

UNIVERSITY OF GHANA

**THE SOCIO-ECONOMIC BENEFITS OF COMMUNITY-BASED ADAPTATION
(CBA) IN GHANA: THE CASE OF THE ADAPTATION LEARNING PROGRAMME
(ALP) IN EAST MAMPRUSI DISTRICT (EMD)**

BY

PRINCE ANSAH

(10275508)

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN
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DECLARATION

I, Prince Ansah, author of this thesis titled, “The socio-economic benefits of community-based adaptation in Ghana: the case of the Adaptation Learning Programme (ALP) in East Mamprusi district” do hereby declare that, with the exception of references to past and current literature duly cited, this work was undertaken by me from August 2014 to July 2015 in the Climate Change and Sustainable Development Programme, University of Ghana, Legon. This work has neither been presented in whole nor in part for any other degree of this university or elsewhere.

.....

Date:

Prince Ansah

This thesis has been presented for examination with our approval as supervisors:

.....

.....

Date:

Date:

Dr. Elaine Tweneboah Lawson

Dr. Charlotte Wrigley-Asante

(Main Supervisor)

(Co-Supervisor)

DEDICATION

I dedicate this work to family and friends.



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ABSTRACT

Community-based adaptation (CBA) has become one of the most discussed climate change adaptation options in recent times especially in developing countries. In Ghana, CARE International's five-year Adaptation Learning programme (ALP) was carried out in two vulnerable districts in Northern Ghana. The study was to identify and describe the socio-economic benefits of the ALP on the livelihoods of households in Saamini and Zambulugu communities in East Mamprusi district. Both quantitative and qualitative research methodologies were employed using the comparative (before and after) and case study analytical approach. Paired-samples t-test and chi-square tests were the statistical tests used to compare primary data between 2010 and 2014. The results from the study showed that households in both communities benefited from the programme. However, Saamini community benefited more from off-farm ALP strategies than Zambulugu community who benefited from on-farm strategies. Although production in both communities dropped in 2014 as compared to 2010, the incomes obtained were tripled due to the changes in price-value of crops between the two periods. Households also saved more and borrowed less but household budget increased and households were unable to lend money in 2014 as compared to periods before the ALP. Social outcomes like months of food availability increased by two months, health conditions improved for households but there was not much difference in terms of months for those who complained of one illness. School attendance increased in both communities and women empowerment was the biggest achievement of the programme in 2014. Although some households complained of some challenges with the ALP, majority of sampled households admitted the intervention was beneficial and sustainable. Recommendations are made to improve any future CBA intervention in the district, region or at the national level. In all, the study confirmed CBA as an effective adaptation option for developing countries in the face of harsh climate change impacts.

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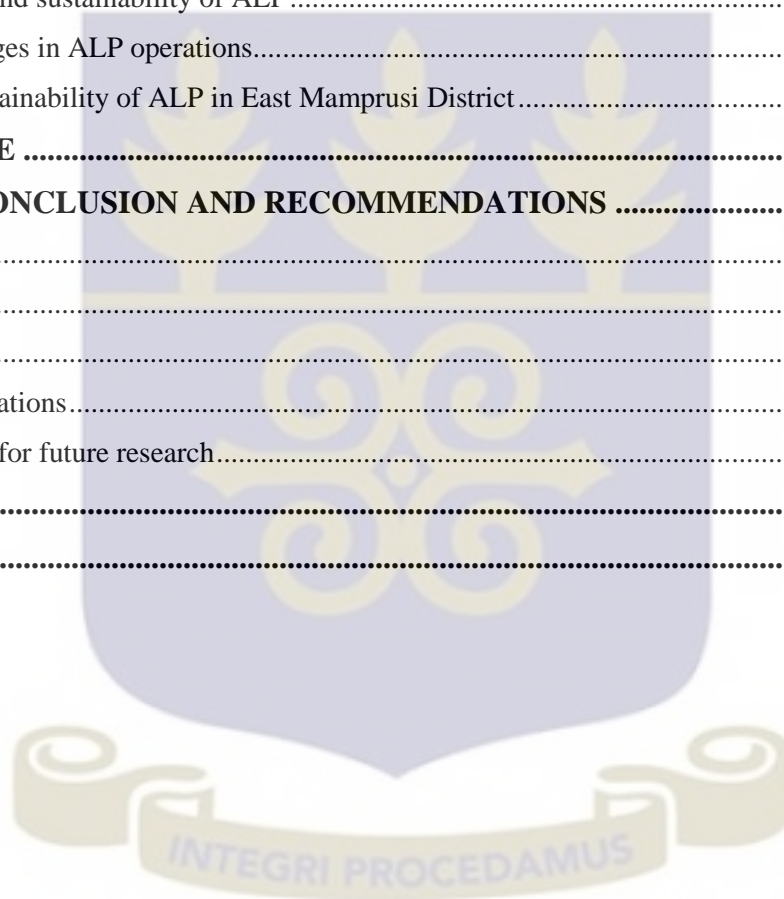
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LIST OF ABBREVIATIONS

ACCRA	African Climate Change Resilience Alliance
ACDEP	Association of Church-based Development
AfClix	Africa Climate Exchange
ALP	Adaptation Learning Programme
CA	Conservation Agriculture
CAAPs	Climate Adaptation Action Plans
CAPri	CGIAR Systemwide Program on Collective Action and Property Right
CCAA	Climate Change Adaptation Action
CARE	Cooperative for Assistance and Relief Everywhere
CCAFS	Climate Change Agriculture and Food Security
CBA	Community-Based Adaptation
CIC	Climate Information Center
CC-DARE	Climate Change Adaptation and Development Initiative
CGIAR	Consultative Group on International Agricultural Research
CHF	Canadian Hunger Foundation
CHIPS	Community Health Improvement Services
CVCA	Climate Vulnerability and Capacity Analysis
DANIDA	Danish International Development Agency
DFID	Department for International Development
DDFs	District Disaster Funds
DMTDPs	District Medium Term Development Plans

DPPs	Disaster Preparedness Plans
EACC	Economics of Adaptation to Climate Change
EBCI	Early Bulking Cassava Initiative
EPA	Environmental Protection Agency
EMD	East Mamprusi District
EUCA	European Union Climate Action
FAO	Food and Agriculture Organization
GCF	Green Climate Fund
GEF	Global Environment Facility
GhanaCAN	Ghana Climate Adaptation Network
GHC	Ghana Cedi
Gmet	Ghana Meteorology
GOG	Government of Ghana
GPRS	Ghana Poverty Reduction Strategy
GSGDA	Ghana Shared Growth and Development Agenda
HLIPE	High Level International of Panel of Expert
IDRC	International Development Research Centre
IIED	International Institute for Environment and Development
IFAD	International Fund for Agricultural Development
IPCC	Internal Panel on Climate Change
JICA	Japan International Cooperation Agency
LOGODEP	Local Government Decentralized Programme
MESTI	Ministry of Environment, Science, Technology and Innovation

MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
MTDP	Medium Term Development Plan
NCCAP	Netherlands Climate Change Studies Assistance Programme
NCAP	Netherlands Climate Assistance Programme
NDPC	National Development Planning Commission
NGOs	Non-Governmental Organizations.
PARED	Partners in Rural Empowerment and Development
PAS-G	Presbyterian Agriculture Station - Garu
REP	Rural Enterprises Programme
SPSS	Statistical Package for Social Sciences
UNDP	United Nations Development Programme
UN-ECOSOC	United Nations Economic and Social Council
UNEP	United Nations Environmental Programme
UNICEF	United Nations International Children's Emergency Fund
WA WASH	West Africa Water Supply, Sanitation and Hygiene
WRC	Water Resources Commission
VSLAs	Village Savings and Loans Associations

CHAPTER ONE

INTRODUCTION

1.1 Background

Climate change has become one of the most discussed and debated environmental phenomenon in the 21st century. According to the Intergovernmental Panel on Climate Change (2007), “warming of the climate system is unequivocal, as it is now evident from observation of increases in global average air and ocean temperatures, wide spread melting of snow and ice and rising global average sea level”. As the evidence supporting climate change becomes uncontested so are its impacts on all levels of society especially on poorer and climate sensitive regions including Africa and Asia. The social and economic developments of most countries across the globe, especially developing and less developed countries, are expected to be challenged directly or indirectly by these impacts of climate change. The United Nations Framework Convention on Climate Change (2006) also reported that developing countries are likely to be more severely affected than developed countries given their existing vulnerabilities related to their geographic and socio-economic contexts.

Agriculture, education, health and gender are some of the potential development-related areas expected to be directly hit by impacts of climate change. For example, agriculture employment is about 65 percent of Africa’s domestic labor force and amounts to 32 percent of gross domestic product (World Bank, 2008). Moreover, nearly 80 percent of the poor in sub-Saharan Africa continue to depend on the agricultural sector for their livelihoods and with climate change as a threat to the sustainability of agriculture in the region, its future is uncertain (Calzadilla, 2009). When the impacts of climate change persists over time without appropriate adaptation and

mitigation actions, development in climate sensitive and poorer regions may be overwhelmed by the phenomenon.

Many experts have predicted that the educational sector will be affected by the impacts of climate change. As climate hazards such as floods increase, the likelihood of impacts on school infrastructure including classrooms blocks, roads and bridges leading to schools may also be affected leading to hindrances in children school education (UNICEF, 2011). As school dropouts increases especially for girls due to lack of resources, school enrollments may also be affected in most developing countries as household survival against climate change compete with education (UNDP, 2010). Furthermore, many children especially boys may be forced out of school to become labourers as a necessity in order to support their families to cope with these changes (Nenova-Knight, 2011).

The health sector is one most sensitive areas in terms of the impacts of climate change. Many countries especially in tropical regions including sub-Saharan Africa are expected to have increases in vector borne disease incidents such as the spread of malaria (Poutiainen et al., 2013). It is predicted that the most vulnerable communities to climate health impacts will be poorer regions with less socio-economic endowment to adapt (Bell et al., 2013; Lesnikowski et al., 2013). In all women are considered to be the hardest hit by climate crises (Reid et al., 2009). This is due to already existing inequalities that often exist between men and women in most developing economies. Most women in the rural and poorer settings do not have access to some resources and this makes it difficult to cope with the impacts of climate change (Bose, 2011; UNDP, 2010).

Various global, regional and national interventions are seeking to address these major concerns posed by the impacts of climate change especially on vulnerable communities in developing

countries. Major socio-economic issues such as poverty, food security, health, education and gender inequality were recognized as part of the eight global development goals to be addressed in the Millennium Development Goals (MDGs) established by the United Nations and its affiliate organizations. At the regional level, New Partnership for Africa's Development (NEPAD) established by African leaders also seeks to tackle similar socio-economic challenges. The role of climate change in the achievement of these global and regional strategic development goals arises with some major questions. These include; can developing economies reach their full development potential in the face of harsh and erratic impacts of climate change and what are the pathways to be taken to ensure development matches with climate change adaptation?.

Unless we can better understand what the future might hold and how to prepare for it, we could see major disruptions to ecosystem services that could threaten existing livelihoods and further increase the vulnerability of the poor to climatic and other future changes related to globalization (Reed et al., 2013).

1.2 Problem Statement

Ghana, like most developing countries is vulnerable to climate change due to already existing development challenges such as poverty, poor infrastructure, food insecurity and poor governance system. Climate trends since 1960 shows an average rate of increase in temperature by 0.21°C per decade in Ghana, with a more rapid increase in the northern regions of the country (MESTI, 2014). The World Bank (2011) holds the view that, the uncertainty in future climate can be noted from previous climatic extremes particularly in the 1980's which led to harsh periods of severe drought, decline in crop production and livestock herds, and the severe food shortages experienced in the country. The adverse impacts of climate change on the natural resources base and the sustainable livelihoods of rural communities can translate into

exacerbating challenges already existing for socio-economic development. Furthermore, the reliance on primary production especially rain fed agriculture, high population growth and wide spread poverty makes Ghana more vulnerable to the impacts of climate change and variability (Nelson and Agbe, 2005).

National policies and developmental frameworks such as the Ghana Poverty Reduction Strategy (GPRS I & II) and Ghana Shared Growth and Development Agenda (GSGDA I & II) expected to empower vulnerable communities in the country have in themselves been partially hindered by the impacts of climate change. This has resulted in making the achievement of socio-economic goals such as poverty alleviation, food security and gender equality a near impossibility. Since the late 1990's when adaptation issues became popular, various adaptation interventions by non-governmental organizations (NGOs) have not integrated adaptation strategies into development agendas. Government institutions working to ensure the achievement of development goals have also not paid particular attention to climate change adaptation as an agent for development. In recent times, the need to integrate both development and adaptation at the community level has become a necessity for both non-governmental organizations and government institutions. In order to build a case for such adaptation initiatives like community-based adaptation (CBA) as an effective adaptation and development tool, the need to evaluate the strategies and outcomes from such interventions for advocacy has also become urgent. This study makes a case for CBA as a socio-economic development tool by using the Adaptation Learning Programme (ALP) of CARE International in Northern Ghana as a case study. ALP is a five-year community-based adaptation project in four countries in Africa including Ghana, Kenya, Niger, and Mozambique. The key outputs of the project were to develop and apply innovative approaches for CBA, enable local civil society organizations to have a voice in decision-making on adaptation, to make

recommendations on policy and practice in the CBA process, sharing relevant lessons learnt from for CBA to influence policies and programmes and finally to build the capacity of CBA practitioners.

