apply good agricultural practices. Livestock farmers in this regard possessed the highest level of SEA activities as a result of their engagement in other farming practices giving them leverage over the other farming groups.

5.5.2 Farmers' Levels of Attitudes towards SEA with Reference to Type of Farming

The study result revealed that there is no statistically significant relation between type of farming and farmer's attitude towards SEA ($r = .039$, $p > 0.05$). The chi-square result specifically showed that farmers with different type of farming exhibit different levels of attitudes towards SEA. For instance, it was discovered that livestock farmers had favourable attitudes towards making planting of trees around one's surroundings compulsory (94.1%) than cash crop and food/vegetable crop farmers (92% for cash crop and 91.7% for food/vegetable crop farmers). Cash crop farmers on the other hand had the slightly favourable attitudes towards the use of manure as a major form of fertilizer in Ghana (90.7%) than the other farming groups (90.1% for livestock and 83.5% for food/vegetable farming). Food and vegetable farmers also had the highest attitudes towards setting days in a month aside for sanitation activities in their communities (97.8) than cash crop and livestock farmers (95.8% and 87.1 respectively).

The exhibition of different levels of attitudes towards SEA by the three farming groups could be explained by diversities in their practices. Livestock farmers, food/vegetable and cash crop farmers impinge on the environment in different ways with their respective activities. For instance, whereas grazing is associated with livestock farming, deforestation may be associated with the other groups. The differences in their practices could therefore influence their attitudes towards sustainable activities differently.

Although the results imply that type of farming cannot determine farmers' levels of attitudes towards SEA, livestock farmers had more favourable attitudes towards most SEA than the others. This may mean that livestock farmers exposure to multiple farming practices enable them to develop mind sets around sustaining their community resources; in which case could either be positive or negative. In this regard, it could be said that personal habits and routines alone does not determine the totality of a behavior, rather, a combination with other external factors; among which is type of farming (Aini et al, 2006).

The study result contradicts the theoretical underpinnings of Fishbein (2000). The Integrative Model of Behavioural Prediction basically assumes that a behaviour could be predicted by a number of factors (directly and indirectly). Indirectly, the model asserts that a person's behaviour could be predicted by background variable, among which is biographical data. Embedded in this could be the type of farming which the study revealed that it cannot determine farmers' levels of attitudes towards SEA.

5.5.3 Farmers' Levels of Practices of SEA with Reference to Type of Farming

The correlational result indicated that there was no statistically significant relationship between type of farming and level of farmers' practices of SEA ($r = .038$, $p > 0.05$). In spite of this, the chi-square results showed that there is a statistically significant relationship between type of farming and using manure as a source of fertilizer, reusing waste (like polythene) for other important activities, planting trees around their surroundings and available bare lands, encouraging others to plant trees around their surroundings, using traditional methods like ash and herbs as alternative pest control measures, dividing their farmlands and rotating crops at the same time, being a member of an environmental protection group and participating in their activities and attending meetings for sustaining the environment with their p-values < 0.05. It could be seen from this result that livestock farmers practiced these outlined SEA regularly than the other groups of farmers. For instance, livestock farmers practiced using manure as a source of fertilizer regularly (78.2%) than cash crop and food/vegetable crop farming (64.1% and 54.4% respectively). Food/vegetable farmers had the least level of using traditional methods like ash and herbs as alternative pest control measures (42.3%) as compared to 29.9% and 38.9 % least level of practices for livestock and cash crop farmers respectively. As already discussed, this may be so due to livestock farmers' experiences gained from practicing mixed farming; planting variety of crops in their gardens too for subsistence purposes. This may have given them leverage over SEA compared to their other counterparts.

From the earlier discussions on the relationships between type of farming and levels of farmers' knowledge, attitudes and practices of SEA, it could be seen that livestock farmers had the highest levels of knowledge and attitudes towards SEA and also practice

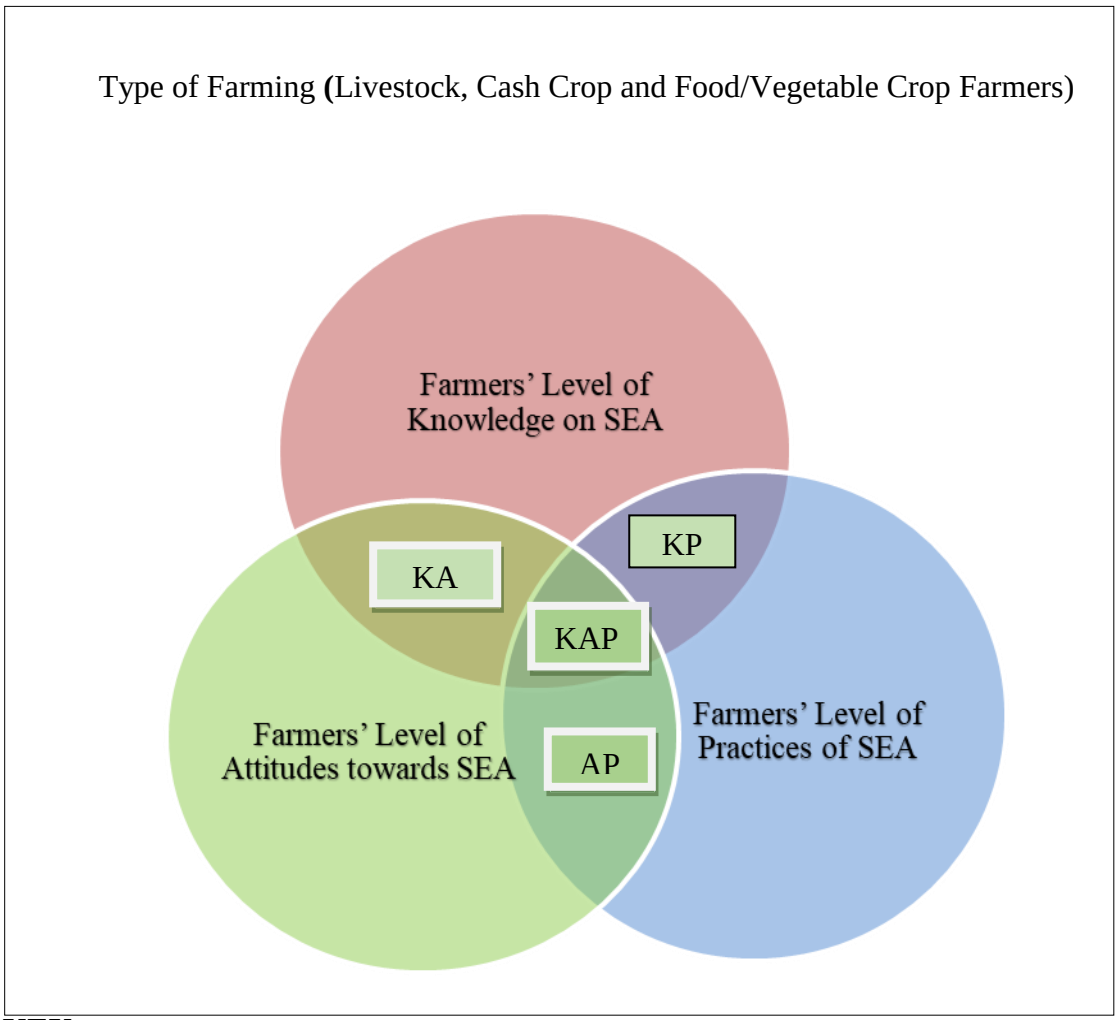
SEA regularly. This implies that, higher knowledge together with positive attitude could result in sustainable practices.

The study result is inconsistent with a number of KAP study findings and assertions (Aini et al, 2006; Ahmad, Noor, Asian, 2015 and Salas-Zapata, Ríos-Osorio and Cardona-Arias, 2018). For instance, the study findings on sustainable knowledge, attitudes and practices among Malaysians revealed that Malaysians had higher knowledge and attitudes towards the environment but were not translated into sustainable practices (Aini et al, 2006). According to them sustainable environment practices are not only influenced by personal habits and routines but other factors like type of farming.

These results are however consistent with assertions and findings that knowledge directly influence attitudes towards a positive behaviour (Gusti, 2016 and Aminrad, Zakariya, Hadi and Sakari, 2013 and Ajzen, 1991). These scholars emphasize a positive relationship between knowledge and attitudes towards sustainable behaviour. For instance, the theory of planned behaviour basically assumes that a person's behaviour is directly influenced by beliefs (normative and subjective), attitudes and behavioural intention. This study has highlighted a major role played by type of farming towards the performance of sustainable environment activities; thus livestock farmers exhibiting much knowledge, favourable attitudes and practicing SEA regularly. These results support the theoretical underpinnings of the study (Fishbein, 2000). The Integrated Theory of Behavioral Prediction basically assumes that a behaviour could be predicted by direct and indirect variables like background variable; among which could be occupation within which type of farming is embedded.

With regards to the levels of farmers KAP in relation to type of farming (livestock, cash crop and food/vegetable crop farming) the study revealed that levels of farmers KAP is related to type of farming, although livestock farmers were more knowledgeable and practiced SEA regular than the others while the three farming groups exhibited different levels of attitudes towards SEA. The relationship between type of farming and levels of farmers' knowledge, attitudes and practices of SEA could be illustrated in Fig. 5.1.

Figure 5.1: The Relationship between Farmers levels of Knowledge, Attitudes and Practices of SEA with regards to Type of Farming



KEY
K =Knowledge, P= Practice, A= Attitude

5.6 Relationship between Farmers' Knowledge and Attitudes towards SEA, Knowledge and Practices of SEA and Attitudes and Practices of SEA

Gusti (2016) asserted that understanding and explaining sustainable practices is best done through KAP studies which establish the relationship among knowledge, attitudes and practices of a behavior. It is also emphasized that the quality of environment or sustainable environment depends on the level of knowledge, attitudes and practices of people towards the environment (Aini, Laily, Nurizan, Azizah, Zuroni, and Norhasmah, 2006). Knowledge, attitudes and practices in this regard therefore play critical role in determining sustainable environment actions. The relationships among KAP and the SEA are therefore discussed in order of the following specific areas:

- Relationship between Farmers' Knowledge of SEA and Attitudes towards SEA
- Relationship between Farmers' Knowledge and Practices of SEA
- Relationship between Farmers' Attitudes towards SEA and Practices of SEA

5.6.1 Relationship between Farmers' Knowledge of SEA and Attitudes towards SEA

The correlational results revealed a positive statistically significant relationship between farmers' levels' of knowledge and their attitudes towards SEA ($r=.661$, $p< 0.05$). This means that higher knowledge of SEA also leads to highly positive attitudes towards SEA. This result supports the general assumptions that knowledge of a behaviour tend to influence individual's attitudes. This was also evident in the focus group discussion which revealed in most instances that the farmers exhibited favourable attitudes towards all activities they were knowledgeable about. For example, the use of alternative pest control measures (ash and plants) received less favourable attitudes since the farmers exhibited limited knowledge about such activities.