1.3 Research Questions

1. How does ALP address vulnerabilities in communities and what level of benefits are there for beneficiaries?
2. What are the economic benefits households and communities obtain from ALP?
3. Which social outcomes are there for beneficial households and communities?
4. What limitations are there in the ALP process and how sustainable is the intervention?

1.4 Objectives

The main objective of the study is to assess the socio-economic benefits of ALP in East Mamprusi district in Northern Ghana. The specific objectives are to;

1. Identify the various CBA strategies used by ALP to increase the capacity of households and communities and the benefits involved.
2. Examine households and communities economic benefits obtained from ALP.
3. Examine households and communities social benefits obtained from ALP.
4. Identify and describe the challenges and the sustainability of ALP in East Mamprusi district.

1.5 Rational

Most communities in Ghana are becoming more and more vulnerable to impacts of climate change and variability due their poor adaptive capacities. Again, as different adaptation interventions are not proving to be effective in building resilience of vulnerable communities, the

need for an adaptation option that can effectively produce a “win-win” situation (thus increase resilience and produce socio-economic results) would be necessary. A “win-win” option which makes room for a simultaneous achievement of efficient adaptation and development goals at the local level will be a key option to consider. One way of addressing climate change impacts at the community level is to strengthen local adaptive capacity for communities to adjust, moderate or take advantage of climate-induced changes in their settings (Robledo et al., 2012). Community-based Adaptation (CBA) serves as that adaptation option which can create such a unique and sustainable developmental pathway by empowering local communities to achieve relevant socio-economic outcomes such as poverty reduction, food security, improvement in health and education including gender equality.

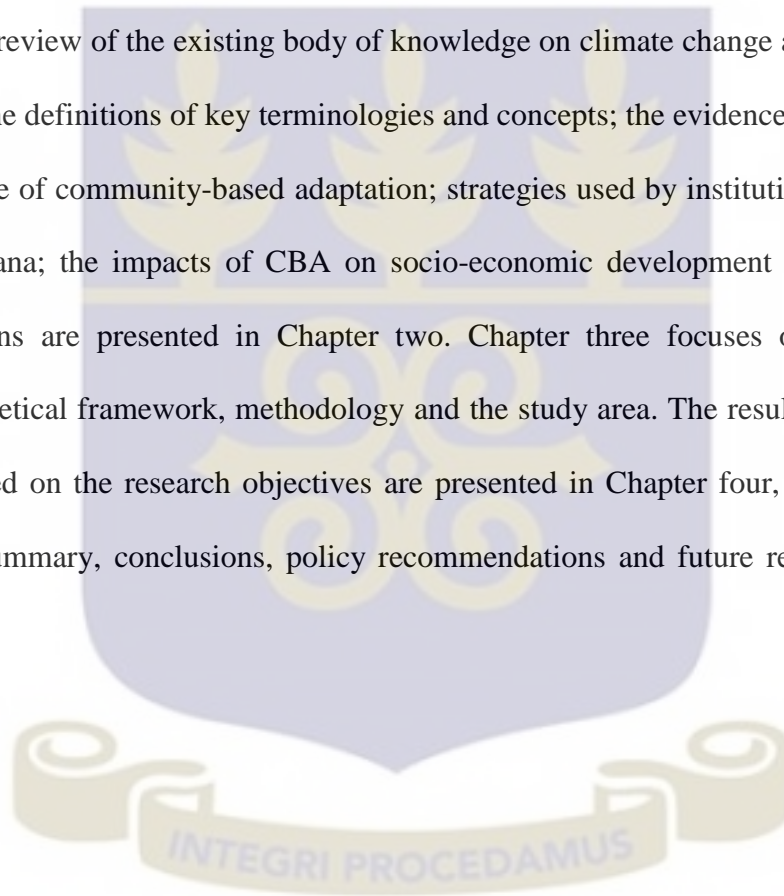
CBA has been described as an adaptation that operates at the community level and is based on community priorities, needs, knowledge and capabilities (Spires et al., 2014). CBA requires an integrated approach that combines traditional knowledge with innovative strategies that do not only address current vulnerabilities, but also build the resilience of people to face new and dynamic challenges (Care, 2010). This adaptation could either be autonomous usually traditional or planned also usually external interventions. Both are necessary for sustainable adaptation. However, it is worth to acknowledge that, as the scale of impacts of climate change escalate over time, it is unlikely that vulnerable communities will be able to adapt on their own and some external or planned adaptation assistance will be essential (Spires et al., 2013).

This research is expected to aid development partners to consider CBA as a key component when planning, designing and addressing climate-related vulnerabilities at the grass root level. Again it is expected to contribute immensely to knowledge on CBA as an adaptation option for development. This study will also provide facts findings for CBA advocacy at local, national and

international adaptation forums. Furthermore this research should inform policy makers in drafting appropriate policy in tackling specific socio-economic challenges such as poverty, food insecurity, education and health problems and gender inequality at the local and national level.

1.6 Organization of the study

This study is presented in five chapters. Chapter one will focus on the general introduction of the study including the problem statement, research questions, objectives and the rationale for the study. Extensive review of the existing body of knowledge on climate change and variability and CBA including the definitions of key terminologies and concepts; the evidence of climate change in Ghana; the role of community-based adaptation; strategies used by institutions in CBA; CBA initiatives in Ghana; the impacts of CBA on socio-economic development and limitations of CBA interventions are presented in Chapter two. Chapter three focuses on the conceptual framework, theoretical framework, methodology and the study area. The results and discussions of the study based on the research objectives are presented in Chapter four, with Chapter five containing the summary, conclusions, policy recommendations and future research suggestion areas.



CHATER TWO

THEORETICAL PERSPECTIVES AND LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of relevant literature. This includes definitions of key terminologies and concepts; the evidence of climate change in Ghana; the role of community-based adaptation; strategies used by institutions in CBA; the impacts of CBA on socio-economic development; limitations or challenges of CBA; interventions CBA initiatives in Ghana; the conceptual framework used for the study and the theoretical framework for analysis.

2.2 Definition of terms and concepts

2.2.1 Climate Change

Climate change has been defined differently by major concerned organizations and these definitions appear to differ but are consistent with each other. Climate change as defined by the International Panel on Climate Change (IPCC) suggests that the phenomenon occurs as a result of the “change in climate over time, whether due to natural variability or as a result of human activity”. These changes as the IPCC noted can be identified using statistical data to observe the mean of properties such as temperature and rainfall over decades or a longer time (IPCC, 2007).

Deferring in definition to the IPCC is the interpretation the United Nations Framework Convention on Climate Change gives to the phenomenon. According to the UNFCCC, climate change refers to “a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods” (UNFCCC, 2007). Both definitions agree that climate change occurs over time but the IPCC specifies the actual range for a variability to be classified as climate change, which they emphasized as a decade or longer. On the other hand, UNFCCC appears to attribute the causes of climate change entirely on human activities whilst

the IPCC seems to share the causes on both human activities and natural phenomenon. Both definitions are consistent with the definition provided by the United Nations Environmental Programme (UNEP) which also supports the long term nature but also emphasizes on the mean levels or variability. “Climate change may be due to natural internal processes or external forcing or to persistent anthropogenic changes in the composition of the atmosphere or in land use” (UNEP, 2009).

2.2.2 Climate Variability

The usage of climate variability as recognized by all the major scientific bodies in the definition of climate change suggests that both phenomena are simultaneous events and largely agreed upon. Variability includes more than individual weather events and may result from natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forces (external variability) (UNFCCC, 2011; IPCC, 2007; UNEP, 2009).

According to Lambrou and Nelson (2010), “Climate variability refers to variations in the mean state of the climate and variations in other statistics (such as the occurrence of extremes) on all temporal and spatial scales beyond that of individual weather events. The average range of temperature for a location, as indicated by minimum and maximum temperature values, is an example of a measure of climate variability. Their view on climate variability is in line with what Dinse (2011) described as the year to year fluctuations of climate events such as temperature and precipitation based on data from a specific region or area of interest.

Although this study will not distinguish between climate change and climate variability, it will emphasize how both climatic phenomena have contributed to the vulnerability of communities and how communities are adapting to these changes through the community-based adaptation

process. In general, climate variability is the short term observed mean changes in temperature and precipitation that occurs within the long term changes and are usually on year to year bases.

2.2.3 Climate change adaptation

The meaning of adaptation in the context of climate change has been expressed in different terms although they carry the same understanding. Smit et al., (2001) defined adaptation as “adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts”. This adjustment must affect practices, process and structures in order to reduce the expected impacts of climate change and at the same time leverage on the advantages climatic changes present (Smit et al., 2001). Since the impacts of climate change cuts across wide range of systems and not just ecological, social and economic systems, the need to broaden the scope of the definition was necessary.

Improvement upon Smit et al., (2001) definition was put forward by the IPCC which expresses climate change adaption as “adjustments in human and natural systems in response to actual or expected climatic variation, with a view to moderating harm or exploiting beneficial opportunities” (IPCC 2007). This definition by the IPCC has been widely acknowledged and accepted by wide range of scientific bodies although the UNFCCC has recognized the definition by Smit el al., (2001). The need to recognize a wide range of systems in the adaption process (human and natural systems) opens the IPCC definition to fit all kinds of systems not just ecological, social and economic systems as put forward by Smit et al., (2001). This probably explains why a wide range of stakeholders and scientific bodies have endorsed the IPCC’s definition on the subject. The need to also adjust to the actual or expected changes by being proactive and taking advantage of the opportunities that comes with these changes is key in the definition of the term (USEPA, 2014; EUCA, 2015; IPCC, 2007; UNFCCC, 2007; Smit et al.,

2001). This idea expresses how adaptation is not just damage control or prevention but an ability to capitalize on the opportunities it presents by building human and natural systems. Prutsch et al., (2010) emphasize that given the variety of meanings and interpretations for adaptation by different stakeholders, there is the need for a general support on the way adaptation action in itself can be carried out.

Various types of adaptation have been identified. These include anticipatory and reactive; private and public; and autonomous and planned adaptations (UNEP, 2009). For anticipatory adaptation which is also known as proactive adaptation, the systems adjust before the impacts of climate change and variability are observed (IISD, 2003; IPCC, 2007). When the adjustment is made just at the onset of the climatic impacts, then it is termed reactive adaptation (IISD, 2003). Autonomous or spontaneous adaptation is not a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems; on the other hand, planned adaptation is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state (IPCC, 2007). Thus the difference between autonomous and planned adaptation is that, while the former is not planned and deliberate, the latter is.

2.2.4 Community-Based Adaptation

According to Reid et al., (2009), interventions only focusing on climate related hazards may not necessarily address the needs and priorities of vulnerable communities which are being impacted the most by the effects of climate change. This view is in line with what Ebi and Semenza (2008) proposed that there should be a broader context in tackling climate change especially in local communities and there are societal, cultural, environmental, political, and economic contexts that

increase vulnerability. Adding to this, they explained that community-based adaptation has the potential to increase resilience to climate stressors and at the same time empower local communities to cope with a wide range of societal issues.

Hud and Reid (2007) emphasized that community-based adaptation is a new layer of addition by governments and organizations to bring developments to local communities through on-the-ground practice, institutional research and governmental policies. This process to them begins with the identification of vulnerable societies in the developing world who are largely prone to the effects of climate change such as floods, shocks and droughts due to their over reliance on the natural resources. Lasage et al., (2008), support this view by proposing that the identification of climate extremes (floods and droughts) within local communities should be quantified and then appropriate adaptive measures should be developed to meet this current vulnerability.

By definition, community-based adaptation has been considered by many institutions and authors in different ways. Dodman and Mitlin (2011) described community-based adaptation on the premise that “local communities have the skills, experience, local knowledge and networks to undertake locally appropriate activities that increase resilience and reduce vulnerability to a range of factors including climate change”. According to Reid et al., (2009), not just the skills, experience, local knowledge and networks are important in defining community-based adaptation; the priorities and needs of local communities should also be considered. Reid, et al., (2009) stated that “community-based adaptation to climate change is a community-led process, based on communities’ needs, priorities, knowledge and capacities which should empower people to plan for and cope with the impacts of climate change”.