This result is consistent with a number of study findings on the relationship between environmental knowledge and attitudes (Zheng, Xu, Kong and Deng, 2018, Gusti, 2016, Aminrad, et al 2013, Aini et al., 2006). Zheng et al (2018) in their study on the correlation between environmental knowledge, attitude and behavioural intention of tourists for ecotourism in China found out that there was a positive correlation between environmental knowledge and environmental attitudes among tourists. This meant that people with higher environmental knowledge exhibited a more optimistic environmental attitude and vice versa. Similarly, Gusti's (2016) also found out that there was a relationship between knowledge and attitudes towards sustainable waste management. Additionally, Aminrad, Zakariya, Hadi and Sakari (2013) also found a significant relationship existing between knowledge and attitude among students about environment. Finally, the study findings on sustainable knowledge, attitudes and practices among Malaysians revealed that Malaysians had higher knowledge and attitudes towards the environment.

All these studies have confirmed the existence of significant relationship between individuals' environmental knowledge and their environmental attitudes. This implies that environmental knowledge is associated with environmental attitudes and vice versa. In that sense, one's knowledge of the environment could determine his/her level of environmental attitudes and vice versa. Knowledge is closely related to attitudes. Farmers will have positive attitudes towards the environment if they are exposed to the relevance of the environment to their livelihoods,

It is worth noting that knowledge and attitudes are all embedded in education. This means that the provision of environmental education could raise individuals' levels of

knowledge and their attitudes toward SEA. Apart from this, other factors like beliefs and experiences could also instill environmental knowledge and attitudes in individuals. This study revealed that farmers in the Eastern Region exhibited higher knowledge of SEA and more favourable attitudes towards SEA.

This could imply that the farmers had adequate environmental education, beliefs or accumulated environmental experiences which together have shaped their knowledge and attitudinal levels. The focus group discussion however discovered that environmental education was not regularly provided to the farmers so they relied on indigenous knowledge most of the time. That was the more reason why these farmers suggested provision of environmental education as a factor to enhance their knowledge of SEA. It could therefore be argued that indigenous knowledge referred to as "lay knowledge," accumulated from the farmers lives and histories of their communities and neighbouring ones (Lewenstein, 2003) may have contributed immensely to their high knowledge of SEA. 'Lay knowledge" in this regard played a major role in shaping farmers' environmental knowledge of SEA. This therefore disproves Lewenstein (2003) arguments on the Models of Public Communication of Science which fails to acknowledge lay knowledge as additional knowledge needed in solving real world problems. Lay knowledge according to Lewenstein (2003) cannot be relied upon because they cannot be empirically tested. The fact that indigenous knowledge cannot be tested empirically does not mean they cannot solve problems. Even though experiences cannot be empirically tested, it is evident that they influence individuals behaviour.

This is consistent with the theory of Planned Behaviour (Ajzen, 2019). The TPB asserts that three kinds of beliefs (behavioral, normative and control beliefs) facilitate or impede

the performance of a behaviour. This means that farmers' beliefs about their expectations of the consequences of their environmental actions, beliefs about environmental norms in their communities and the presence of other factors are interrelated to guide the farmers' practices of SEA. Environmental beliefs according to the theory produces favourable or unfavourable attitudes. In this case, environmental beliefs of the farmers produced favourable attitudes towards SEA.

5.6.2 Relationship between Farmers' Knowledge and Practices of SEA

The study results from the correlational metrics showed a positive statistically significant relationship between knowledge and practices of SEA ($r = .620$, $p < 0.05$). This means that the higher the knowledge level of SEA, the regular the practices of SEA. Farmers who are knowledgeable in SEA also practiced SEA regularly and vice versa. This implies that the level of one's environmental knowledge could be determined by his/her level of practices of SEA. Environmental knowledge therefore becomes an important factor necessary for practicing SEA.

This result reflects general beliefs and assumptions that knowledge about a behaviour tend to influence its practices. Just as indicated by the TBP (Ajzen, 2019) that beliefs about the likely consequences of a behaviour tend to influence individuals' intention towards its practices. This is because knowledge about an activity may tend to expose the possible benefits and problems associated with practicing that activity. As a result, activities with possible benefits would be practiced regularly and vice versa. For example, the study revealed that the farmers were much knowledgeable about tree planting as a sustainable environment activity. These may be as a result of their knowledge about the numerous benefits derived from planting trees. It is therefore not

surprising that the farmers' planted trees regularly and even encouraged others to do same.

These results are consistent with findings of studies on the relationships between knowledge and sustainable environmental practices (Gusti, 2016, Zheng et al, 2018, Ahmad, Noor and Asian, 2015). Gusti's (2016) study in India for instance found out that there was a relationship between knowledge about sustainable waste management and its practices among primary school students. Similarly, Zheng et al. (2018) also found environmental knowledge to be positively correlated with environmental behaviour among tourists in China. Additionally, Ahmad et al. (2015) in a study which investigated the relationship between knowledge, attitudes and practices of the environment and effective communication of environmental messages found that there was a significant relationship between students' level of knowledge and sustainable environmental practices, even though the relationship was weak. These studies have confirmed that individuals' environmental knowledge contributes positively to their environmental behaviour/practices.

In spite of these, the study result is contrasted by findings from another study conducted in Malaysia (Aini et al, 2006). The study findings on sustainable knowledge, attitudes and practices among Malaysians revealed that Malaysians had higher knowledge but these were not translated into sustainable practices (Aini et al, 2006). According to them sustainable environmental practices are not only influenced by personal habits and routines but other external factors like technology, social policies, laws and regulations and community values. This implies that sustainable environment requires an integration of both internal factors (those among individuals, namely, environmental knowledge and

attitudes towards sustainable behaviour) and external factors mostly controlled by the state.

The differences in research findings could be attributed to the contextual and population differences. While the Malaysian studies focused on Malaysians, the current study relied on farmers with no structured, formalized or non-formalised environmental education. Inferences from these study findings therefore could mean that while farmers in the Eastern Region of Ghana require elaborate environmental education to boost their knowledge, attitudes and practices towards SEA, the Malaysians require other external factors like other socio-economic interventions to boost their morals for sustainable practices.

In spite of this, the results are consistent with theoretical assumptions of the IMBP (2000). The Integrative Model of Behavioural Prediction by (Fishbein, 2000) also generally holds that individual's behaviour is influenced by a number of related factors in different ways. Behaviour according to the IMBP is influenced by factors namely; intention, knowledge and skills to perform the behaviour, environmental constraints and other background variables. It further explains that individual's knowledge, attitudes and skills come together to form beliefs which tend to influence their behaviour that are often translated into actions. Based on the results of this study, knowledge and practices of farmers could be said to be inseparable but contributes immensely towards each other.

It could therefore be argued that environmental education is required to fully equip these farmers with the requisite environmental knowledge to practice sustainable activities like tree planting, recycling and using alternative pest control methods regularly.

5.6.3 Relationship between Farmers' Attitudes towards SEA and Practices of SEA

The computerized correlational results revealed a positive but moderate statistically significant relationship between attitudes of farmers and practices ($r = .542$, $p < 0.05$). This meant that higher levels of environmental attitudes lead to higher levels of environmental practices and vice versa. This evident from the results of the means and standard deviations which also revealed that the farmers had more favourable attitudes towards SEA (mean = 4.5) and also practiced SEA regularly (mean = 3.7).

Attitudes as highlights by the TPB (Ajzen, 2019) results in intentions to perform a behaviour and with the presence of positive perceived behavioural control factors, a behaviour is enacted. One of the major determinants of individual's behavioral intention according to Ajzen (1991) is attitudes. Environmental attitudes among these farmers were highly favourable. The favourable attitudes according to the focus group discussions were much of community related, which implied that the farmers had moderately favourable communal attitudes towards SEA. This result could be a reflection of the nature of people in rural communities in Ghana. Unlike people in urban areas, those of rural communities are communalistic by nature. Thus, there is evidence of communal spirit among rural dwellers in Ghana than in urban areas. People in rural areas often take communal responsibilities and rely on each other for support hence strong sense of community ownership and management among people of rural communities in Ghana. This was the more reason why SEA were carried out through communal labour. Community members thus unite into a formidable force to maintain environmental resources for their own good.

For purposes of environmental sustainability, rural community require favourable communal attitudes rather that individual ones. This means that although, one's education could influence his/her level of sustainable environmental attitudes to bring practices of SEA, the provision of environmental education to the entire community could bring about higher communal attitudes resulting in higher practices of SEA.

Additionally, community values 'and norms could also influence communal attitudes to bring about higher practices of SEA. Evidence of this could be seen from the focus group discussions which emphasized that environmental norms, beliefs and values in the Eastern Region contributed to highly favourable attitudes of farmers towards SEA.

This study results are consistent with findings of similar studies by Gusti (2016) and Ahmad, et al. (2015). Gusti (2016) for instance, found a relationship between attitudes and practices of waste management. Ahmad et al. also discovered a relationship between students' attitudes and sustainable environmental practices.

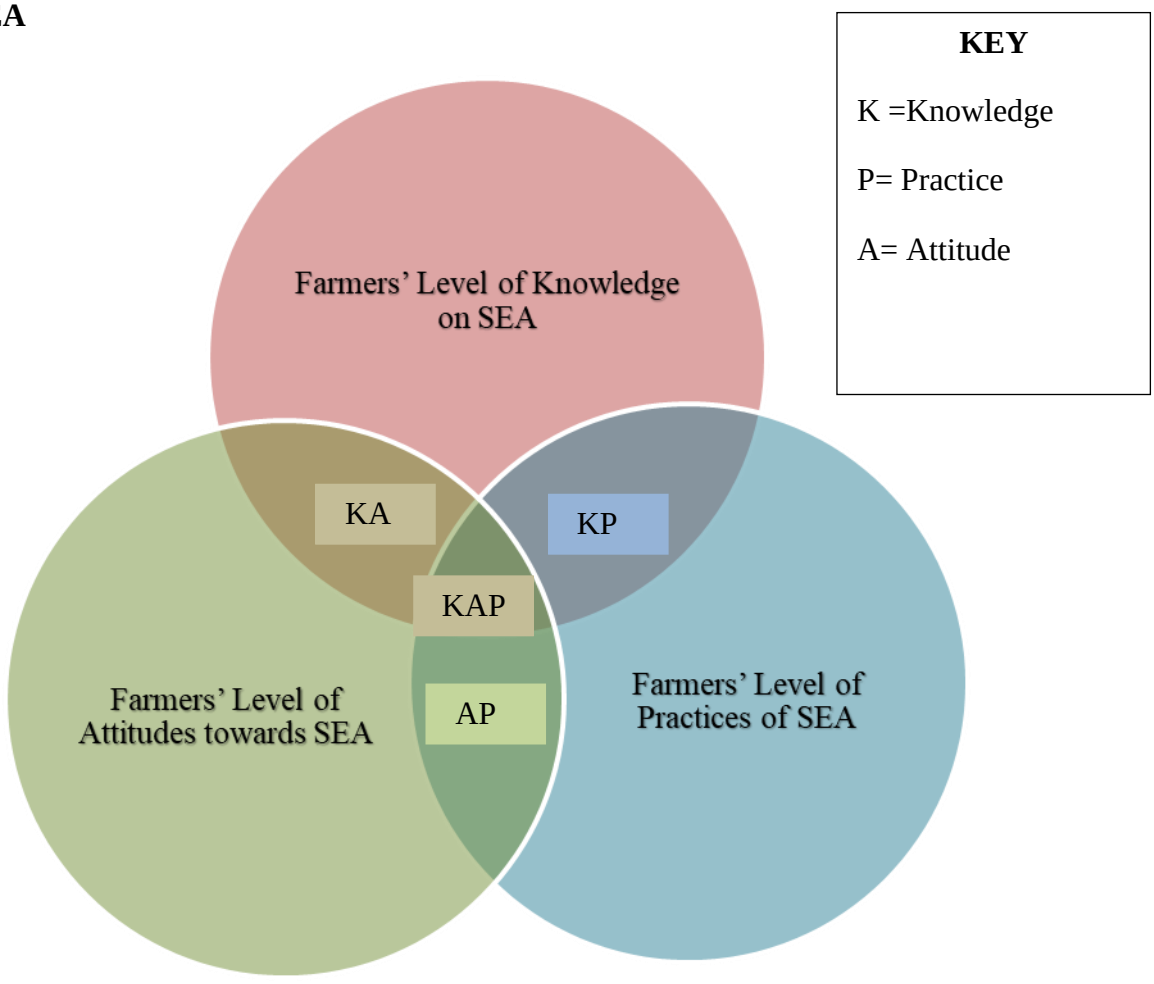
In spite of these, the study results contradict findings by Salas-Zapata, Ríos-Osorio and Cardona-Arias' (2018) study on attitudes and practice related to sustainability. They discovered that participants generally had positive attitude towards sustainability but their willingness to actively participate accordingly does not necessarily correspond to their attitude. The differences in findings could be attributed to contextual variances.

In order to also identify the kind of relationship among KAP, a regression analysis using practice a dependent variable with knowledge and attitudes as independent variables, also showed a positive statistical linear relationship between practice of SEA and knowledge level of farmers with a *p-value* <.05. The study results thus indicated that

attitude of farmers is positively related to practice and knowledge levels. There was also a relationship between knowledge and practice as well as attitude. This was emphasized by the regression results which revealed that farmers' knowledge on SEA (β = .464; p≤ .000) and farmers' attitude on SEA (β = .234, p ≤ .00) contributed significantly and positively to the variance in the farmers' practices of SEA.

The study thus concludes that there is a significant positive linear relationship between farmers attitude and practice of SEA, a significant relationship between knowledge and attitude towards SEA as well as a significant relationship between knowledge and practices of SEA while finally farmers' knowledge and attitude towards SEA contributes significantly and positively to their practices of SEA as illustrated in Fig. 5.2:

Figure 5.2: The Relationship between Farmers' Knowledge, Attitudes and Practices of SEA



5.7 Farmers' Views on Measures to Enhance their Knowledge, Attitudes and Practices of SEA in the Eastern Region of Ghana

Evidence from literature has revealed that sustainable environment and for that matter environmental practices are not only influenced by personal habits and routines but also external factors with which individuals have no control over (Aini et al. 2006 and Ahmad, Noor and Asian. 2015, Fishbein, 2000).

The study results showed that the highest suggested measure to enhance farmers' knowledge of SEA was education on good farming practices which recorded 32.7% (163). With regards to attitudes, the highest suggested measure to enhance farmers' attitudes towards SEA was punishing offenders who go against environmental laws representing 16.9% (82). Last but not least, the highest suggested measure to enhance farmers' practices of SEA was setting days for regular communal activities represents 19.5% (92). The results therefore revealed that education, punishment of offenders and setting days for regular communal activities were the highest suggested measures to improve farmer's knowledge, attitudes and practices of SEA respectively.

Education as a matter of fact instils requisite knowledge in individuals to enact positive behaviours. This could therefore mean that providing environmental education to farmers in the Eastern Region could bring about improvement in their levels of practicing SEA. For example, the farmers' knowledge on leaving cleared weeds to rot as manure could be enhanced in all angles rather than arguing that burning cleared weeds add ammonia to ferlilise the land. Even though such an assertion may be true, burning cleared weeds is not a sustainable practice and this could be detected by the farmers if the necessary environmental education is given to them. Providing environmental education to farmers

could therefore help to correct some errors from their indigenous knowledge and practices in order to promote SEA at higher levels.

Additionally, punishing offenders as suggested by the farmers could improve their attitudes towards SEA probably because punishment in most cases is a major factor to instill discipline into individuals. It could be argued that all humans are fallible and are therefore capable of going against environmental regulations in their communities, especially among deviants. The best way to instill discipline among a group is through punishment. Making deviants face community rules and regulations could serve as deterrent to others. This is because some deviants most often than not escape punishment for one reason or the other and this ends up discouraging others from practicing sustainably.

Setting days for regular communal labour could also enhance farmers' levels of practices for a number of reasons. One of the regular means of assembling people to undertake activities in rural communities in Ghana is through communal labour. Such days are normally off farming or fishing days in order to enable all community members with the exception of individuals like the aged and the sick to come together to undertake activities. Some collective activities undertaken on such days are sanitation related (desilting gutters) and also providing labour for development projects. In most cases, it is only a day that is set aside for the collective activities. Meanwhile, for purposes of sustainability, two to three days could be dedicated to communal activities so as to increase farmers' practices of SEA as revealed in the focus group discussions.

This result confirms assertions on the major role played by education in sustainability issues (Egaga and Aderibigbe, 2015; Laurie, Nonoyama-Tarumi, Mckeown and Hopkins, 2016; Singh and Hensel, 2014 and Michalous, Creech, MacDonald and Kahlke, 2009). Environmental education is concerned with knowledge, values, attitudes and skills needed to prepare, build and equip people towards living responsible environmental behaviours in their communities (Egaga and Aderibigbe, 2015 and Michalous, Creech, MacDonald and Kahlke, 2009). It is therefore not surprising that the period, 2005-2014 was declared as a United Nations Decade of Education for Sustainable Development (DESD, Ostewlder, 2009). The DESD suggests that "education is a motor for change" and ought to contribute requisite knowledge, skills and attitudes needed by citizens to face challenges of today and that of the future" (Jabareen, 2012. p.4). Education for sustainable development in this regard was consented to by all member countries of the United Nations to integrate environmental education holistically in all educational reforms (both formal and non-formal) for a sustainable world.

Education for sustainability led to a number of policy directives which have chalked different successes among which is the integration of the concept into pedagogies, curriculum and other spheres of the formal and non-formal education (Egaga and Aderibigbe, 2015 and Laurie, Nonoyama-Tarumi, Mckeown and Hopkins, 2016). In spite of this, developing countries like Ghana has not consciously integrated the concept into non-formal education systems which is proliferated all over the country. This was reflected in the focus group discussions when some farmers emphasized that there was the need for quality environmental education by experts. According to them many of the extension education officers lacked the requisite skills and the technical-know-how of the concept to provide requisite environmental education, leading to ineffective

education and absence of sustainable behaviours in their communities. Environmental education for this reason needs to be emphasized holistically, especially in the study area.

It is as a result of this that Egaga and Aderibigbe (2015) stressed that education about the environment is life long and must be captured in two folds: formal and non-formal. The formal education according to them takes place in schools from primary to tertiary while the non-formal education takes place in adult literacy programmes, media, organized campaigns, among others. This was confirmed by the study through the other measures suggested by farmers to enhance their knowledge, attitudes and practices of SEA. For instance, the qualitative result revealed that the farmers received environmental education from Non-governmental organization and extension officers. They however indicated that the education was limited to farmers within groups. This meant that farmers without any group were not privileged to such information. That was the more reason why they suggested that environmental education should be provided through media (radio and television) using their native languages.

Apart from this, some empirical studies have also confirmed education as a catalyst to achieving sustainable environment (Singh and Hensel, 2014 and Michalous, Creech, MacDonald and Kahlke, 2009). Michalous, Creech, MacDonald and Kahlke (2009) for instance, found out that the highest level of education completed is more important for explaining sustainable development favourable behaviours. They further explained that the highest level of one's general education is more important than specific sustainable development knowledge for explaining favourable behaviours. Similarly, Singh and Hensel (2014) found out from their study that environmental knowledge for males and

females had improved from a lower to an appreciable standard after the farmers' participation in extension education on a scientific intervention programme organized for farmers.

The result also indicated that punishing offenders was the highest suggested measure to improve farmers' attitudes towards SEA. It is in line with this that Gunningham (2011) asserted that:

> For environmental legislation to work it must not only be well designed but also efficiently and effectively enforced. Strategies must be developed as to how inspectors should go about the task of intervening in the affairs of regulated organisations to ensure compliance and enforcement (p. 169).

This implies that for farmers' attitudes towards SEA to be enhanced, community leaders together with state environmental agencies must strategise to effectively implement and enforce environmental rules and regulations in their communities. This may enable them to punish offenders as indicated by the farmers to serve as a deterrent to others.

To determine the type of enforcement strategies to be used, Gunningham (2011) again identified seven types of intervention strategies as rules and deterrence; advice and persuasion; criteria based regulation; responsive regulation; smart regulation; risk-based regulation; and meta-regulation. Rules and regulations which addresses punishing offenders as a suggestion to improve farmers' attitudes towards SEA according to Gunningham (2011):

> emphasises a coercive, formal and adversarial style of enforcement and the sanctioning of rule-breaking behaviour. It assumes that regulates are rational actors capable of responding to incentives, and that if offenders are detected with

> sufficient frequency and punished with sufficient severity, then they, and others, will be deterred from future violations (p. 174).

The results also revealed that another major suggested measure to enhance farmers' practices of SEA was setting regular days for communal activities. It is generally a practice in many Ghanaian rural communities to assemble people for collective activities geared towards community development. Some communities often schedule multiple days for these activities while others only use one day in a month to do that. Evidence from this study however indicated that only a single day is scheduled within a month for such communal activities in communities within the study area. The farmers were therefore of the view that setting different days in a month for regular sustainable activities could enhance their practices of SEA.

Similarly, Aini et al. (2006) stressed that community plays an important role in environmental decision and must be recognized in development processes to promote sustainability. Participation according to them is a co-management of environmental resources with state institutions and local communities working together in making environmental decisions. For this reason, setting days for regular communal activities as suggested by farmers in the study areas is a major findings needed to be integrated in environmental decisions in the study area to promote sustainable environment. At such communal days, education and environmental activities (good practices) may be done.

The results of this study is consistent with the theoretical underpinning of the study. The Integrative Model of Behavioural Prediction (Fishbein, 2000) basically assumes that behaviours can be predicted directly and indirectly by a number of factors. The three

suggested measures by the farmers; environmental education, punishing offenders and setting days for regular communal activities form part of the background variables whic according to Fishbein (2000) could predict behaviors indirectly.