The earlier definition is supported by CARE International’s position on understanding the concept of community-based adaptation, where the adaptation process covers other development

perspectives than only climate change as expressed by Reid et al., (2009). CARE (2010) view point states that, “effective community-based adaptation require an integrated approach that combines traditional knowledge with innovative strategies that not only address current vulnerabilities, but also build the resilience of people to face new and dynamic challenges”. According to Baas and Ramasamy (2008), this integrated approached is necessary in the community-based adaptation process where considerable knowledge and experiences from local actors are tailored with science based climate predictions. This will enable science models to connect with local realities and give a better understanding to the communities in other to meet their needs and provide feedbacks for the application value of their research.

This research sought to identify the cross sectional implications of community-based adaptation and the extent to which existing intervention has been able to address socio-economic problems in East Mamprusi District

2.3 The evidence of climate change and variability and its impacts in Ghana

The global evidence of climate change as expressed by the IPCC (2007) states emphatically that “warming of the climate system is unequivocal, as it is now evident from observation of increases in global average air and ocean temperatures, wide spread melting of snow and ice and rising global average sea level”. Sub-Saharan Africa is noted to be one of the most vulnerable societies in relation to the impacts of climate change according to regional assessments (Müller-Kuckelberg, 2012). Ghana like most sub-Saharan Africa is very vulnerable to climate change and climate vulnerability. In reference to the historic climatic data, there has been an increase in average temperature about 1°C in a 30 year period with increased evaporation, reduced and variable rainfall pattern, and frequent drought spells (Kankam-Yeboah et al., 2010). The World Bank (2010b) after analyzing the rainfall pattern within and between years concluded that annual

rainfall in Ghana is highly variable. Based on historical data, rainfall was mostly high in the 1960s but decreased to low levels in the latter part of 1970s and early 1980s. When plotted on a graph, a general decreasing trend is observed between 1960 and 2006, with an average decrease of 2.3 millimeters per annum (reference).

Based on available evidence and climate models, dry season mean temperatures are projected to rise by about 1.5 to 2.0 degrees Celsius to about 3 degrees Celsius by 2080 within most ecological zones in Ghana (Stanturf et al., 2011). In an earlier claim by EPA (2008), it was reported that there has been an annual average temperature rise in five out of the six ecological zones over the past 40 years (1960-2000) and that this increasing trend is expected to continue over time. Furthermore, the highest temperature increases is projected to be in the Northern, Upper East, and Upper West regions, while the lowest will be in the Brong Ahafo region. For example, under one of the climate scenarios (Ghana Dry), temperatures in the three regions of the north are expected to rise by 2.1–2.4 °C by 2050. In comparison, the predicted rise in the Ashanti, Western, Eastern, Central, and Volta regions will be 1.7–2.0°C, and the rise in the Brong Ahafo region will be 1.3–1.6 °C (World Bank, 2010b). As sea surface temperatures in Ghana are expected to increase with time, sea-level rise is also projected to rise by from 0.13-0.60 meters by the late 21st century (Stanturf, et al., 2011; Kankam-Yeboah et al., 2010).

This evidence reflects how Ghana like any other sub-Saharan country is expected to suffer the impacts or the consequences of climate change due to the over dependency of its economy on the natural system especially on rain-fed agriculture (Asafu-Adjaye, 2014).

Although all regions are expected to be impacted by climate change, northern Ghana is reportedly one of the most affected areas in terms of climate hazards as reported by many authors. Stanturf, et al., (2011) reported that between 1991 and 2008, six major floods were

recorded which affected not less than 2 million people in the country and in 2007, floods followed a period of severe drought which also affected over 325,000 people in the northern savanna. According to Kankam-Yeboah et al., (2010) the floods which occurred in the three northern regions of Ghana; the Upper East, Upper West and the Northern region caused the death of 56 people out of the 332,600 affected people.

In a UNDP (2010) report on climate change and health impacts in Ghana, it was indicated that there could be a considerable strain on health delivery systems in the country when dangerous projected temperature threshold is reached especially for the three northern regions. This is expected to have implications on cold chain for drugs, blood supply and vaccination, which are important parts of the national health system. According to FAO (2011), food security issues under climate change will impact vulnerable people in many ways depending on their gender, age, health and education. For instance, World Bank (2010a) reported that climate change will deepen gender inequalities and women are often victims of rights, responsibilities and voice especially women in Northern Ghana as they lack access and control over economic resources most especially land.

2.4 The role of institutions in Community-based adaptation

The impacts of climate change on vulnerable communities will require active adaptation measures which will demand internal and external institutional collaboration. According to Bose (2011), the role of adaptation should not be the sole responsibility of vulnerable communities but a concern to those who are responsible for causing the vulnerability. The sharing of responsibility in adaptation can only be done in a collaborative effort by both local communities and the external institutions through effective participation. Bryan et al., (2013) confirm this collaborative effort for community adaptation by stating that “effective collective action requires

that external agencies recognize the right of communities to organize, and that local organizations are “nested” within other vertical and horizontal governance institutions”. These institutional and governance structural linkages have been proven to be vital for success in the community-based adaptation process (Bryan et al., 2013). These supporting institutional and governance structures should also be framed in the existing policies, laws, rules, regulations, programs, and mandates, provided the adaptation strategy is not meant to review the existing laws or process (Amaru and Chetri, 2013).

In community-based adaptation, it has been recognized that external actors, including non-governmental organizations and international agencies play a crucial role in the success of community adaptation (Gogoi et al., 2014; Dumar, 2010). The role these external actors play are usually noticed in the provision of capacity training, funding, inputs and other adaptation support with the aim of reducing the burden local communities have to deal with in coping with the impacts of climate change (Allen, 2006; Bryan et al., 2013).

Again, local communities are also responsible for a full group participation in making decisions and setting out the rules and conditions for the adaptation process. At this point, the extent to which the priorities, interest and the needs of all members of the communities are incorporated in dependent on the efforts of the local power structure (Bryan et al., 2013; Practical Action, 2010). Reid et al., (2010), also accounts of the conflict which usually occurs between institutions and local communities where local people expect external institutions to be facilitators and co-learners and not teachers and experts which is usually observed in their dominant professional behavior and institutional design. This conflict in their view can be resolved for an effective collaboration in the way funding is given to local communities. They argue that the challenges of climate change as reported by developing nations is emanating from developed nations and as

such adaptation support such as funding should be used as developing nations seem fit to address these challenges and that such support should be long term and stable than support given for development work which is usually bound to conditions and priorities of the developed nations. This has the ability to provide the needed participatory support for effective CBA activities at the community level since communities are allowed to make their own decisions concerning the direction such support should go.

On funding, the International Institute for Environment and Development (2009) reported that many donor organizations have found interest in supporting community-based adaptation. The report revealed that, agencies such as the Food and Agricultural Organization (FAO), United Nations Development Programme (UNDP), World Bank, Department for International Development (DFID) and Swedish International Development Agency (SIDA) all expressed interest in supporting community-based adaptation (IIED, 2009; Dumaru, 2010). For instance, they emphasized that, an organization like the UNDP in partnership with government and non-government organizations including some United Nations agencies have put forward a proposal for a CBA Fund Facility which is expected to offer funding for CBA-type projects better than existing climate change finance mechanism. Furthermore, UNDP found the need to mobilize funds to support CBA related projects carried out by NGOs and community based organizations (CBOs). Reid et al., (2009) warns that, although funding is necessary for effective adaptation, the attempt by external actors to immediately respond to adaptation needs of communities by the use of new and available funds can result in misappropriation and abuse of these funds.

This study will explore whether the strategies used in community-based adaptation in the study area were collaborative and participatory and the specific role the local community and institutions played to ensure effective adaptation process.

2.5 Strategies used by institutions in community-based adaptation.

Various institutions have proposed different ways of implementing community-based adaptation programmes and project at different local context. Generally community-based adaptation approaches are characterized by placing emphasis on the use of both hard and soft adaptation options, the need to act locally but in line with regional and national strategies, making adaptation a lifestyle at the local level through participation and stressing on the need for both short-run and long term adaptive capacity (Vardakoulias and Nicholles, 2014).

According to Paudel et al., (2013) on practical evidence of community-based adaptation planning (CAP) in Nepal, institutions and stakeholder collaboration adopted diverse participatory tools which will ensure vulnerability assessment, explore adaptation options and plan for activity implementation. This was to enable stakeholders to explore sources of funding in other to implement the tools. The participatory tools adopted included timeline preparation for disaster events, mapping of community resources, a seasonal calendar development, key hazards and their impact identification, livelihood analysis options and disaster vulnerability matrix.

The structure of this adaptation strategy is quite different from what Practical Action (2010) proposed. They proposed that, community based adaptation should have it basis from a National stakeholder forum where all stakeholders including international, national and local organizations are brought together to formulate and review national adaptation plans on an ongoing basis. A bottom-up participatory planning done by NGOs and CBOs would be necessary to serve as a linkage between the national forum and the local communities. For a participatory decision to be implemented and available funds to be appropriately used, the need for a monitoring and accountability mechanism should be put in place by the national forum. This should enable results from monitoring adaptation planning to reach the national forum for

accountability. The implementation stage is the final stage where local institutions work with local communities by building their capacity to reduce their vulnerability to hazard and increase their resilience.

The FAO community-based adaptation working approach was carried out in Bangladesh over a two-year review and testing period to produce a five-step strategy. This included an assessment of current vulnerability, the future climate risk assessment, the identification and testing of adaptation options, designing location specific adaptation and mainstreaming and up-scaling good adaptation practices. This was an integrated approach expected to manage climatic risk by reducing livelihood vulnerability, especially among women and poor communities that have less capacity to appropriately adapt. This approach also is in line with the general overview of CBA strategy mentioned by Vardakoulias and Nicholles (2014).

Gogoi et al., (2014), also elaborated on the five point framework used by Africa Climate Change Resilience Alliance (ACCRA), a network of four NGOs who have partnered in research working in Ethiopia, Uganda and Mozambique. ACCRA framework for community-based adaptation breaks adaptive capacity into five main characteristics including; access to and availability of assets, institutions and entitlements, knowledge and information, innovation, and flexible forward-looking decision-making (Gogoi et al., 2014). This approach unlike the others does not directly touch on vulnerability assessment of current and future climate risk but put more emphasis on how to increase adaptive capacity to reduce community and household vulnerabilities.

According to CARE (2013), CBA is a way to ensure effective adaptation and resilience through strategies that address specific vulnerability needs of local communities. Seven main strategies or approaches are used by CARE International to achieve the desired CBA goals. These

strategies include; vulnerability assessment through a participatory approach that includes vulnerable and marginalized groups such as women and children. The creation of a climate information system that is accessible to most vulnerable groups in order for an appropriate decision to be taken. The adaptive capacity of vulnerable communities is strengthened to enable already existing and flexible adaptation to take place. The integration of adaptation into the overall community development strategy and sector planning, disaster risk management and early warning systems. An enabling environment for policy and investment through effective monitoring and evidence, with reference to new timescales and the localized nature of climate change. Emergency responses to disaster risk reduction and development, through capacity building, coordination and coherence. Lastly, CBA approaches including financing are mainstreamed into national planning and relevant sectors to achieve a long term adaptation and resilience goal.