From all the discussions made so far, it could be seen that farmers in the Eastern Region had higher levels of knowledge about SEA, highly favourable attitudes towards SEA and practiced SEA regularly. In spite of the overwhelming levels of farmers' levels of KAP of SEA, their sex, educational backgrounds, ages and type of farming in relation to KAP were at varying levels. Additionally, there were positive statistically significant relationships between farmers' levels of knowledge and their attitudes, knowledge and practices and attitudes and practices of SEA. Farmers knowledge and attitudes also contributed significantly and positively to their practices of SEA. Finally, farmers' levels of KAP could be improved by providing environmental education, punishing offenders and increasing days for regular communal activities. Apart from these, some of the new ideas which emerged for effective continual practice of SEA include:

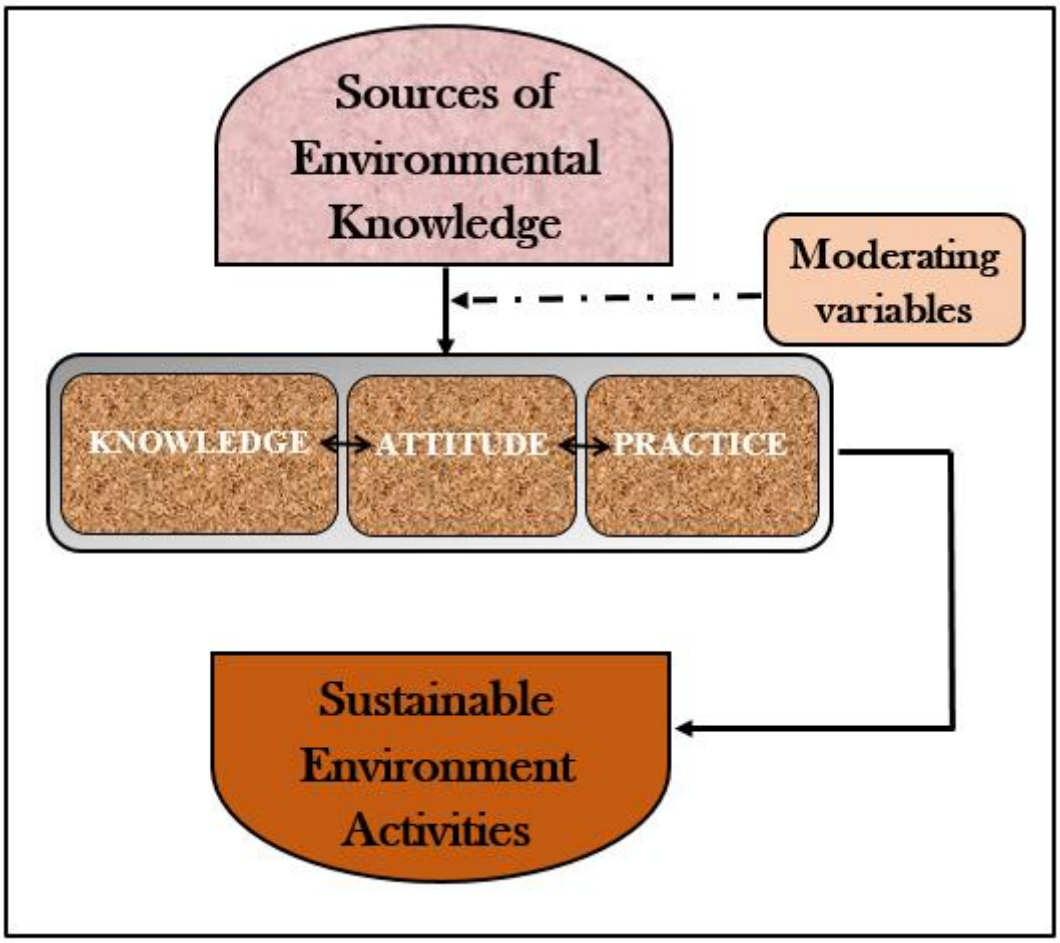
- Educational background is a major factor that contributes to effective farmers' interaction of the environment.
- Indigenous ecological knowledge contributed positively to farmers' higher levels of knowledge of SEA and could be explored as a source of environmental knowledge.
- Community norms and values constitute an integral part of farmers' environmental attitudes towards SEA, hence the need for intensification of environmental regulations in communities.
- Increasing days for regular communal activities could improve farmers' practices of SEA.

The TPB (Ajzen, 2019) and IBMP (Fishbein, 2000) identified varied factors capable of predicting behaviours. These factors ranged from external to personal ones (such as attitudes and skills). However, the theories failed to specify knowledge as a contributory factor to predicting a behaviour. It should be emphasized that one's knowledge of a phenomenon contributes to his/her enactment of a behaviour as revealed by this study (sustainable environmental knowledge contributed to practices of SEA. The TPB and IBMP in this regard fails to explain practices of SEA. A new model is therefore constructed.

A Model of Integrated Sustainable Environment Activity emerged from the study. The study revealed that knowledge and attitudes are key variables that influence practices of farmers in relation to sustainable environment activities. Even though literature indicates the existence of relationships among KAP in relation to sustainable environment, the nature of relationships as far as sustainable environment activities is concerned is unclear. There are varied opinions on how these variables influence one another.

The Model of Integrated Sustainable Environment Activities therefore provides graphically the nature of relationships among these variables and the nuance of the relationships that exist among them. It also shows some factors that interacts with farmers' levels of KAP of SEA. This is depicted as Fig. 5.3.

Figure 5.3: Model of Integrated Sustainable Environment Activity



Source: Author's Own Construct, 2019

The Model of Integrated Sustainable Environment Activity explains that different community institution; in the form of formal and non-formal serve as sources of environmental knowledge for farmers in carrying out their routine activities. Some of the prevailing sources of environmental knowledge are educational institutions and indigenous ecological knowledge. Knowledge received from the environment ends up shaping individuals' attitudes and vice versa which subsequently influence specific practices carried out to either sustain or damage environmental resources in their community.

The model acknowledges that the kind of environmental knowledge provided by these institutions may not necessarily be those needed for sustaining environmental resources in communities. The model holds that the kind of knowledge that informs farmers knowledge, attitude and subsequently their practices could be shaped by some moderating variables either from the individual farmer or community in which he or she finds himself/herself.

These moderating variables intercepts the rate at which environmental knowledge is received to influence one's attitudes or practices to either damage or sustain the environment. Among these moderating variables are personal factors (demographic data) and external factors (socio-cultural factors). This means that personal factors like one's educational background and age could interfere with his/her absorption of environmental knowledge. External factors like motivations and involvement in decision making could also interrupt the flow of environmental knowledge to individuals.

The model therefore emphasizes that environmental knowledge and awareness obtained from these sources together with the right aggregates of moderating variables integrate to shape farmers' knowledge and attitudes towards environmental resources and subsequently into practicing SEA in their respective communities. This implies that with the requisite environmental knowledge, positive influence of the other moderating variables, favourable attitudes towards sustaining the environment, a farmer is likely to practice sustainable environment activities. In effect, the farmers understanding and appreciation of sustainable environment will be enhanced and could also positively influence existing institutions positively in their provision of requisite environmental education to bring about sustainable environment.

The model finally points out that knowledge, attitudes and practice integrate to produce sustainable environment practices. This implies that knowledge and attitudes independently may not produce SEA but rather an integration of the two together with favourable practices could produce sustainable environment activities.

5.8 Summary of the Chapter

The chapter discussed the results of the study in relation to reviewed literature along the objectives of the study. It emerged from the discussions that farmers' levels of knowledge, attitudes and practices of SEA in the Eastern Region were at varying levels in relation to their sex, education and age. Formal educational backgrounds contributed to effective farmers' interaction of the environment as confirmed by Tang (2018), Bedural (2018), Waitling & Zhou (2011) and Rico (1998) whereas sex and age of farmers had a slightly low influence on farmers' interactions of the environment. Again, sustainable environmental attitudes were much of community than individually associated. In effect, knowledge of farmers was found to be closely related to their attitudes in bringing about best sustainable environmental practices. Farmers thus, tend to develop positive attitudes towards practicing sustainable environment activities when exposed to the relevance of the environment to their livelihoods (Zheng, Xu, Knog & Deng 2018, Gusti, 2016, Aminrad et al, 2013). The findings emerging out of the chapter revealed that the TPB and IMBP failed to adequately explain SEA, hence the emergence of a new model; Model of Integrated Sustainable Environment Activity.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter provides a summary of the study and highlights the conclusion that was derived. Based on the findings and conclusion drawn, recommendations that offer adult education and human resource practitioners together with other related institutions more insight into Farmers' knowledge, attitudes and practices of sustainable environment were made. The chapter also presents implications of the study and researcher's contribution to knowledge.

6.2 Summary of the Study

Sustainable environment has become an important issue in global development. It also constitutes a major global concern that is strongly articulated by the United Nations through the Sustainable Development Goals (SDGs) in recent times. According to Rabinowicz and Chinapah (2014) the constant instability in the interaction of the environment, economic and social systems require strategies to bring about a balanced and stable systems.

Different policy directives and interventions have therefore been formulated as a means of stabilizing these systems. Typical among them is education for environmental sustainability. Education has been recognized as a critical component needed to enhance environmental knowledge, skills and attitudes in individuals. Efforts are therefore made towards integrating the tenets and values of education for sustainability in all educational reforms.

In spite of these, many Ghanaian communities; of which the Eastern Region is no exception are still challenged with a number of environmental issues often caused by poor agricultural practices, urbanization, industrialization, and population expansion (Sharma, 2012). The Eastern Region is one of the most populous farming areas with environmental problems emanating from human activities like farming and illegal mining. The knowledge, attitudes and practices of grassroot farmers whose activities directly impinge on the environment ought to be identified in order to design appropriate educational programmes for them. It is as a result of this that the study sought to address the question: What are farmers' knowledge, attitudes and practices of sustainable environment activities in the Eastern Region of Ghana?

The study was designed to achieve the following specific research objectives:

1. Find out the levels of the farmers' knowledge, attitudes and practices of sustainable environment activities (SEA) in the Eastern Region with regards to:
    i. Sex
    ii. Education
    iii. Age
2. Find out the levels of knowledge, attitudes and practices of farmers on SEA in the Eastern Region with reference to type of farming.
3. Identify the relationship between the farmers' levels of:
    i. Knowledge and attitudes towards sustainable environmental activities
    ii. Knowledge and practices of sustainable environmental activities
    iii. Attitudes and Practices of sustainable environmental activities.
4. Find out the farmers' views on measures to enhance their knowledge, attitudes and practices of SEA the Eastern Region of Ghana.