Community based adaptation strategies as according to Bryan and Behrman (2013), can be classified by their type or function and their timing. Tables 2.1 and 2.2 show the various categories of CBA classifications from literature;

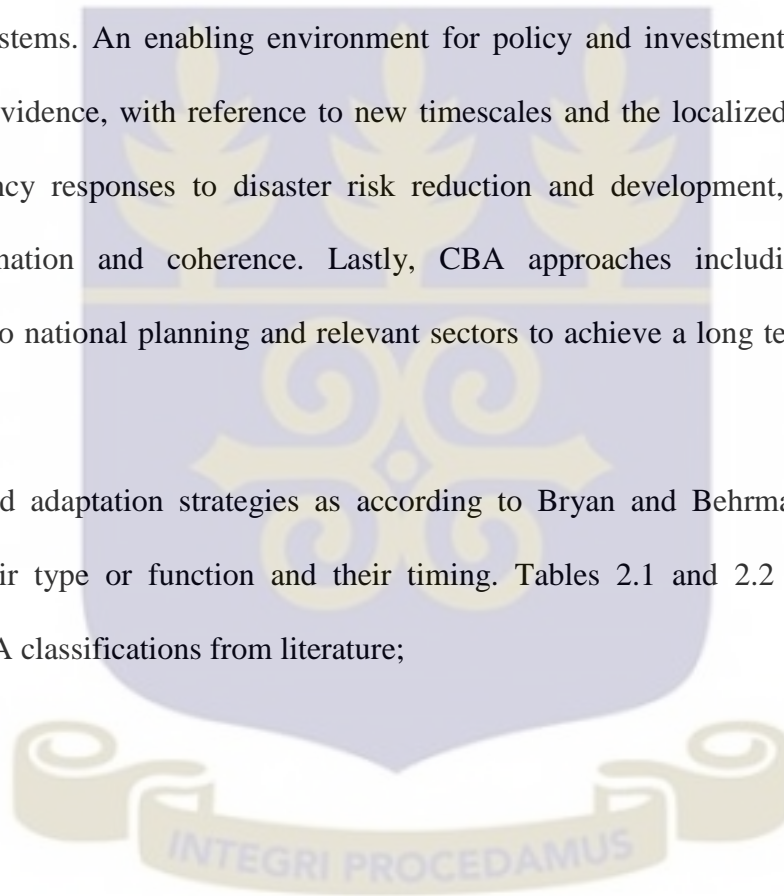


Table 2.1: Community-based adaptation strategies according to type/function

Form/Type	Function	Examples
Mobility	Pools or avoids risks across space	Migration or relocation of animals Wage-labour migration
Storage	Pools or reduces risks over time	Water storage Food storage (crops, seeds, products) Asset accumulation (livestock)
Diversification	Reduces risks across assets/livelihood sources	Asset diversification Livelihood diversification Skills and occupational training
Communal pooling	Pools risks across households	Infrastructure development Information gathering and dissemination Disaster risk management
Exchange	Reduces risk through access to markets	Group-based weather insurance Group-based credit facilities Improved market access Input purchases

Source: Agrawal and Perrin (2008) as seen in Bryan and Behrman (2013).

Table 2.2: Community-based adaptation strategies according to their timing

Form/Type	Function	Examples
Ex-ante	Risk prevention strategies (reduction of exposure or sensitivity)	Investments to protect and enhance community assets Investments in physical and social infrastructure Investments in human capital (education, literacy, training) Building social capital Rights and security
	Risk mitigation strategies (or compensation)	Group-based insurance schemes Group credit or saving mechanisms Collective storage facilities (e.g. food, seed) Collective livelihood diversification schemes (e.g. income-generating activities) Local weather monitoring, information gathering and sharing
Ex-post	Ex-post coping strategies	Depleting community assets Receiving external aid (e.g. food aid, emergency relief) Migration of animals

Source: Heltberg Siegel, and Jorgensen (2009) as seen in Bryan and Behrman (2013).

This study will focus on the CARE International CBA approach and identify the specific adaptation strategies that were employed in the various vulnerable communities. The study will

also explore which of the strategies yielded the maximum results and which ones could not fit into the local context.

2.6 Impact of community-based adaptation on socio-economic development

Every adaptation programme or project is expected to add value to vulnerable communities where they are being practiced. The UNFCCC (2007) in recognizing the need to integrate adaptations into national development resolved; “The parties have a right to, and should, promote sustainable development. Policies and measures to protect the climate system against human-induced change should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change”. The cross-cutting nature of climate change demands a consideration and integration into development project designs especially for health, agriculture and poverty reduction programmes (CHF, 2011; Reid et al., 2009).

Since development projects as a whole do not necessarily address climate change impacts, Bryan and Behrman (2013) suggest that adaptation should be concentrated in vulnerable and less developed communities where such efforts would be magnified than areas where climate change impacts are minimal and adaptation efforts would be of a less importance. Reid et al., (2009) argue that CBA and developments projects usually resemble and that it is difficult to notice the additional adaptation components which distinguish them. For example, water storage projects in drought years initiated by a community is difficult to be distinguished whether it was done to deal with the normal climate variability or initiated as a results of the impacts of climate change. The sub-sections below are review of literature on the impacts of climate change and the role of CBA on socio-economic development such as poverty reduction, food security, and improvement in health care, education and gender integration.

2.6.1 Community-based adaptation and poverty reduction

According to IPCC (2014), projections show that climate change impact will retard economic growth, create additional poverty traps and make efforts to eradicate poverty very difficult. Climate Change impact is again expected to exacerbate poverty especially in the poorest countries and groups with dangerous risk (IPCC, 2014; Banuri and Opschoor, 2007). In addition, Baas and Ramasamy (2008) also affirm how risky investments to reduce poverty in high risk areas will be due to regular hazard impacts. In another view point, Wlokas et al., (2012) suggested that the attempts by developing countries to reduce climate change and improve socio-economic development simultaneously creates a dual challenge, where economic development is associated with poverty and inequality reduction but development process also means increasing greenhouse gas emissions which cause climate change.

In sub-Saharan Africa where 80% of the poor wholly depend on agriculture, climate change is expected to have significant impact on the sector by deepening poverty in the region. Calzadilla et al., (2009) suggested that, the pathway out of poverty is linked to the improvements in agricultural productivity. As poverty is recognized as both a condition and a determinant of vulnerability, Tanner and Mitchell (2008) argue that, the individual and community reduction to the impacts of climate change is directly or indirectly associated with poverty reduction. Nelson and Agbey (2005) also demonstrated in their technical paper that, a deep understanding into climate change/variability is crucial for poverty reduction and that the attainment of national and global poverty reduction goals cannot be realized unless climate change is mainstreamed into poverty reduction programmes and national development as a whole.

In reference to the role community-based adaptation play in poverty reduction, International Development Research Centre argues that, the reduction of poverty in communities is feasible

through participatory processes that promote ownership and contribution by local people, engages local institutions and integrate adaptation into policy framework (IDRC, 2011). According to Reid et al., (2009), any effective CBA should consider poverty reduction and livelihood benefits as part of its core process. For example, CARE International framework for community-based adaptation at the national level considers the need to build resilient livelihoods by integrating climate change or variability issues into poverty reduction strategies and policies and this is crucial for poverty reduction strategies to be considered sustainable (CARE, 2010). From the Canadian Hunger Fund (2011), “Climate Change Adaptation interventions can be transformative in communities for their capacity to secure sustainable incomes for families and foster food security. In this respect investments in adaptation do not just protect previous development investments, but also lead to income generation. This gives people the resources to lead lives out of poverty”.

2.6.2 Community-based adaptation and food security

According to the IPCC (2007), more extreme climate events as a result of climate change will compromise crops, food security, shelter and livelihoods. In a more recent report by IPCC (2014), there is a high confidence that, poorer populations including those in the rural setting are to experience a breakdown of food system as a result of climate hazards thereby increasing food insecurity. For instance, climate change predictions for Africa indicates that, the length of growing season especially in the arid and semi-arid regions will decrease and by the year 2020 rain-fed agriculture could also be reduced by 50% negatively affecting food security and increasing malnutrition on the continent (IPCC, 2007; Reid et al., 2008). Adding to this, Girot et al., (2012) commented on the fact that climate change will present a challenging situation to the

traditional coping mechanism and thereby increasing the vulnerability of the poor to food insecurity and famine.

The High Level Panel of Experts (HLPE) on food security recommended that the policies and programmes designed by organizations to tackle climate change should not be independent but complementary to the policies and programmes expected to increase food security and that interventions to increase food systems should also consider climate change as a factor in the design (HLPE, 2012). The World Bank (2008) points out that there is an opportunity to capitalize on the global food crisis to ensure sustainable food production and effectively manage climate crisis. In support, Kreft et al., (2010), emphasized that prioritizing projects and activities that promote food security such as climate resilient agriculture would be necessary since they have double benefit. The Canadian Hunger Fund (2011) recommends that climate adaptation investments should be able to help farmer households to strengthen economic stability and maintain access to food, thereby yielding a double dividend. An example of such dividend was reviewed in a paper by Simane and Zaitchik (2014), where community-based organizations pursuing CBA interventions in Blue Nile Highlands of Ethiopia integrated land management to address different challenges including food security. Some adaptation practitioners suggest that, the provision of superior approach rather than given food in the face of climate change will result in building a long-term resilience and improvement in agriculture (Amaru and Chetri, 2013). Care International recognizes food and seed banks as a disaster risk reduction strategy that could support vulnerable communities out of food insecurity (CARE, 2010).

2.6.3 Community-based adaptation and health care

Climate change is expected to exacerbate the existing health challenges with the highest impact felt at regions that are currently affected by climate related diseases (IPCC, 2014). According to

Poutiainen et al., (2013), extreme events such as floods, heat waves and storms will increase as a result of temperature and precipitation change. Again, the distribution, survival and increase of pathogens and disease vectors (mosquito and tick) should be expected as a result of increased temperatures. Indigenous and rural communities with less capacity and resources to adapt are already disadvantaged in terms of socio-economic distribution and climate change has the potential to increase these inequities with unequal health outcomes (Bell et al., 2013; Lesnikowski et al., 2013).

Since climate change is considered to be one of the most critical public health threat in the 21st century (Poutiainen et al., 2013), finding an appropriate adaptation measure to the threat will also be one of the most important policy challenge for stakeholders in this century (Lesnikowski et al., 2013; Huang et al., 2011). In a view point expressed by Kwiatkowski (2011), the climate related health problem in vulnerable communities cannot be addressed by a single approach or modern scientific knowledge alone but through a collaborative effort at all levels by different stakeholders including government, non-governmental organizations, academia and the local people themselves. The engagement of stakeholders in the community-based adaptation process including the design, implementation and monitoring is necessary because the strategies to reduce climate health vulnerability is directly linked with specific population and regional or local vulnerability (Ebi and Semenza, 2008). According to Huang et al., (2011), to address climate health related impacts, there is the need to consider a different mix of policies and strategies for adaptation at all levels. They further stated that “public health adaptation also can be undertaken as part of broader social and development initiatives, rather than actions to address the health risks only. It is important to integrate planned adaptations into existing health promotion and protection activities to reduce the health risks posed by climate change”.

For an effective integration to be achieved, Kwiatkowski (2011) noted that participation should be used to engage communities in drawing out the policies, programmes or the project in order to achieve a fair balance between what practitioners want to do and the needs (quality of life and well-being) of the communities.

2.6.4 Community-based adaptation and child Education

Climate change is expected to have negative impact on livelihoods including development goals relating to education (UNICEF, 2007). One of the most vulnerable groups to be hardest hit by climate change and its impact on education are children (UNICEF, 2011; Mitchell and Borchard, 2015). Climate related disasters have forced many children out of school and some have also become child laborers out of necessity or as a form of coping mechanism particularly boys (Nenova-Knight, 2011; Percy and Otzelberger, 2011). On the contrary, a UNDP (2010) report indicates that girls in developing countries are more vulnerable to the impacts of climate change since they are likely to drop out of school first as a result of lack of resources. There are also reported low enrollment figures for girls in schools as a secondary effect since they have to spend hours looking for water. On the other hand, UNICEF (2011) added that climate hazards including floods and heavy rainfall are likely to affect infrastructures such as bridges and roads that reach schools and can lead to absenteeism. Again possible food shortages can lead to malnutrition which can also have impact on students' academic performance. Diseases such as malaria which may increase in some regions can also affect school attendance and as such impede children's education.

In order to effectively tackle the impacts of climate change on education, there is the need to integrate child-centered adaptation strategies into the educational structures and also engage all channels of the educational system including formal and informal in the adaptation process

(Mitchell and Borchard, 2015). For instance, the need to include children in the CBA participatory process will be necessary to increase their understanding on climate change impacts and thereby encouraging them to monitor their own level of risk (Nenova-Knight, 2011). In a CBA evaluation report in the Dakora region of Niger, Vardakoulias and Nicholles (2014) indicated a high increase in school attendance in 2013 than in 2010 when the CBA process began in the region.

2.6.5 Community-based adaptation and gender

The increasing threat of climate change is posing a danger to the development gains made in developing countries especially in gender equality (UNDP, 2010). Climate change affects both men and women but with differential impacts. Women are affected the most by the harsh climatic conditions and environmental stresses (Reid et al., 2009). Usually poor women are not given the opportunity to access resources such as land and partake in decisions in the rural settings making them one of the most vulnerable social groups in developing countries (UNDP, 2010; Bose, 2011). Although women are the major food producers globally, the range of women affected by climate change is between 48 percent and 73 percent in sub-Saharan Africa. In recent times, the harsh impact of climate change at the local level is creating an opportunity where communities are appreciating the need for gender equality in development (Gyang, 2012; Percy, 2012). Again, both men and women are taking new roles and responsibilities as well as working together at the local level to cope with climate change impacts (Percy and Otzelberger, 2011).

According to UNDP (2010), there is the need to mainstream gender into all programmes and activities of international agencies due to its cross-cutting nature. Gender mainstreaming as defined by the United Nations Economic and Social Council (UN-ECOSOC) and emphasized by UNDP (2010) “is the process of assessing the implications for women and men of any planned

action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality". For an adaptation process to be called "successful", Wong (2009) suggests that there should be the need to recognize the involvement and contribution of women in the adaptation process. The adaptation learning programme (ALP) of CARE International recognizes the achievement of gender sensitive adaptation along with vulnerability reduction as part of its key characteristics in the CBA process.