On the basis of these research objectives, literature was reviewed along theoretical and conceptual perspectives, related literature and empirical research. Literature was reviewed along areas such as meaning of sustainable environment, ways of promoting sustainable environment, factors influencing sustainable environment, sustainable environment activities, knowledge about sustainable environment, attitude towards sustainability environment, relationship among biographical data and sustainable environment activities and public participation in sustainable environment activities. Findings from studies on sustainable environment practices and relationships among farmers' knowledge, attitudes and practices of sustainable environment activities were also reviewed. A Theory and models were reviewed on the Theory of Planned Behaviour (Ajzen, 2019), Integrative Model of Behavior Prediction by Fishbein (2000) and Models of Public Communication of Science and Technology (Lewenstein, 2003).

The sequential explanatory mixed method (Quan, qual research approaches) were adopted using a population of all actively engaged farmers from the ages of eighteen (18) to sixty (60) years in the Eastern Region. A sample of 400 (out of an estimated target population of 724,001) was used for the quantitative study. The multi-stage sampling methods that is purposive, proportional quota and simple random sampling techniques were used to select 400 farmers for the quantitative study while the purposive sampling method using the snowball technique was used to select 30 farmers out of the population for the qualitative study. A structured interview schedule together with a focus group discussion guide were used to collect data for the study. Quantitative data was analysed descriptively and inferentially using IBM SPSS version 24 and thematic analysis was also employed to analyze the qualitative study.

6.3 Major Findings of the Study

The key findings of the study are presented in the order of the research objectives as follows:

6.3.1 Objective 1: Farmer's Levels of Knowledge, Attitudes and Practices of SEA in the Eastern Region with Regards to Sex, Education and Age

Farmers generally had high knowledge about SEA, highly favourable attitudes towards SEA and practiced most SEA regularly.

1. The study found out that there was no significant relationship between male and female farmers in knowledge (r = .029) and attitudes (r = .017) towards SEA, however, female farmers practiced more SEA than their male counterparts. The specific findings in relation to these were as follows:

Farmers' levels of Knowledge, Attitudes and Practices of SEA in Relation to Sex

i. With regards to levels of farmers' knowledge in relation to sex, the study found out that male and female respondents differ in knowledge on recycling and reusing waste (79.2% females against 76.1% of males), leaving farmlands to fallow to regain its strength (93.9% for males and 93% for females) and leaving cleared weeds on the land to serve as manure (93% for males and 92% for females). Female farmers were thus knowledgeable than males in recycling and reusing waste while males were also knowledgeable than females in the remaining two SEA.

ii. The study found out that sex is not significantly related to farmers' level of attitudes towards SEA (r = .017). Thus, being male or female did not have much relation with farmers' attitudes towards sustainable environment activities. In spite of this, male farmers somewhat had more favourable attitudes (95.7%)

towards making tree planting around surroundings compulsory for everyone than their female counterparts (88.29%).

iii. Farmers levels of practices of SEA were also found not significantly related to sex (r = .037). Both sexes exhibited different levels of practices of SEA. For instance, the results showed that most female farmers practiced the use of rotten weeds as manure (85.5%) higher than their males (84.9%). Female farmers also attend meetings for sustaining the environment more (56%) than their males (51.7%). Alternatively, more males are members of environmental protection groups and they participate in their activities than their female farmers.

Farmers levels of Knowledge, Attitudes and Practices of SEA in Relation to Education

2. The study found out that farmers with formal education had higher levels of knowledge and attitudes towards SEA than those with no formal education while farmers with different educational background exhibited varying levels of practicing SEA. The specific findings with regards to these variables were as follows:

i. The study found out that farmers with lower educational backgrounds (No formal education) had lower level of knowledge on SEA than those with higher education and vice versa. For instance, with regards to rotating crops at regular interval, the results indicated 77.8% level of knowledge for no formal education as against 90% of basic, 94% of secondary and 96.4% of tertiary educations.

ii. The study found out that farmers with higher educational backgrounds and for that matter formal education had favourable attitudes towards SEA than those with less/no formal educational backgrounds. For instance, with regards to attitudes towards making tree planting around surroundings compulsory, the

results revealed that 81.5% of respondents with no formal education would do so against 89.6%, 98.7% of those with basic education and with secondary education and 100% tertiary education respectively.

iii. Farmers with different education backgrounds were found to exhibit different levels of practices of SEA. For instance, the chi-square results showed that farmers with secondary educational background use manure as a source of fertilizer (76.9%) more than those with no formal, basic and tertiary educational background (57.4%, 59.2% and 71.4%) respectively. On the other hand, farmers with basic educational background take part in communal activities for sustaining environmental resources in their communities more (91.2%) than those with no formal, secondary and tertiary educational backgrounds (79.7%, 88.5% and 71.4%) respectively. Likewise, farmers with tertiary educational backgrounds encourage others to plant trees around their surroundings regularly (67.9%) than those with no formal, basic, and secondary educational backgrounds (48.1%, 64.6% and 64.1% respectively).

iv. Educational background is a major factor that contributed to effective farmers' interaction of the environment in bringing about SEA.

Farmers' levels of Knowledge, Attitudes and Practices of SEA in Relation to Age

3. Farmers' knowledge of SEA was not significantly associated with their ages ($p < 0.05$). In spite of this, middle-age farmers were more knowledgeable in using alternative pest control methods and distilling drainages and river banks than the other age groups while the elderly farmers had the most favourable attitudes and practiced SEA regularly compared to the other age groups. The specific findings were as follows:

i. The study found out that the higher the age, the more favourable one's level of attitudes toward SEA and practicing SEA: Elderly farmers thus recorded the highest attitudes towards SEA and also translated their attitudes into practicing SEA more than the others. For instance, most elderly farmers within the ages of 46 to 60 years (95.9%) had the most favourable attitudes towards making tree planting compulsory in their communities compared to 94.1% of middle age farmers and 84.4% of young ones within age 18 to 35 years. Similarly, the elderly practiced leaving cleared weeds on their farmlands to rot as manure regularly (87.9%) than the other age groups (80.8% for young farmers of 18 to 35 years and 84.6% of middle age farmers within the ages of 36 to 45 years). Indigenous knowledge therefore plays key role.

6.3.2 Objective 2: Levels of Farmers Knowledge, Attitudes and Practices of SEA in the Eastern Region with Reference to Type of Farming

4. The study found out that livestock farmers had the highest level of knowledge and practiced SEA more than cash crop and food/vegetable crop farmers whereas all the farming groups exhibited different levels of attitudes towards SEA. The specific findings in relation to levels knowledge, attitudes and practices of SEA were as follows:

   i. The study found out that livestock farmers were more knowledgeable in recycling and re-using waste (80.1%) than cash crop and food/vegetable crops (50.3% and 70.9%) respectively. Similarly, livestock farmers were more knowledgeable in planting trees on empty lands and replacing cut ones (93.1%) than the other farming groups (89.7% for cash crop and 84.2% for food/vegetable farming).

ii. The study found out that farmers with different type of farming exhibited different levels of attitudes towards SEA. For instance, the results indicated that livestock farmers had favourable attitudes towards making planting of trees around one's surroundings compulsory (94.1%) than cash crop and food/vegetable crop farmers (92% for cash crop and 91.7% for food/vegetable crop farmers). Cash crop farmers on the other hand had the most favourable attitudes towards the use of manure as a major form of fertilizer (90.7%) than the other farming groups (90.1% for livestock and 83.5% for food/vegetable farming) while food and vegetable farmers also had the highest attitudes towards setting two days in a month aside for sanitation activities in every community (97.8) than cash crop and livestock farmers (95.8% and 87.1 respectively).

iii. Livestock farmers were found to practice SEA regularly than the other farming groups. For instance, livestock farmers practiced using manure as a source of fertilizer regularly (78.2) than cash crop and food/vegetable crop farming (64.1% and 54.4% respectively).

iv. Food/vegetable farmers had the least level of using traditional methods like ash and herbs as alternative pest control measures (42.3%) compared to 29.9% and 38.9 % least level of practices for livestock and cash crop farmers respectively.

6.3.3 Objective 3: Relationship Between Farmers' Knowledge and Attitudes Towards SEA, Knowledge and Practices of SEA and Attitudes and Practices Towards SEA.

5. There was a significant relationship between knowledge and attitude towards SEA (r = .661 with a significant level of .000). Farmers knowledge thus contributed significantly towards their attitudes of SEA.

6. There was also a significant relationship between knowledge and practices of SEA ((r = .620; p = .000). Farmers' levels of knowledge thus influenced their levels of practices of SEA.

7. The study found a significantly positive relationship between attitude and practice of SEA ((r = .542; p = .000). Farmers' levels of Attitudes towards SEA contributed to their levels of practising SEA were thus related.

8. Farmers' knowledge and attitudes toward SEA contributed significantly and positively to their practices of SEA.

6.3.4 Objective 4: Farmers' Views on Measures to Enhance their Knowledge, Attitudes and Practices of SEA the Eastern Region of Ghana.

9. The study found out that regular environmental education ((32.7%), through different media was the most effective way of enhancing farmers' knowledge about SEA.
10. Punishment for offenders was supported by (16.9%) and setting days for regular communal activities (19.5%) were suggested measures farmers' stated to enhance their attitudes and practices of SEA respectively.
11. Indigenous ecological knowledge contributed positively to farmers' high levels of knowledge of SEA.
12. Community norms and values constituted an integral part of farmers' environmental attitudes towards SEA.

6.4 Implication of the Findings for Adult Education and Human Resource Policy and Practice

The term adult education refers to activities intentionally designed for the purpose of bringing about learning among those whose age, social roles, or self-perception define them as adult (Merriam and Brockett cited in Nafukho, Amutabi and Otunga, 2005). Education has also been established as a crucial factor for all aspects of development and poverty alleviation; especially in this era of education for sustainability (Schwartz, 2010). Adult education thus uses education as tool to build people's capacity so that they can promote their own self-development as well as that of their communities. In order for adult educators to successfully carry out this role, they need to have in-depth knowledge on the educational gap (knowledge, attitudes and practices) of grassroot farmers on sustainable environment activities which is a major issue of global concern together with farmers' views on measures to enhance their educational gap. The findings of the study would therefore serve as guide to adult educators to design appropriate educational programmes that target higher levels of knowledge, attitudes and practices and implement them appropriately to enhance farmers' knowledge, attitudes and practices of SEA.

The findings that environmental education, punishment of offenders and setting days for regular communal labour as the highest suggested measures to enhance farmers' knowledge, attitudes and practices of SEA would help educators to provide frequent environmental education using varied media (radio, television, newspapers, community durbars). This will help raise the quality of environmental education that can enable the farmers to improve upon their levels of knowledge, attitudes and practices of SEA in the

Eastern Region of Ghana. The study is therefore relevant in the field of environmental education and education for sustainable development.

The findings of the study are also useful for human resource development. Human Resource development aims at building the capacity of individuals in order to function well in their respective communities. For this reason, the study findings on environmental education; particularly those related to training issues could be used by implementers to train individuals to manage environmental resources sustainably. For instance, organisations of Adult Education and Human Resource Development and Non-Formal Education programmes could organize regular workshops for trainer of trainers' sessions for specific environmental education implementers like extension officers and Non-Governmental Organizations.

In terms of policy, the findings of study would help policy makers to formulate policies needed to promote increased levels of farmers' knowledge and attitudes towards the implementation of SEA practices. For instance, it would enable policy makers to formulate policies towards the implementation of education for sustainability in the informal sector and non-formal sector. This would equip grassroots, whose livelihoods directly impinge on the physical environment, with the requisite knowledge, attitudes and skills to bring about sustainable environment practices.

6.4.1 Linking Findings within Existing Literature and Policy Implications

The study findings are also linked to previous literature to highlights consistencies and contradictions of findings needed for policy directives. These are presented on table 6.1 as follows:

Table 6.1: Linking Findings within Existing Literature and Policy Implication

Previous Literature	Findings from Study	Policy Implications
Individual's sex have been identified by some studies to influence their levels of knowledge, attitudes and practices of sustainable development while others discovered otherwise (Hassan, Rahman and Abdullah, 2012; Michalous; Creech; MacDonald & Kahlke, 2009; Mabawonku as cited in Egaga and Aderibigbe, 2015; Fishbein and Yzer, 2003; Ribeiro and Lutke, 2014)	The present study found out that sex contributes to levels of KAP; with females exhibiting more practices of than males.	Efforts should be made to improve male farmers' level of practices of SEA to be at power with their female counterparts.
Educational background was said to be significantly related to levels of knowledge, attitudes and practices of sustainability (Bedural, 2018; Tang, 2018; Aini et al, 2006; Nnabue and Asodike, 2010; Briguglio and Pace, 2004; Maclean et al. 2008; Yauntari, Gestel, Straleen, Widianarko, Sunoko and Shorbib 2015; Hirsh, 2014; Walpole and Goodwin, 2001; Fishbein, 2000 and Ajzen 1991).	The findings of this study confirmed literature. The study found out that the higher the educational background, the more knowledge and favourable attitudes exhibited.	There is the need to provide requisite environmental education to equip individuals; especially those in the informal sector to improve upon their levels of knowledge and attitudes to be able to translate them into sustainable behaviours and practices. Additionally, efforts should be made to integrate indigenous knowledge into the provision of environmental education so as to balance the levels of farmers practices of SEA.

Wiernik, Ones and Dilchert (2013) asserted that older people are more likely to sustain environmental resources than younger ones in their examination of existing data from 1970 to 2010. According to them, older people have positive environmental attitudes which are translated into sustainability practices	The study findings confirmed this assertion. The study found out that the elderly farmers (46 to 60 years) recorded the most favourable attitudes and also practiced SEA most.	This implies that experience counts so much in the implementation of sustainable practices. Environmental educators should therefore tap into the experiences of elderly farmers in any environmental education programme. Programme implementers should endeavor to encourage younger farmers to translate their environmental knowledge into sustainable practices
Hothongcum, Suwunnamek and Suwanmaneepong (2014) and Singh and Hensel (2013) found that age determine individuals' levels of knowledge on decision-making regarding sustainable practices	The study confirmed that there was generally a modest significant relationship between farmers' age with their level of knowledge in some SEA.	There is the need to implement environmental education aimed at targeting the farmers in different age groups so as to address their individual environmental educational gaps for their improvement in sustainable environment activities
It is emphasized that a sustainable environment depends on the level of knowledge, attitudes and practices of people environment (Gusti, 2016 and Aminrad, Zakariya, Hadi and Sakari, 2013)	The study confirmed the findings that there is a positively significant relationship between levels of knowledge, attitudes and practices of SEA which however contradicts the findings Aini, Laily, Nurizan, Azizah, Zuroni, and Norhasmah, (2006) that Malaysians had higher knowledge and attitudes towards the environment but these were not translated into sustainable practices.	Environmental education programmes must include strategies to improve farmers' knowledge and attitudes to bring about sustainable practices. Further research is needed to confirm or disprove this

According to Aini et al (2006) sustainable environmental practices are not only influenced by personal habits and routines but other external factors like technology, social policies, laws and regulations and community values.	This study confirmed the views by Aini et al (2006) as it reveals that provision of environmental education, punishment of offenders and setting days for regular communal activities (which constitute external factors) were the highest suggested measures to enhance farmer' knowledge, attitudes and practices of SEA.	There is the need to integrate personal habits and routines with all other external factors to bring about improvement in farmers; knowledge, attitudes and practices of SEA.
Salas-Zapata, Ríos-Osorio and Cardona-Arias (2018) and Ahmad, Noor and Asian (2015) discovered from their studies that participants generally had positive attitude towards sustainability but their willingness to actively participate accordingly did not necessarily correspond to their attitudes	This was confirmed in this study which revealed that among the three groups of farmers, livestock farmers had the highest levels of knowledge and attitudes towards SEA but failed to practice SEA always.	There is the need for sensitization and training programmes to increase levels of knowledge and attitudes towards SEA among all the different farming groups to enable them translate their knowledge and attitudes into sustainable practices.
Sustainable environmental practices are not only influenced by personal habits and routines but other external factors like technology, social policies, laws and regulations and community values (Aini et al (2006)	Environmental knowledge and attitudes were found to be community driven rather than an influenced by individuals' personal habits.	There is the need to strengthen communal spirit, ownership and management so as to enable community members develop higher and favourable environmental knowledge and attitudes towards SEA respectively for enhanced sustainable environment activities.

6.4.2 Contribution of Thesis to Knowledge

Knowledge, attitudes and practices generally interact to promote environment sustainability. The study revealed that knowledge and attitudes are key variables that integrate to influence farmers' practices of sustainable environment activities. The Model of Integrated Sustainable Environment Activity (Fig. 5.3) was therefore constructed by the researcher to depict the nature of relationship among these variables and the nuance of the relationships that exist among them. Knowledge and attitudes are integrated to influence SEA. Unlike the TPB (Ajzen, 2019) and IMBP (Fishbein, 2000), this model identifies the distinctive role of played by knowledge in promoting SEA. The model holds that environmental education interrupted by the right aggregates of moderating variables (education, gender, age, culture etc.) contribute to farmers' environmental knowledge which in turn leads to favourable environmental attitudes and subsequently resulting in the practicing of SEA.

This implies that with the requisite environmental knowledge, positive influence of moderating variables, favourable attitudes towards sustaining the environment, a farmer is likely to practice sustainable environment activities.

6.5 Conclusion

As per the problem addressed by the study, the findings have shown that even though male and female farmers generally had no significant differences in knowledge and attitudes towards SEA, female farmers practiced SEA more than their male counterparts. Formal education assists in promoting knowledge about SEA while enhancing better attitudes and regular practicing of SEA as well. Persons in middle adulthood had higher

knowledge of SEA, showing most favourable attitudes and high practices of SEA. Further to this, livestock farmers had better environmental knowledge and favourable attitudes towards SEA and tended to practice SEA than the other type of farmers. Thus, it could be said that positive attitudes and knowledgeability of SEA may lead to best practices. In effect, farmers' knowledge and attitude towards SEA were found to contribute significantly and positively to their practices of SEA. Additionally, the provision of environmental education and stringent punishment of offenders with regular communal activities could enhance farmers' knowledge, attitudes and practices of in the Eastern Region of Ghana. Farmers levels of knowledge, attitudes and practices of SEA in the Eastern Region of Ghana were therefore at varying levels in relation to some selected biographical characteristics (sex, education and age).

In effect, high sustainable environmental knowledge with positive attitudes and high practices adhered to by farmers can bring about sustainable environment through various practices. Future livelihoods of farmers could therefore be promoted by engaging in best practices (like the planting of drought resistant trees such as oranges and oil palm). High sustainable environmental knowledge and positive attitudes can lead to better practices but cannot ignore the individuals' age, sex and type of farming.

6.6 Recommendations

On the basis of the findings made, the study recommended the following:

With regards to sex, education and age in relation to levels of knowledge, attitudes and practices of SEA, the study recommends that:

1. Stakeholders of education should formulate policies and implement environmental education policies for the non-formal education sector to promote SEA.
2. Adult Education Institutions should design or intensify their environmental education curriculum.
3. Agricultural Extension Officers, Community Development Agents and Non-Formal Education Organizations should provide regular environmental education to grassroots farmers whose activities directly impinge on the physical environment
4. The Environmental Education Agency together with other education agencies should provide educational programmes targeting the varying knowledge, attitudinal and practices gaps of male and female farmers as well as those in different age groupings.

With regards to type of farming in relation to levels of knowledge, attitudes and practices of SEA, the study recommends that the Ministry of Food and Agriculture:

5. Should encourage farmers to increase their practices of mixed farming (food/vegetable crops, livestock and cash crop) to enhance their knowledge and attitudes required for better practices of SEA.
6. Should provide farming incentives to boost farmers' attitudes towards practicing sustainable activities.

In line with the relationships between farmers' knowledge, attitudes and practices of SEA, the study recommends that:

7. The Non-Formal Education sector of the Ministry of Education, NGOs on the environment, the Agricultural Extension Officers and other implementers of education should tap into farmers' indigenous ecological knowledge and integrate them into environmental education for communities.

8. Community opinion leaders should thoroughly discuss with farmers the need for SEA to enable them see their immediate relevance so as to raise their levels of knowledge, attitudes to be translated into sustainable environment practices.

Finally, the study recommends that to enhance farmers' knowledge, attitudes and practices of SEA, the following measures should be addressed:

9. Community opinion leaders together with law enforcement agencies should enforce environmental laws by arresting and punishing offenders so that such penalties to serve as deterrent to others.
10. Environmental education and regular training programmes must be organized for farmers on emerging issues like the SDGs on environment to position farmers to accept policies towards sustainability.
11. Frequent training programmes should be organized for community leaders, especially those in the rural areas of Ghana. This could be achieved by sending Adult Educators to rural communities to provide leadership training programmes to leaders in order for them to play their respective roles that will help improve community members' participation levels in sustainable activities.

6.7 Suggestion for Further Study

Some areas that may be of particular interest for future research are:

- Comparative study on the use of media (radio, television and newspapers) and agricultural extension officers for community environmental education programmes.

- Factors influencing sustainable environmental practices.

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APPENDICES

Appendix I: Ethics Committee Approval Note

UNIVERSITY OF GHANA
ETHICS COMMITTEE FOR THE HUMANITIES (ECH)
P. O. Box LG 74, Legon, Accra, Ghana

My Ref. No.....

18th May, 2018

Ms. Angela Kyerewaa Ayisi-Addo
Department of Adult Education and Human Resources Studies
University of Ghana
Legon

Dear Ms. Ayisi-Addo,

ECH 142/17-18: FARMERS' KNOWLEDGE, ATTITUDES AND PRACTICES OF ENVIRONMENTAL SUSTAINABLE ACTIVITIES IN THE EASTERN REGION OF GHANA

This is to advise you that the above reference study has been presented to the Ethics Committee for the Humanities for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date:	17/05/19
On Agenda for:	Initial Submission
Date of Submission:	19/03/18
ECH Action:	Approved
Reporting:	Bi-Annually

Please accept my congratulations.