2.7 Challenges of implementing Community-based adaptation

Community-based adaptation like any other adaptation intervention has its own challenges. Climate change as a phenomenon is noted to be a key challenge to adaptation in the 21st century (Maru et al., 2014) especially for poorer communities in developing countries (UNFCCC, 2007). Raymond and Robinson (2013) described the challenges to climate adaptation in four categories namely normative, cognitive, institutional structure and governance. They describe normative barriers to adaptation as cultural barriers while the cognitive barrier is an individual perception to adopt or reject a particular adaptation strategy. Institutional and governmental barriers to adaptation are dependent on how communication and participatory structures of the implementing institution or government agency are conducted. Community engagement through participatory process as noted earlier by Ebi and Semenza (2008) remains a key challenge in community-based adaptation as varied view must be considered in the process.

In a similar but broader review on adaptation challenges, Spires et al., (2014), reconsidered the barriers to community-based adaptation in three broad categories including social, resources and physical barriers. They classified normative, cognitive and institutional barriers under social barriers and recognized political and psychological as part of this category. They also considered funds for adaptation, human resource, technical know-how and technology as resource base that can hinder effective adaptation. Physical barriers such as climate change impacts that weaken the ecology of communities pose additional or intensify existing environmental challenges which can also hinder economic diversification and environmental adaptation efforts (Bryan and Behrman, 2013; Rodina-Taylor, 2012) conducted in these vulnerable communities. The prevailing social condition such as poverty and food insecurity in vulnerable communities can also set a tone to challenge community-based adaptation efforts (Baas and Ramasamy, 2008).

Rodina-Taylor et al., (2012), emphasized that the lack of adequate and sufficient climate information about the community in question can mislead practitioners and researchers in the design of an appropriate CBA strategy. Adequate climate information and local models should therefore be key but caution should be taken since complex climate information may be a challenge in itself as information may be too technical for community members to understand and use (Picketts et al., 2012). Lee et al., (2014) indicated that the weak relationships between NGOs, civil society groups and government agencies prevents the partnerships and the flow resources including funding for CBA projects from one institution to the other especially between governing authorities and NGOs. The upscaling of successful CBA interventions remains a challenge to implementing agencies (Lee et al., 2014; Reid et al., 2009). Upscaling for CBA has become a challenge due to inability to integrate successful adaptation into development

plans coupled with the confusion of which institution will be the appropriate vehicle to carry out the upscaling process (Paudel et al., 2013).

2.8 Community-based adaptation initiatives in Ghana

As Ghana has been identified to be vulnerable to the impacts of climate change, many authors have followed the various interventions and initiatives that have been implemented by national, international and non-governmental organizations to help build adaptation capacity and increase resilience against the impacts of climate change.

Würtenberger et al., (2011) in their study on adaptation initiatives in Ghana, mentioned that the first adaptation initiative in the country was started in 1996 known as Netherlands Climate Change Studies Assistance Programme (NCCSAP). The first phase of this project was done with the help of the Environmental protection Agency (EPA) to explore how sectors are vulnerable to climate change and an adaptation strategy that can be designed to counteract the threats of climate change. The second phase which began in 2003 was also named Netherlands Climate Assistance Programme (NCAP) and was tasked to come up with policies that lines up with the Ghana poverty reduction strategy to increase mainstreaming of polices into district and national development plans.

Other adaptation initiatives such as the Climate Change Adaptation and Development Initiative (CC-DARE) were introduced in 2009 as a joint programme between UNDP, UNEP, Environmental protection agency (EPA) and supported by Danish International Development Agency (DANIDA). This initiative was meant to improve the ability of Ghana to reduce barriers and increase opportunities for climate change adaptation to be incorporated into national development planning and decision-making frameworks (Würtenberger et al., 2011; DeVit and Parry, 2011). The Economics of Adaptation to Climate Change (EACC) which was led by the

World Bank had objectives similar to that of the NCCSAP in 1996 in the area of assessing and predicting climate change impact in Ghana. The other addition to this initiative was to estimate the cost involved in adapting to the predicted climate change impacts (Würtenberger et al., 2011; De Vit and Parry, 2011).

All the earlier initiatives were a top-down approach which usually does not address the needs and priorities of vulnerable communities in the country. To address specific vulnerable community needs and priorities through a bottom-up approach, various community-based adaptation initiatives have occurred over the decade. Table 2.3 shows the compilation of completed and ongoing CBA initiatives in Ghana from literature.

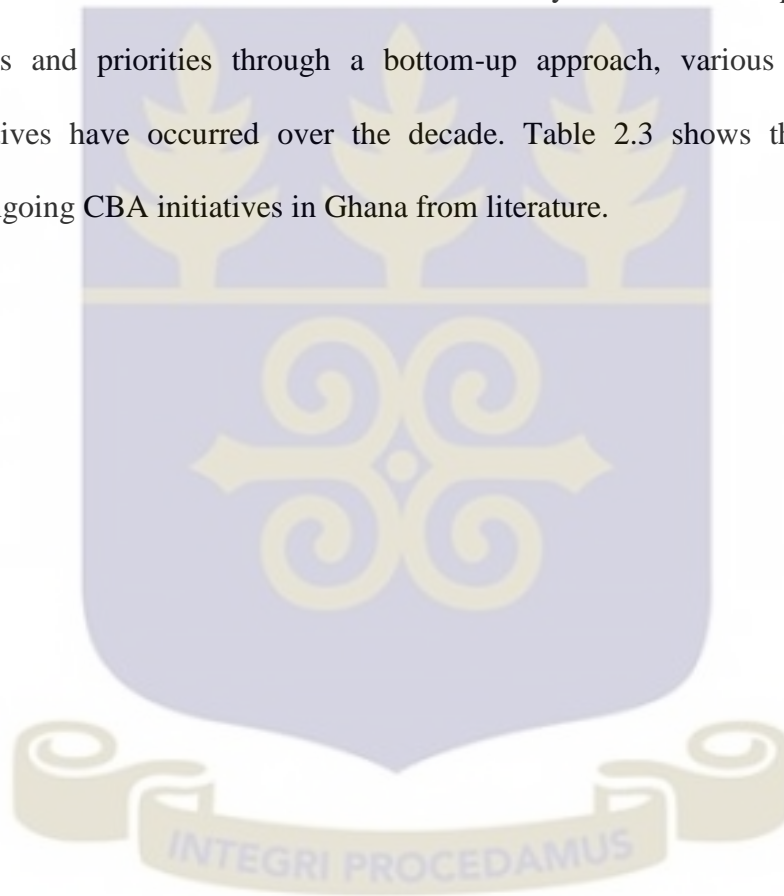


Table 2.3: CBA initiatives in Ghana

CBA Initiatives	Initiators/ Implementers	Duration	Geographic focus	Author(s)
Climate Change Adaptation in the three Northern Regions of Ghana	WRC, DANIDA	Unknown	Upper East, Upper West, and Northern Regions	DeVit and Parry, 2011; Würtenberger et al., 2011
Community Land Use Resources to Climate Change	CARE, Zuuri Organic Vegetable Farmers Association, Presbyterian Agricultural Station (PAS)	2007-2011	Bawku Municipal and East Mamprusi	DeVit and Parry, 2011; CARE, 2009
Promoting Value Chain Approach to Adaptation in Agriculture	GEF, IFAD	2010-?		DeVit and Parry, 2011
Africa Adaptation Program (AAP)	JICA, UNDP	2008–2011	Keta Municipality,	DeVit and Parry, 2011; Würtenberger et al., 2011; Sova et al., 2014; UNDP, 2012
Resilience and the African Smallholder: Enhancing the capacities of communities to adapt to climate change	DFID and IDRC through the CCAA	2007–2011		DeVit and Parry, 2011
Sustainable Climate change adaptation in Northern Ghana	CHF, ACDEP	2009-?	Northern region	CHF, 2011
Adaptation Learning Programme (ALP)	CARE, DFID,	2010-2015	East Mamprusi, Garu-Tempane	CARE, 2013; De Vit and Parry, 2011; Würtenberger et al., 2011

Source: Author's compilation from literature

The Adaptation learning programme (ALP) of which this study is based on was implemented as a five-year pilot project in eight communities within two districts in Northern and Upper West Regions of Ghana. The project worked with local institutions and community members most especially women to increase adaptation capacity of vulnerable households in Garu-Tempene and East Mamprusi districts (ALP, 2013). The objectives of the project were to; develop and apply innovative approaches to community-based adaptation (CBA) to generate best practice models; empower local communities and civil society organizations to have a voice in decision-making on adaptation; promote best practice models for CBA among adaptation practitioners; and influence national, regional and international adaptation policies and plans (De Vit and Parry, 2011; CARE, 2013). This study will assess the socio-economic impact of the ALP in some selected communities in East Mamprusi district.

2.9 Conceptual frameworks on CBA process

Various conceptual frameworks from different agencies and organizations are involved in the community-based adaptation process. CARE International's community-based adaptation framework will be used for the purpose of this study although few frameworks from some organizations will be reviewed.

Practical Action provides a conceptual framework for community-based adaptation governance through national and international stakeholder forum which is made up of academia, government, media and civil society groups (vulnerable groups, faith groups and low income representatives). This stakeholder forum is responsible for the designing, funding, assessing and monitoring of national adaptation plans on a frequent basis by ensuring the recognition of all voices in the adaptation process. Community-based organizations serve as participatory planning facilitators who ensure an effective bottom up approach in the adaptation process. Community-

based organizations communicate the needs and priorities of the communities to the national forum in order for their concerns to be addressed. Again, civil society groups at the national forum are expected to provide opportunities for monitoring and accountability in order to ensure an effective appropriation of funds during the implementation period. The implementation process will have to ensure an integration of both local and expert knowledge in the adaptation process in order to reduce vulnerability to climate extremes and build resilience. This is achieved through capacity building for community members and facilitated by the implementing agencies including NGOs and CBOs. Figure 2.1 shows the conceptual framework for community-based adaptation governance process.

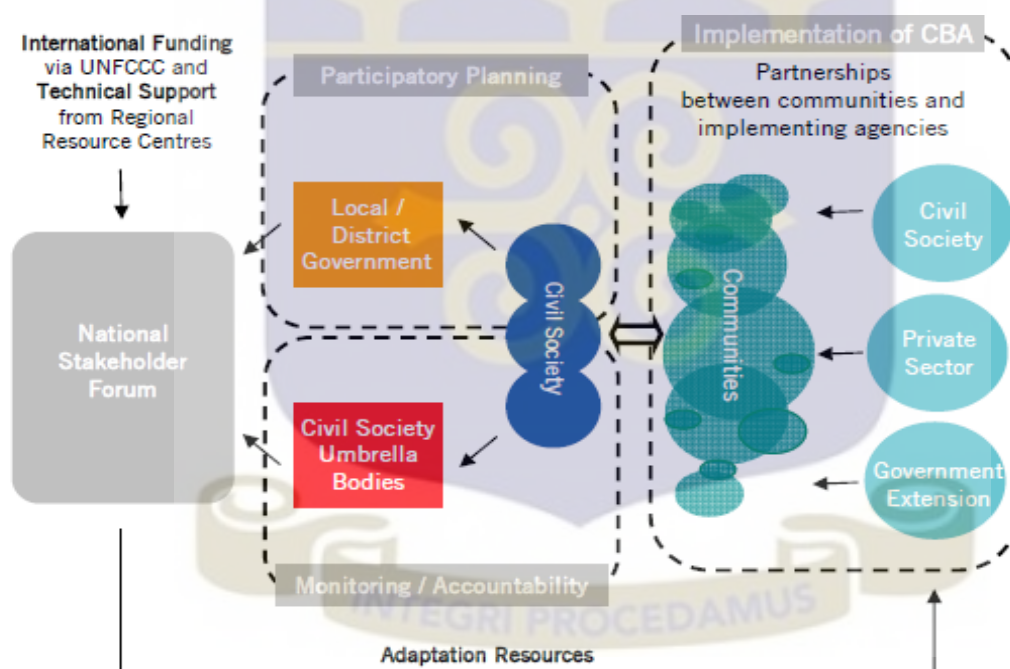


Figure 2.1: Conceptual framework for CBA from Practical Action

Source: Practical Action (2010).

Action Research on Community Adaptation in Bangladesh (ARCAB) developed a long term community based adaptation framework that focuses on achieving a longer term adaptation success by reducing vulnerability and building a more lasting resilience for poor communities.