Yours Sincerely,

Rev. Prof. J. O. Y. Mante
ECH Chair

CC: Prof. Olivia A. T. F. Kwapong, Department of Adult Education and Human Resources Studies, University of Ghana.

Tel: +233-303933866 Email: ech@ug.edu.gh | ech@isser.edu.gh

Appendix II: Introductory Letter

UNIVERSITY OF GHANA
DEPARTMENT OF ADULT EDUCATION AND HUMAN RESOURCE STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION

Ref. No.: ..... August 15, 2018.

TO WHOM IT MAY CONCERN

Ms. Angela Kyerewaa Ayisi-Addo (ID 10212097) is a Ph.D. candidate of the Department of Adult Education and Human Resource Studies of School of Continuing and Distance Education under the College of Education, University of Ghana, Legon.

She is undertaking a study in connection with her thesis **(Farmers' Knowledge, Attitude and Practices of Sustainable Environment in the Eastern Region of Ghana)** which requires contacting institutions and organisations for data collection.

I should be very grateful if you would give her the needed assistance.

Thank you.

Prof. Olivia A. T. F. Kwapong
Head of Department

COLLEGE OF EDUCATION
P. O. Box 31, Legon, Accra, Ghana.
• Tel: +233 (0) 303 938 853 • Email: aahs@ug.edu.gh • Website: www.coe.ug.edu.gh

Appendix III: Interview Schedule in English

UNIVERSITY OF GHANA

DEPARTMENT OF ADULT EDUCATION AND HUMAN RESOURCE STUDIES

INTERVIEW SCHEDULE DESIGNED FOR FARMERS LIVING IN THE EASTERN REGION ON THEIR KNOWLEDGE, ATTITUDES AND PRACTICES OF SUSTAINABLE ENVIRONMENTAL ACTIVITIES

As part of my work towards fulfilling the requirements for the award of a Doctor of Philosophy Degree in Adult Education, at the University of Ghana, Legon, I am conducting a research on "Farmers' Knowledge, Attitudes and Practices of Sustainable Environment Activities in the Eastern Region of Ghana''. Your answers to questions in this interview schedule will be used together with other information to achieve the objectives of the study.

Please, this research is solely for academic purpose. You are therefore encouraged to answer the questions as frank as possible. Your responses would be held in strict confidence. Your participation too is voluntary and you may choose to stop at any time.

Thank you.

SECTION A: Biographical Characteristics

1. Sex (tick one)
    1. Female [ ]
    2. Male [ ]
2. What is your level of education?
    1. No formal Education [ ]
    2. Primary School/ JHS/ Middle School [ ]
    3. Secondary school/High school [ ]
    4. Tertiary [ ]
    5. Other, please specify: ----------
3. How old are you?
    1. 18 -35 [ ]
    2. 36 - 45 [ ]
    3. 46 - 60 [ ]

4. Which of these types of farming groups do you belong? Please tick one dominant group.

   1. Cash crop farming [ ]
   2. Food crops and vegetable farming [ ]
   3. Livestock farming [ ]
   4. Other, please specify: ----------

SECTION B: Knowledge Levels on Activities that Sustain the Environment

5. What is your level of knowledge about the following sustainable environment activities? (Please circle appropriately).

No	Knowledge about Activities that sustains the environment	Very Low	Low	Neutral	High	Very High
1	Recycling and re-using waste	1	2	3	4	5
2	Planting trees on empty lands and re-placing cut ones	1	2	3	4	5
3	Using manure as a major form of fertilizer	1	2	3	4	5
4	Use of alternative pest control: traditional methods (eg. Ash and herbs usage)	1	2	3	4	5
5	Desilting gutters and river banks	1	2	3	4	5
6	Rotating crops at regular intervals	1	2	3	4	5
7	Leaving farmlands to fallow to regain its strength	1	2	3	4	5
8	Leaving cleared weeds on the land to serve as manure	1	2	3	4	5

SECTION C: Level of Farmers' Attitude towards Activities that Sustain the Environment

6. Indicate the extent to which you agree or disagree with the following statements. (Please tick appropriately).

No.	Attitudes Towards Engaging in Sustainable Environment Activities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Recycling and re-use of waste is a good practice and needs to be encouraged	1	2	3	4	5
2	It should be compulsory for everyone to plant trees around his/her surroundings	1	2	3	4	5
3	Manure should be used as the major form of fertilizer in Ghana	1	2	3	4	5
4	Traditional pest control methods (like ash application and herbs usage) must be encouraged rather than chemical pesticides	1	2	3	4	5
5	Two days in a month must be set aside for sanitation activities (like desilting gutters and weeding banks of rivers) in every community	1	2	3	4	5
6	It is good to plant different crops together on the farm at the same time	1	2	3	4	5
7	Leaving some parts of farmlands unplanted to enable the land to regain its strength is a good practice	1	2	3	4	5
8	leaving cleared weeds on the land is a good source of manure and needs to be encouraged	1	2	3	4	5
9	Radio and television programmes must be used to educate farmers on environmental sustainability issues.	1	2	3	4	5
10	Education on the environment and sustainable development must be provided to everybody	1	2	3	4	5
11	It is good to encourage others to plant trees around their surroundings	1	2	3	4	5
12	Anybody who engages in activities that destroy the environment (e.g. bush burning and galamsey' activities) must be punished severely	1	2	3	4	5
13	It is the responsibility of every person to protect environmental resources					

SECTION D: Level of Farmers Practices in Activities that Sustain the Environment

7. What is your level of participation in the under listed sustainable environment activities? (Please, circle as applicable).

No	Practices of sustainable Environment Activities	Never	Low	Average	High	Always
1	I use manure as a source of fertilizer	1	2	3	4	5
2	I reuse waste (like polythene) for other important activities (eg. nursing seedlings)	1	2	3	4	5
3	I plant trees around my surroundings and available bare lands.	1	2	3	4	5
4	I encourage others to plant trees around their surroundings	1	2	3	4	5
5	I use traditional methods like ash and herbs as alternative pest control measures	1	2	3	4	5
6	I take part in communal activities for sustaining environmental resources in my community (eg. desilting gutters, clearing and desilting river banks)	1	2	3	4	5
7	I divide my farmlands and rotate crops at the same time	1	2	3	4	5
8	I leave some part of my farmland unplanted for the land to regain its fertility	1	2	3	4	5
9	Cleared weeds on my farmland are left to rot as a form of manure	1	2	3	4	5
10	I am a member of an environmental protection group and participate in their activities	1	2	3	4	5
11	I attend meetings for sustaining the environment	1	2	3	4	5
12	I attend environmental education training programmes	1	2	3	4	5

SECTION E: Measures to enhance Farmers' knowledge, attitudes and practices of Sustainable Environment Activities

8. What, in your view could be done to enhance your:

a. Knowledge on sustainable environmental activities: ----------
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---

b. Attitude towards sustainable environmental activities: ----------
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c. Practices of sustaining the environment:----------

Appendix IV: Interview Schedule in Twi

UNIVERSITY OF GHANA
DEPARTMENT OF ADULT EDUCATION AND HUMAN RESOURCE STUDIES

INTERVIEW SCHEDULE DESIGNED FOR FARMERS LIVING IN THE EASTERN REGION ON THEIR KNOWLEDGE, ATTITUDES AND PRACTICES OF SUSTAINABLE ENVIRONMENTAL ACTIVITIES

As part of my work towards fulfilling the requirements for the award of a Doctor of Philosophy Degree in Adult Education, at the University of Ghana, Legon, I am conducting a research on "Farmers' Knowledge, Attitudes and Practices of Sustainable Environment Activities in the Eastern Region of Ghana''. Your answers to questions in this interview schedule will be used together with other information to achieve the objectives of the study.

Please, this research is solely for academic purpose. You are therefore encouraged to answer the questions as frank as possible. Your responses would be held in strict confidence. Your participation too is voluntary and you may choose to stop at any time.

Thank you.

SECTION A: Woho nsɛm

1. Bɔbrɛ (Yi biako)
   3. Ɔbea [ ]
   4. Bɛrima [ ]
2. Sukuu gynapɛn?
   6. Nhyɛase Sukuu [ ]
   7. Ntoaso Sukuu [ ]
   8. Sukuupɔn [ ]
   9. Menkɔɔ sukuu da [ ]
   10. Biribi foforo a, mepa wo kyew kyerɛkyerɛ mu: ----------
3. Wadi mfi sɛn?
   1. 18 -35 [ ]
   2. 36 - 45 [ ]
   3. 46 - 60 [ ]

   4. Kuayɛ kuw yi mu ahorow bɛn na woka ho?

   Kookoo ne mmɛ fuw [ ]
   Nuan ne atoso deɛ nfuw [ ]
   Mmoa nyɛn [ ]
   Biribi foforo a, mepa w'akyɛw kyerɛ mu: ----------

SECTION B: Nimdeɛ a Wowɔ Fa Nwumadi a ɛbɔ abɔde ntwahyia ho ban

5. Nimdeɛ mpɛnmpɛn so bɛn na wowɔ fa abɔde ntwahyia nwumadi a edidi so yiho?

No	**Nimdeɛ a ɛfa nwumadi a ɛbɔ abɔde ntwahyia ho ban**	**ɛwɔ fɔm paa**	**ɛwɔ fɔm**	**Menni ho adwen kyerɛ biara**	**ɛwɔ soro**	**ɛwɔ soro paa**
1	Wode suminaso nwura reyɛ nneɛma pa	1	2	3	4	5
2	Wore dua nnua	1	2	3	4	5
3	Wode mmoa agyanan regu asase so ne nnɔbae ase	1	2	3	4	5
4	Wode nso ne nwura rekum nnɔte mmoa	1	2	3	4	5
5	Wo tete gɔta ne nsu ano mu	1	2	3	4	5
6	Wore sesa nnɔbae ahorow dua abere biara	1	2	3	4	5
7	Wore gyaw afuw ama n'ahome	1	2	3	4	5
8	Wore gyaw nnwura a y'adɔ agu asaase so ama no aprɔ	1	2	3	4	5

SECTION C: Nneyɛi a wɔda n'adi kyerɛ abɔde mu ntwahyia ho ban bɔ nnwuma ho

6. Mepa w'akyɛw kyerɛ mpɛnmpɛn so a wosi fa gye anaa wongye nsɛmfua a edidi so yi tom.

No.	**Nneyeɛ a wɔda n'adi kyerɛ abɔde mu ntwahyia ho ban bɔ nwuma**	Mennye ntomu koraa	Mennye ntomu	Nnyɛ mu biara	Megye tom	Megye tom paa
1	Wode suminaso nwura reyɛ nneɛma pa foforo ye paa	1	2	3	4	5
2	ɛwɔsɛ ɛyɛ hyɛ ma obiara sɛ ɔbɛdua nua atwa fie ho ahyia	1	2	3	4	5
3	ɛwɔsɛ wode mmoa agyanan gu asase so ne nnɔbae ase wɔ Ghana	1	2	3	4	5
4	ɛwɔsɛ yɛma nso ne nwura a yɛde kum nnɔte mmoa ho nkoranshyɛ	1	2	3	4	5
5	Yɛde nna abien wɔ bosome mu resi Hɔ ama ahodie nnwuma wɔ mpɔtɛm biara	1	2	3	4	5
6	ɛyɛsɛ wobsɛ dua ahorow wɔ asaase so	1	2	3	4	5

7	Wogyaw afuw ama nafuw ama assase no anya ahoɔden	1	2	3	4	5
8	ɛwɔsɛ yɛma nkoranshyɛ wɔ nnwura a y'adɔ agu asaase so ma no prɔ	1	2	3	4	5
9	ɛsɛsɛ yɛde akasanoma ne akasa mfoni nwuma ahorow nom bi de ma abɔde mu ntwahyia ho nkyerɛkyerɛ	1	2	3	4	5
10	ɛsɛsɛ obiara nya abɔde mu ntwahyia ho nkyerɛkyerɛ	1	2	3	4	5
11	ɛsɛsɛ yɛma afoforo nkoranshyɛ wɔ nnua a wɔdua twa fie ho hyia	1	2	3	4	5
12	ɛsɛ sɛ yɛtwe wɔn a wɔsɛe abɔde mu ntwahyia ho aso.	1	2	3	4	5
13	ɛyɛ obiara asɛde sɛ ɛbɛbɔ abɔde mu ntwahyia ho ban.					

SECTION D: Nsheshyeɛ a ɛfa Abɔde mu ntwahyia ho ban bɔ nwuma ho

7. Nnwuma yi mu nea ɛwɔ he na w'ayɛ bi pɛn? Mepa wo kyɛw kyerɛkyerɛ dodow ahorow a w'ayɛ bi pɛn.

No	**Nsheshyeɛ a ɛfa Abɔde mu ntwahyia ho ban bɔ nwuma ho**	**Mennyɛɛ bi da**	**Neyɛ no wɔ fam**	**ɛhɔ ne hɔ**	**noyɛ no wɔ soro**	**meyɛ no abre biara**
1	Mede mmoa agyanan gu asase so ne nnɔbae ase	1	2	3	4	5
2	Mede suminaso nwura yɛ nneɛma pa foforo	1	2	3	4	5
3	Me dua nnua **w**ɔ menpɔtem	1	2	3	4	5
4	Mehyɛ afoforo nkoran ma **w**ɔdua nnua fie ho ahyia	1	2	3	4	5
5	Mede nso ne nwura kum nnɔte mmoa	1	2	3	4	5
6	Mekɔ ɔman nnwuma ma yde siesie me kurow.	1	2	3	4	5
7	Mekyekyɛ ma'fuw asaase mu de dua nnɔbea ahorow	1	2	3	4	5
8	Megyaw m'afuw ma assase no nya ahoɔden	1	2	3	4	5
9	Me gyaw nnwura a m'adɔ agu asaase so ma no aprɔ	1	2	3	4	5

10	Meka abɔde mu ntwahyia ho ban bɔ nhyiamu	1	2	3	4	5
11	Me kɔ abɔde mu ntwahyia ho ban bɔ nhyiamu	1	2	3	4	5
12	Me kɔ abɔde mu ntwahyia ho ban bɔ nhyiamu ntete**ɛ**	1	2	3	4	5

Section D: Nnema ahorow a akuafo susuw sɛ ɛbetumi am awn nimdeɛ, nneyeɛ ɛne wɔn nnwuma bɛtumi akɔ anim

7. a. Dɛn na wosusu sɛ ɛbetumi ama wo nimdeɛ a ɛfa abɔde mu ntwahyia ho ban akɔ anim?

   ……
   ……
   ……
   ……

   b. Dɛn na wosusu sɛ ɛbetumi ama wo nneyɛe a ɛfa abɔde mu ntwahyia ho ban akɔ anim?

   ……
   ……
   ……
   ……

   c. Dɛn na wosusu sɛ ɛbetumi ama nnwumadi a ɛfa abɔde mu ntwahyia ho ban akɔ anim?

   ……
   ……
   ……
   ……

Meda W'ase

Appendix V: Focus Group Discussion Guide in English

UNIVERSITY OF GHANA

DEPARTMENT OF ADULT EDUCATION AND HUMAN RESOURCE STUDIES

STRUCTURED FOCUS GROUP DISCUSSION GUIDE FOR FARMERS IN THE EASTERN REGION OF GHANA

Section A: Level of Farmers' Knowledge on Activities that sustain the Environment

1. a) What activities sustain environmental resources in your community?
   b. Why do the community consider these activities to sustain resources in the environment?
2. a) Which activities destroy the environment in your community?
   b. In what ways do these activities contribute to environmental destruction?
3. Mention any laws/rules/beliefs that control the use of environmental resources in your community.
4. a. From where does the community get their environmental education?
   b. Briefly describe any environmental education you receive.
5. What knowledge do your community have about the following sustainable environment activities?
   a. Recycling and reusing waste
   b. Tree planting
   c. Using manure
   d. Using ash and herbs as alternate pest control methods
   e. Desilting gutter and river banks
   f. Rotating crops
   g. Leaving farmlands to fallow
   h. Leaving cleared weeds on the land to serve as manure

Section B: Level of Farmers' Attitude towards Sustainable Environment Activities

6. What is your community's attitude towards the following sustainable environment activities:
   a. Recycling and reusing waste
   b. Tree planting
   c. Using manure
   d. Using ash and herbs as alternate pest control methods

e. Desilting gutter and river banks
f. Rotating crops
g. Leaving farmlands to regain its strength
h. Leaving cleared weeds on the land to serve as manure

Section C: Level of Farmers' Practices of Environmental Sustainable Activities

8. a. What sustainable environment activities are practiced in your community for sustaining the environmental resources?
9. b. How are the following sustainable environment activities practiced in the community?
   a. Recycling and reusing waste
   b. Tree planting
   c. Using manure
   d. Using ash and herbs as alternate pest control methods
   e. Desilting gutter and river banks
   f. Crops Rotation
   g. Leaving farmlands to regain its strength
   h. Leaving cleared weeds on the land to serve as manure

Section D: Measures to Enhance Farmers' Knowledge, Attitudes and Practices

9. What can be done to improve your community's:

a) Knowledge about sustainable environmental activities?

b) Attitude towards sustainable environmental activities?

d) Practices of sustainable environmental activities?

Appendix VI: Focus Group Discussion Guide in Twi

UNIVERSITY OF GHANA

DEPARTMENT OF ADULT EDUCATION AND HUMAN RESOURCE STUDIES

STRUCTURED FOCUS GROUP DISCUSSION GUIDE FOR FARMERS IN THE EASTERN REGION OF GHANA IN TWI

Section A: Nimdeɛ ahorow mpɛnpɛn so a akuafo wɔ fa nwumadi a ɛbɔ abɔde mu ntwahyia ho ban

5. a) Nnwumadi ahorow bɛn na ɛbɔ abɔde mu ntwahyia ho ban wɔ mo npɔtem mu?

   b) Adɛn nti na mo susu sɛ saa nnwumadi ahorow yi bɔ abɔde mu ntwahyia ho ban wɔ mo npɔtem mu?

6. a) Nnwumadi ahorow bɛn na mo susu sɛ ɛseɛ abɔde mu ntwahyia wɔ mo npɔtem mu?

   b. Kwan bɛn na saa nnwumadi ahorow yi si fa seɛ abɔde mu ntwahyia wɔ mo mpotem mu?

7. Bobɔ mmara/gyedi ahorow wɔ mo mpɔtem mu a ɛkyerɛ kwan a monfa so mfa abɔde mu ntwahyia mu nneɛma yɛ nnwuma ahorow.

8. a. Biae ahorow bɛn na mo nya abɔde mu ntwahyia ho ban bɔ nkyerɛkyerɛ wɔ mo npɔtem mu?

   b. Nkyerɛkyerɛ ahorow a mo nya ne bi ne dɛn?

9. Tebiaɛ bɛn na mo susu sɛ abɛde mu ntwahyia wɔ wo npɔtem mu te mprenpren yi?

Section B: Nneyeɛ mpɛnpɛn so a akuafo wɔ fa Abɔde mu Ntwahyia ho ban bɔ Nnwuma ho

7. Nneyeɛ bɛn na mo mpotɛmfo da no adi fa abɛde mu ntwahyia ho ban bɔ nnumadi ahorow a edidi so yi ho?

   a. Wode suminaso nwura reyɛ nneɛma pa foforo

   b. Wore dua nnua

   c. Wode mmoa agyanan regu asase so ne nnɔbae ase

   d. Wode nso ne nwura rekum nnɔte mmoa

   e. Wo tete gɔta ne nsu ano mu

   f. Wore sesa nnɔbae ahorow dua abere biara

   g. Wore gyaw afuw ama n'ahome

   h. Wore gyaw nnwura a y'adɔ agu asaase so ama no aprɔ

Section C: Nnwuma Ahorow a Akuafo yɛ de bɔ Abɔde mu Ntwahyia ho Ban.

10. . Nnyuma ahorow bɛn na moyɛ de bɔ abɔde mu ntwahyia ho ban wɔ mo mantɛm ha?

    b. Kwan bɛn na kurow yi mu mpotɛmfo yi si fa yɛ nnwuma a edidi so yi?

    a. Wode suminaso nwura reyɛ nneɛma pa foforo

    b. Wore dua nnua

    c. Wode mmoa agyanan regu asase so ne nnɔbae ase

    d. Wode nso ne nwura rekum nnɔte mmoa

    e. Wo tete gɔta ne nsu ano mu

    f. Wore sesa nnɔbae ahorow dua abere biara

    g. Wore gyaw afuw ama n'ahome

    h. Wore gyaw nnwura a y'adɔ agu asaase so ama no aprɔ

Section D: Nnema ahorow a akuafo susuw sɛ ɛbetumi am awn nimdeɛ, nneyeɛ ɛne wɔn nnwuma bɛtumi akɔ anim

11. a. Dɛn na mosusu sɛ ɛbetumi ama momantɛmfo a ɛwɔ ha nimdeɛa ɛfa abɔde mu ntwahyia ho ban akɔ anim?

    b. Dɛn na mosusu sɛ ɛbetumi ama momantɛmfo a ɛwɔ ha nneyɛe a ɛfa abɔde mu ntwahyia ho ban akɔ anim?

    c. Dɛn na mosusu sɛ ɛbetumi ama momantɛmfo a ɛwɔ ha nnwumadi a ɛfa abɔde mu ntwahyia ho ban akɔ anim?

Appendix VII: Informed Consent

I have carefully read and understood all the information provided on this study. I had the opportunity to ask questions for clarification purposes. I understand that my involvement is voluntary and that I am free to withdraw at any point in time, without giving any reason whatsoever. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study and hence give my consent.

Participant's signature:_____ Date: _____

Investigator's signature _____ Date: _____