Whilst the earlier framework is for community-based adaptation governance, this framework is for monitoring and evaluation. From the framework, three interlocking domains would be necessary in building a transformed resilience. Firstly, both scientific and local meaningful and relevant knowledge (K) would be needed to build needed adaptation options. Secondly, there should be an opportunity to turn knowledge in practice through capacity (C) building. This may include giving individuals and institutions the opportunity to have access to resources, power, skill and finances to enable them adapt effectively to climate hazards. Lastly, changes in practice (P) will be expected as a result of knowledge and capacity given to people. This may be through a “shift towards a more integrated, long-term, flexible, strategic and participatory way of development planning” (Reid et al., 2013). The Figure 2.2 shows the conceptual framework for community-based adaptation monitoring and evaluation process.

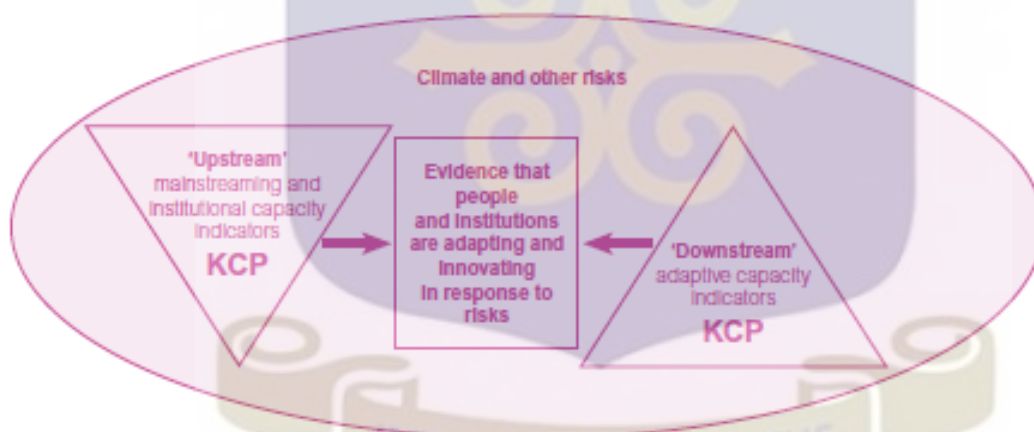


Figure 2.2: Conceptual framework for CBA from Action Research on Community Adaptation in Bangladesh (ARCAB).

Source: Brookes et al., (2011) as seen in Reid et al., (2013).

According to Gubbels (2013) in a conference report on community based adaptation in West Africa, the CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS) has also developed an adaptation framework which is used in their community-based

adaptation activities in Africa. Differing from the previously discussed frameworks, this framework is strategy based and the main focus is to develop the adaptive capacity of farmers and organizations in order to increase their livelihood opportunities, food security and environmental health. The framework for CCAFS community-based adaptation was developed in collaboration with vulnerable communities and community based organizations to produce “climate smart villages”. This framework includes components such as weather insurance, climate services, designed diversification, community management of resources, capacity building, and climate mitigation. The Figure 2.3 shows the CCAFS framework on CBA.

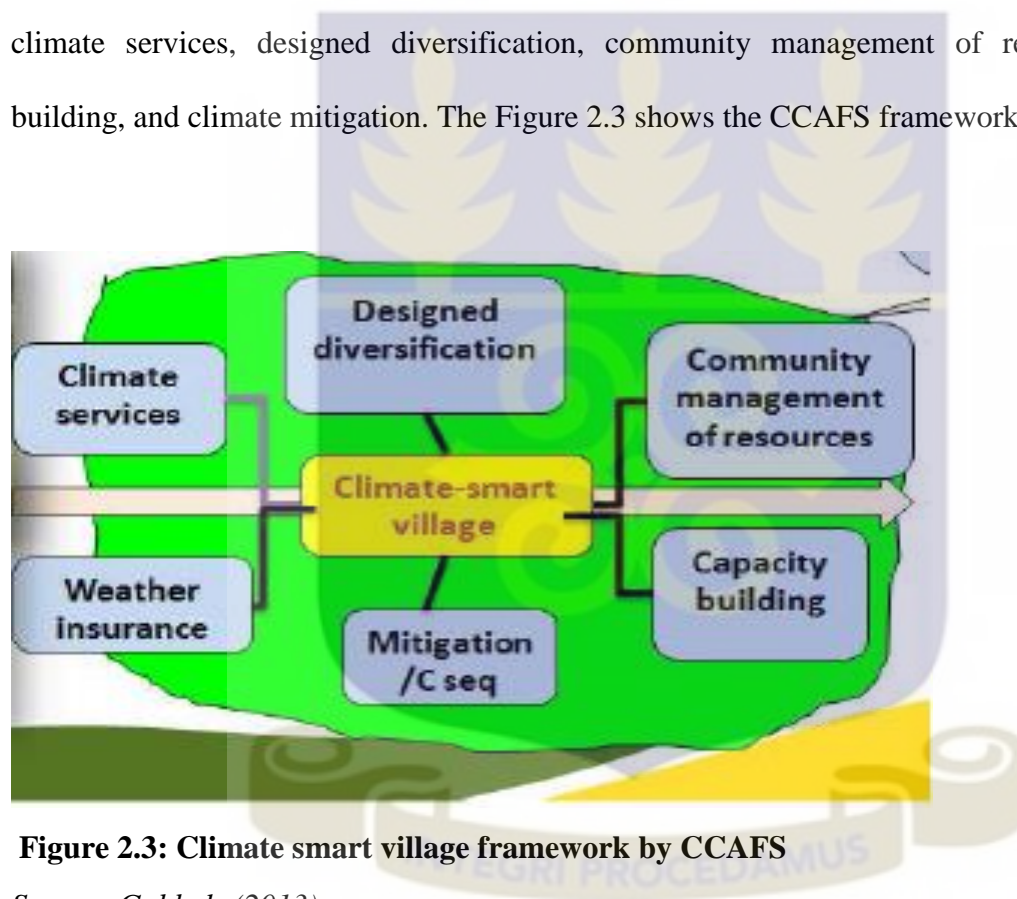


Figure 2.3: Climate smart village framework by CCAFS

Source: Gubbels (2013)

Beside the climate smart village framework, CCAFS adds other components to the CBA approach to make it more integrated. These other components include focusing on women farmers, scaling up climate information services and the farm of the future approach.

CARE International’s adaptation learning programme (ALP) has developed a CBA framework that is more integrating and holistic. Its focuses on building inter linkage relationship between four major components for an effective CBA. This framework was developed considering various livelihood frameworks such as sustainable adaptation framework and gender and diversity framework. The four components considered by the ALP framework includes: a) the promotion of livelihood climate-resilience strategies such as diversification of land use and incomes, b) disaster risk reduction strategies where vulnerable households are able to reduce the impacts of climate-related natural disasters, c) local adaptive and organizational capacity are strengthened, d) addressing the underlying causes of vulnerability including poor governance, gender-based inequality or the limited access to basic services where local and national empowerment and advocacy influence the policy and enabling environment to better support communities in adaptation efforts. Planning adaptation programmes and actions in all of these components is informed by climate knowledge and risks - in addition to the range of information on local context and conditions, underlying causes of vulnerability and the enabling environment (CARE, 2015).

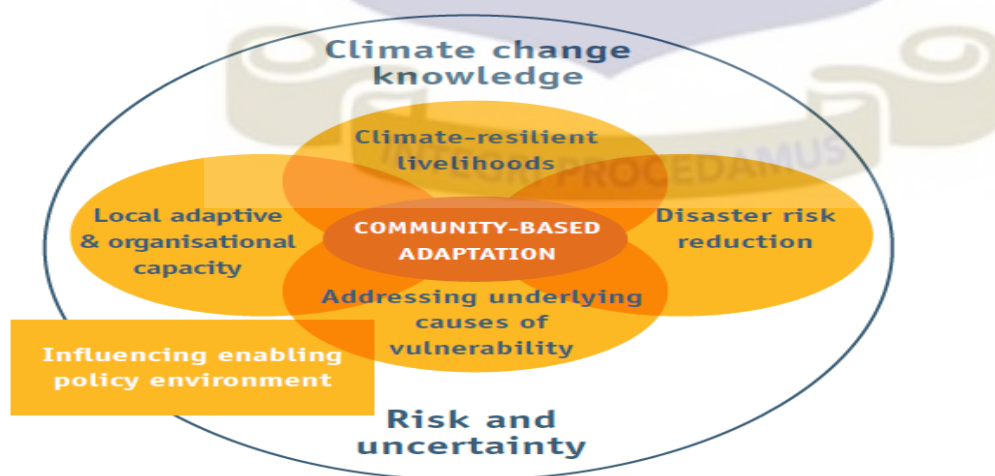


Figure 2.4: Conceptual framework for ALP

Source: CARE (2015)

The Adaptation Learning programme's framework by CARE International is adapted for this research due to its holistic approach as compared to the other concepts. It reflects the governance, monitoring and evaluation and strategic process considered in the already discussed frameworks. Again, the CBA project selected to be assessed for this thesis is the ALP in Northern Ghana and as such the need to embrace the framework that suits its purpose. Furthermore, the framework is easy to understand, interpret and use. The ALP framework helped to inform the questions used in the design of the questionnaires and interview guide, as they were the bases to which the adaptation strategies were formulated for implementation.

2.10 Theoretical framework for research analysis

The “theory of change” (TOC) is the theoretical approach adapted for this study. This theory according to Vogel (2012) is an outcome-based approach, which meant for change in a particular environment by allowing for a critical assessment of an initiative during the project cycle particularly the design, implementation and the evaluation. Many authors describe theory of change as an approach to the design and evaluation of social programme (Stein and Valters, 2012). Many international development agencies and donors have found the methodology used for theory of change as a relevant tool since it combines a long-standing evaluation and development practice theories, makes it a more useful approach, and is easily accessible (Vogel, 2012).

Anderson (2004) noted that the term “theory of change” became popular by in 1995 and identified as a set of assumptions that put emphasis on explaining the mini-steps of a programme that leads to a long-term goal and creates a connection between activities and outcomes of a project. Furthermore, community-based initiatives designed with theory of change should be

more specific in order to enhance evaluation plans and give practitioners a more concrete claim over the outcomes of their initiatives. In doing so, she suggested that the outcome expectations of the initiative should be laid out and an evaluation strategy to monitor these expected outcomes.

In this study, the theory of change is used to develop two models. The first model is the theory of change for 'business as usual' and the second model is the theory of change for CBA. The theory of change for 'business as usual' is to identify what conditions will prevail in respect to climate change impacts or what threats communities are likely to face if nothing was done. This examines the prevailing conditions before the introduction of ALP and the outcomes (economic and social) that were likely to occur in the face of climate change hazards or shocks. The context of change is put in a model to show the prevailing conditions, immediate or short-term outcomes, medium-term outcomes, and long-term outcomes. The theory of change for CBA will also examine the various strategies or interventions introduced by ALP in the various communities to build their capacity to reduce the vulnerability to climate change. Again, their economic and social outcomes benefited from the various strategies are examined. This second model (TOC for CBA) is to contrast the first model (TOC for BAU) by clearly identify the actual evidence of change the ALP intervention has brought to the communities.

2.11 Conclusion

In conclusion, this chapter reviewed existing literature on the key terminologies and concepts used in the study; the evidence of climate change in Ghana; the role of community-based adaptation; strategies used by institutions in implementing CBA; the impacts of CBA on socio-economic development including poverty, health, education, food security and gender equality; limitations or challenges of CBA; interventions of CBA initiatives in Ghana; the conceptual framework of the study and the theoretical framework for analysis.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter, the study areas including the profile of communities under study with the map of East Mamprusi district, the physical, ecological and socio-economic characteristics are presented. The theory for analysis, research design, sample techniques, data collection procedure, indicators for the study and the method of analysis for achieving each specific objective are also presented under this chapter.

3.2 Profile of study area

Vulnerable communities in four countries in sub-Saharan Africa were selected as pilot sites for the five-year Adaptation Learning Programme (ALP) for Africa by CARE International. These countries include Ghana, Niger, Kenya and Mozambique. In Ghana, ALP is working with local governments and organizations in eight vulnerable communities within two districts in two regions as beneficiaries of the CBA intervention. These districts include; East Mamprusi district in the Northern region and Garu-Tempane district in the Upper East region. There are eight ALP communities in both districts, four in each district. This study focuses on two most vulnerable communities within the East Mamprusi district namely Saamini and Zambulugu communities. The district has three main urban towns namely Gambaga (district capital), Nalerigu and Lamgbensi as shown in Figure 3.1. These urban centers serve as nodes for all the communities in the district.

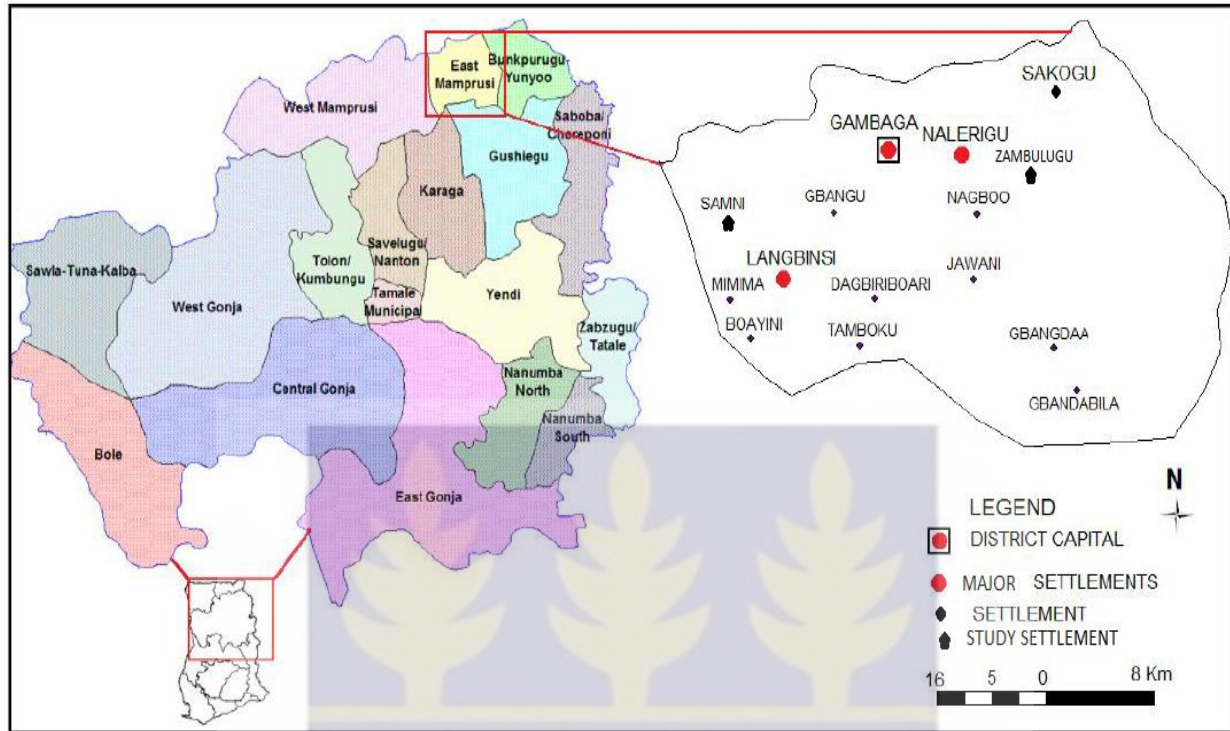


Figure 3.1: Map of East Mamprusi district in National and regional context

Source: Department of Planning, East Mamprusi District

3.2.1 Characteristics of communities under study

The approximate location for Saamini community is longitude $0^{\circ} 37' 13''$ West and latitude $10^{\circ} 28' 14''$ North and that of Zambulugu community is longitude $0^{\circ} 19' 31''$ and latitude $10^{\circ} 31' 58''$ West. Saamini community has more social amenities such as electricity, market, school, road access, health post than Zambulugu community which has only a primary school. As shown in Figure 3.1 above, Saamini community is a few kilometers away from Lamgbensi whilst Zambulugu is closer to Nalerigu. Both communities are farming communities engaged largely in subsistence agriculture growing major crops such as maize, millet and groundnut.

3.2.2 Physical and ecological characteristics

East Mamprusi district where Saamini and Zambulugu are located is within the Guinea Savanna zone which is the largest climate zone in Ghana comprising of the Volta River Basin, the

Konkori plains and the Gambaga escarpment. The zone is characterized by infertile soils but areas with floodplains and rivers are more fertile. These soils are largely savanna ochrosols which covers major portions of the district and ground water laterite which is found at smaller portions of the district usually at the southern parts. The vegetation is also characterized by densely wooded and vigorous grassland (*Andropogon*, spp.) and deciduous trees usually fire resistant shrubs with varied types of grasses growing separately and beneath the trees. Guinea savanna is among the hottest climatic zone in Ghana with an average of 27.5 degrees Celsius (based on the data from 1961-2000) and seasonal variations ranging from 22-25 degrees from July to September and 27-32 degrees during the hottest dry season months of February to May. Rainfall variability is high in this zone with an average rainfall of about 1115 millimeters per annum as compared to over 2000 millimeters in the evergreen forest zone in the south. Climate change impacts are expected to be heightened in the Northern region especially in the ALP communities.

3.2.3 Socio-economic characteristics

As part of the poorest districts in Ghana, the ALP communities including those in the communities in East Mamprusi district have some of the poorest poverty rates in Ghana. The district has over 52% poverty levels with average per capita income way lower than the national average (ALP, 2013). The communities are largely engaged in subsistence agriculture with major crops such as maize, millet, sorghum and groundnut as their main crops. Cereals are usually stored in traditional silos and usually sold when price-value is higher on the market. Cattle, goats and sheep are important livestock reared including poultry such as chicken and guinea fowls. These animals are usually seen as alternative sources of income during the dry seasons as they

are sold to make extra money for household keeping. Other services such as petty trading and transportation are also active in the communities within the district.

3.3 Research design

The research designs employed for this study are the case study research approach and the comparative research approach. These approaches were selected over other approaches such as surveys and experiments based on the main objective of the study and also to ensure that the research questions are adequately answered based on the evidence collected from the field.

A case study approach ensures that a single case (CBA) with embedded units (economic and social outcomes) can be fully analyzed within subunits separately (within case analysis) and between different subunits (between case analysis) as well as across all the subunits (Baxter and Jack, 2008). In this approach, both descriptive and explanatory studies were used to allow a qualitative study that describes and relates to socio-economic benefits of CBA in the East Mamprusi district within specific period.

The comparative research approach was also suitable for this study due its usefulness in analyzing the contributions made by the ALP on the various communities in the district. This approach is both qualitative and quantitative and capable of providing the basis to be able to explain whether there has been change and the degree of the change that could be attributed to ALP intervention. This approach was also operationalized by “before” and “after” approaches which is vital to determine the change which occurred between the periods before the ALP began and after ALP ended. In this study, the baseline selected before the ALP was 2010 and after ALP was 2014. These baselines were selected because it is assumed that the outcomes in 2010 is a reflection of what happened before the ALP in 2009 and the outcomes in 2014 reflects what happened in a complete year before the ALP ended in 2015 (also the year of this study).

3.3.1 Sampling technique

The multi-stage sampling technique was used in sampling approach of this study. Multi-stage sampling enables the combination of various sampling techniques at different levels or depending on the different stages of the sampling which could either be probability or non-probability sampling. Both purposive and normal random sampling techniques were used to select the communities and the household used for this study.

Purposive sampling technique was used to select the district and the two communities that participated in the study. The criteria for the selection of East Mamprusi district over Garu-Tempene district (both ALP districts) was based on the easy transportation access to the district and the availability of ALP partners within district to assist in the study. The two out of four communities in the district were also selected based on their location, availability or non-availability of social amenities, the size of the community and the availability of the community monitors to assist in data collection. Saamini community was selected because it is located at the western part of the district (as shown in Figure 3.1), bigger in size and has access to road, electricity, Junior High School and a market center. Zambulugu community was also selected because it is located at the eastern part of the district (as shown in Figure 3.1), smaller in size and has limited social amenities except for a primary school. Community monitors in both communities were also both available and willing to assist in the data collection process hence an additional factor for selecting them.

Households were selected randomly based on the World Health Organization's (WHO) expanded programme on immunization "random walk" methodology (WHO, 2005). Since all households in both communities were beneficiaries of the intervention (directly or indirectly), the random selection was done in such a way that each household stood an equal chance of being

selected. After community focus group discussions, community monitors lead the team to any household whose household head was available to administer questionnaires.

3.3.2 Sample size

Sample size was determined by the formula: $n = \frac{N}{1+N\alpha^2}$, Where n = sample size, N = sample population (Total Number of households) and α = the confidence level. But, $N = 343$, and $\alpha = 0.065$, $n = 140.047$, therefore, $n \approx 140$.

Table 3.1 indicates the number of households and sampled population for each community selected for the study in the district.

Table 3.1: Number of households sampled from each community

Community	Number of household	Number sampled (frequency)	% sampled
Saamini	195	80	57
Zambulugu	148	60	43
Total	343	140	100

3.3.3 Data collection

The main sources of data collection in this study included primary sources and secondary sources of data. The primary sources of data are raw qualitative and quantitative data collected from field. For the purpose of the study, data relating to the strategies used by ALP in the district, yields, incomes, education, health, gender and food security. This information from community, household and community monitors were made through focus group discussions and interviews. The secondary sources of data were made available through published and unpublished research materials. Published books and papers from journals were reviewed and used to support or refute

findings from analyzed primary data relating to the objectives of the study. This was also complemented by the use of conference papers, articles and technical reports.

3.3.4 Instruments and tools for data analysis

Structured questionnaires were designed in an open-ended and close-ended format to allow for flexibility in the response during household data collection. This instrument of data collection enabled a one-on-one interaction with household heads who were expected to give full detail of their household experiences with the introduction of the ALP in the community and how beneficial it has been to them socially and economically. In all 77 questions were used. The questionnaire had five sections including the basic or general information of the household, the composition of the household, access to credit and income sources, household information on education, health, gender and knowledge and finally experiences of ALP from 2010 to 2014. Questions designed to track economic changes were mostly numeric and those to track social changes were mostly ordinal and nominal in nature. This allowed for both comparisons and description of the data collected. Focus group discussions were also conducted for each community especially women groups in both communities using a focus group discussion checklist. In the general focus group discussion (for both male and female) community members were asked to identify what their prevailing conditions were before ALP intervened, what would have happened in the short, medium and long term without the intervention and what changes they have observed with the introduction of the intervention. This was used to design the theory of change model for business-as-usual and for ALP. Key informant interviews were also conducted with ALP community monitors. This was recorded and transcribed accordingly.

The data collected from the field was cleaned, coded and edited before data entry. The analytical tool used was the Statistical Package for the Social Scientist (SPSS) version 22. Appropriate

statistical tools were used to process the raw data for interpretation and relevant inferences made from the output of the SPSS analysis.

3.4 Indicators for measuring socio-economic benefits

Two main indicators including economic and social indicators were used in measuring the extent of benefit ALP has been to communities and households. There are sub-indicators for these two main indicators and these are presented below;

1. Economic indicators include household crop and animal production, number of household crops yields consumed and sold, income from crops sold, household savings for the year, rate and amount of household borrowing, household budgeting and household lending for the year.
2. Social indicators include household food security for the year, rate and number of children absenteeism for the week and the academic year, rate and number of incidence of illness and household women empowerment and gender equality.

These indicators were determined by using literature and background information of the community and the programme.

3.5 Method of analysis for specific objectives

The methods of analysis for both quantitative and qualitative data in specific objectives are presented in this section. The study used descriptive and comparative statistics to analyze data and present results for specific objectives.

3.5.1 Method of analysis for identifying the strategies and the level benefits obtained from ALP.

Conference papers and ALP documents on the work done so far by the intervention in both districts (East Mamprusi and Garu-Tempene districts) were compiled and presented in a table to

showcase the strategies that has been used under the ALP framework to achieve specific objectives in ALP communities. Discussions from community focus groups were used to design two theory of change models. One model for the situation before ALP intervened (prevailing conditions) and what societal outcomes in the short-term, medium-term and long term was to be expected without the intervention. This is called the theory of change for business-as-usual. The second model called the theory of change for CBA shows the interventions used by ALP to obtain specific and current economic and social outcomes. Percentages and frequencies were used to demonstrate which adaptation strategy is the most useful or relevant to households in both communities.

In showing the level of benefit a particular household may have obtained from ALP, households were asked to choose how beneficial ALP has been to them in an ordinal scale including; “not beneficial”, “little beneficial”, “beneficial” and “extremely beneficial”. To establish whether the scale of benefit is dependent on other variables, chi-square test was used to test the strength of relationship between how beneficial ALP was to a household and other variables including the community, gender, education, marital status, year intervention was received and the type of ALP strategy which was most relevant. Results were presented for only variables that show a level of relationship with scale of benefit.

3.5.2 TEconomic benefits of ALP to household and community.

Paired samples t-test was used to compare means and test for level of change for crop yields, animal production, crop yield consumed and sold, incomes from crops sold, household incomes from savings, household indebtedness from borrowing, household budgeting and lending between 2009 and 2015 or for 2010 and 2014. Results for means and mean change in crop production between 2010 and 2014 were presented for three staple crops in the district (maize,

millet and groundnut). Means and mean difference were also established for livestock (sheep and goats) and poultry for 2010 and 2014. Incomes from maize, millet and groundnut for each household was determined using the price-value of these crops in 2010 and in 2014 and multiplied by the number of bags (50kg) sold at the time. Their means were then compared and mean difference established.

Household savings before the introduction of ALP village savings and loans associations (VSLAs) and in 2014 were compared to indicate the mean difference of savings and the results emphasized using percentages. The rate of borrowing from friends and other sources was ordinal scaled using “never borrowed”, “not often borrow”, “often borrow” and “very often borrowed”. The mean change for amount borrowed between 2009 and 2015 was presented to confirm the results from the rate of borrowing. Pie chart for how monies borrowed from the VSLAs were used is also presented and discussed. The mean and mean change for household budget are also determined for 2010 and 2014. The ability to lend for the past 12 months was also determined and presented in frequencies and percentages. The level of economic change was determined at the household and community levels.

3.5.3 Social benefits of ALP to households and community

This objective also employed paired samples t-test to determine the mean values and calculate the level of changes for months of food availability in a year, months of illness in a year and days of school absenteeism in a week before and after ALP. Qualitative ordinal scale was also used to determine the rate of school absenteeism by children in the household, the frequency in the affordability of school requirements, the rate of illness in a year and the involvement of women in decision making.

Due to the minimal results for mean changes in household monthly food availability and illness, the monthly means were converted to days (30 days = 1 month). This was useful in estimating the minimal mean changes for both outcomes in days. The mean change for number of days of school absenteeism in a week (5 days = 1 week) was converted to number of days of school absenteeism in an academic year (180 days = 1 academic year). This was to help estimate whether the number for days of school absenteeism in a year has appreciated or depreciated under the ALP intervention.

Qualitative ordinal scale for the rate of school absenteeism and illness was presented as “Never”, “Not often”, “Often” and “Very often”. The qualitative scale for frequency of affordability of school requirements (school fees, books and stationary) was also presented as “Never”, “Not frequent”, “frequent” and “Very frequent”. Women participation in decision making was also scaled as “Never”, “Not always” and “Always”. Nominal responses were mostly “Yes” or “No” answers. All nominal and scale results in this objective were estimated in percentages.

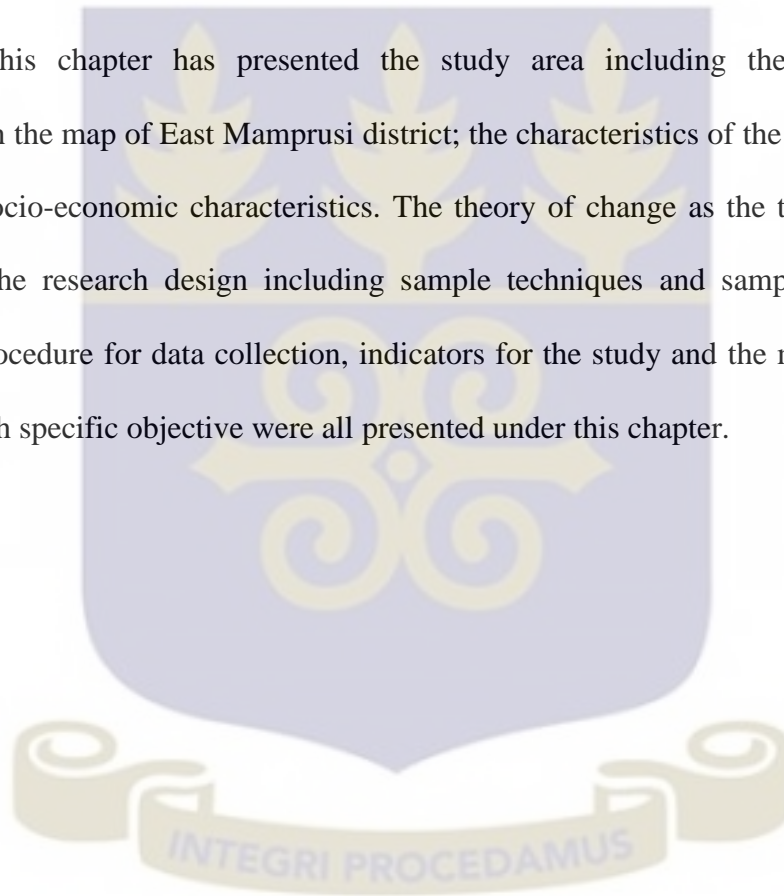
3.5.4 Describe the challenges observed with the operations of the ALP and its sustainability.

The method of analysis for this objective is based on interview transcribing, information from focus group discussions, conference papers and reports. The descriptive statistics such as chi-square, frequencies, bar chart and percentages are also used.

Challenges from households related to the operations of the ALP was presented in percentages and explained with information from interviews and focus group discussions. The challenges presented by CARE International and local institutions working with ALP was obtained from ALP annual reflection meeting on 28th – 29th January, 2015 in Tamale. This information was obtained through conference presentations and general conference discussions on ALP performance. This was supported with evidence from the field and literature.

“Yes” or “No” responses was useful to identify whether households would be able to continue to use capacity obtained from ALP to build future resilience or not. Chi square test was carried out to establish the strength of evidence of relationship between the ability of households to continue and other variables such as the community of respondents, level of benefit, marital status, age, gender and household size. Results were presented for only variables that showed a level of relationship with the ability to continue after ALP.

In conclusion, this chapter has presented the study area including the profile of ALP communities with the map of East Mamprusi district; the characteristics of the study area and the ecological and socio-economic characteristics. The theory of change as the theory for analysis was discussed; the research design including sample techniques and sample size were also described; the procedure for data collection, indicators for the study and the method of analysis for achieving each specific objective were all presented under this chapter.



CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter focuses on the results obtained from data analysis of the study as well as the relevant literature discussions and interpretation of these results. Section 4.2 describes the background or general information of the communities and household sampled. This is followed by Section 4.3, which also identifies the various strategies or interventions used by the Adaptation Learning Programme (ALP) to increase the capacity of vulnerable communities and households in order to adapt to climate change and variability and how beneficial ALP has been by using these strategies to address the needs and priorities of communities and households. In Section 4.4, the results from the economic outcomes of the ALP are interpreted and discussed. Section 4.5 focuses on the social outcomes of ALP and the extent to which it has benefited communities and households in the district. The last section which is Section 4.6, will present interesting results on the challenges that has threatened the potential of the ALP in yielding its full results.

4.2 Background of sampled population

The number of households sampled in both communities was 140 with 80 households from Saamini community and 60 households from Zambulugu community. There were more male-headed households (76%) than female headed households (24%) in the sampled population. The average age of household heads in both communities was 52 years. Almost all household heads have stayed in the same community all their lives most of whom (89%) have not had any form of formal education. 91% of the household heads are married and 9% were found to be widows. The average household size for the sampled population is 11 persons per household even though the average size in Zambulugu community (13 persons) is higher than that of Saamini

community (9 persons). The number of female population in the sampled households in Zambulugu community (7 persons) is higher than that of males (6 persons) as compared to Saamini community which had more males (5 persons) than females (4 persons). The average number of school going children in the sampled household is 6 children but more were recorded in Zambulugu community (7 children) than Saamini community (6 children). All households are engaged in farming activities with 53% of the sampled population also engaged in off-farm income generating activities. Appendix A1 shows the summary of the background information of sampled households.

4.3 ALP adaptation strategies to increase the capacity of households and communities.

This section discusses the strategies used by ALP in both East Mamprusi and Garu-Tempane districts. This is followed by a theory of change model that conceptualize what would have happened without ALP (business-as-usual) and the changes that have resulted from ALP. The ALP strategies which was considered relevant and beneficial to households are also presented and discussed. The final part of the section discusses the perception of households on how beneficial ALP has been in increasing their capacity to adapt and address their needs and priorities.

4.3.1 Strategies used for the Adaptation Learning Programme in Northern Ghana.

In the design of the ALP framework for CBA in sub-Saharan Africa, four broad intervention areas were expected to be implemented. The interventions within the framework include; Climate Resilient Livelihoods (CRL), Disaster Risk Reduction (DRR), Local Adaptive and Organizational Capacity (LAOC) and addressing underlining causes of climate change (ACCC). Influencing enabling policy (IP) is considered as a facilitating intervention for ALP activities to thrive within the socio-political context of the region it is operating and usually considered as

additional intervention apart to the four (CARE, 2015). These major intervention areas were universal for the 40 communities within four countries (Ghana, Kenya, Niger and Mozambique) in which the ALP was functional. The choice of specific adaptation strategy under a main intervention area for a particular community was dependent on the vulnerability context of that community which was initially assessed with a participatory tool developed by CARE International known as the climate vulnerability and adaptive capacity analysis (CVCA) tool. This tool worked directly with communities with the help of local NGOs and CBOs to identify their own vulnerabilities and establish the needed intervention necessary to increase their capacity to adapt to climate change. In Ghana, the CVCA was completed in 2009 for eight communities in the two districts ALP is operational and was immediately followed by the appropriate CBA interventions in 2010. Table 4.1 shows the strategy implementations by ALP in Northern Ghana (Northern and Upper West region) from 2010 to 2015.

Table 4.1: ALP strategies implemented in Northern Ghana

Intervention	Strategy Implementation
Climate Resilient Livelihoods (CRL)	<ul style="list-style-type: none"> • Expanded support on early bulking cassava initiative to four communities (Jawani, Demia, Teanuba and Zambulugu). • Established a one-acre model dry season garden at Tariganga in partnership with the district Department of Agriculture and Presbyterian agricultural station in Garu (PAS-G). • Supported dry season farmers with water pumping machines to ease the drudgery especially for women farmers. • Established village savings and loans associations (VSLAs) district umbrella groups as advocacy wings of the VSLAs in the communities.
Disaster Risk Reduction (DRR)	<ul style="list-style-type: none"> • Supported the review of disaster preparedness plans (DPPs) in Garu-Tempane and East Mamprusi districts in line with national disaster action plan and facilitated the reconstitution of district disaster funds (DDFs). • Supported the training of 185 disaster vigilante guards. • Organized Participatory Scenario Planning (PSP) workshops in the two ALP districts and one regional workshop in the Upper West Region in partnership with OXFAM, West Africa water supply, sanitation and hygiene (WA WASH) and the Ghana meteorological agency (Gmet). • Set up two Climate Information Centres (CIC) as early warning

	<p>mechanisms in partnership with Farm radio International and local FM radio stations (Quality FM in Garu-Tempene district and Eagle FM in East Mamprusi district).</p>
<p>Local Adaptive and Organizational Capacity (LAOC)</p>	<ul style="list-style-type: none"> • Worked in partnership with the national development planning commission (NDPC), UNDP and local government decentralized programme (LOGODEP) to provide orientation for the 216 metropolitan, municipal and district assemblies (MMDAs) on the 2014-17 medium term development plan (MTDP) guidelines and how to integrate climate change and green economy. • Supported the Garu-Tempene and East Mamprusi districts planning units on the development and integration of climate adaptation action plans (CAAPs) into the medium term development plans. • ALP community exit plans were developed. • Supported District stakeholders' development partners' interface in the East Mamprusi and Garu-Tempene districts. • Regional chapters of the Ghana climate adaptation network (GhanaCAN) and their constituents were trained on climate change concepts. • Linkages of ALP implementing partners with projects/organizations such as UNEP's early warning for climate change (CLIM WARN) and the Africa climate exchange (AfClix).
<p>Addressing Underlining causes of Climate Change (ACCC)</p>	<ul style="list-style-type: none"> • Gender study conducted in partnership with CCAF to find out the gender relations and power dynamics in changing climate. • Facilitated community advocacy processes through design, implementation, monitoring, review and updates of the CAAPs • Facilitating community linkages for easy access to relevant information (weather, inputs and resources). Example, linkages with the rural enterprise program (REP) and community banks.
<p>Influencing Enabling Policy (IP)</p>	<ul style="list-style-type: none"> • Organized a national round table on the generation and dissemination of Climate Information in partnership with Gmet. • Supported Ghana to organize an awareness creation forum on the Green Climate fund (GCF)-Ghana readiness. • Supported GhanaCAN to conduct an analysis of the national budget on climate change perspective. • Provided capacity building for the environment and climate change desk officers of ministry of food and agriculture (MoFA) on the PSPs. • Built the capacities of the media on climate change concepts in other to enhance reportage.

Source: Based on ALP (2015b)

The first four interventions were carried out at the community level in partnership with local NGOs, other donor agencies and specific governmental wings such as the MoFA and the district

assemblies. The fifth intervention was carried out at the national and regional levels in collaboration with national and regional institutions to create the enabling environment and the needed support for the operation and sustainability of the four main interventions. This participatory approach at all stakeholder level is highly commendable and recognized as the best way to achieve effective CBA as ALP engaged the horizontal and vertical institutions and stakeholders structures needed for a successful implementation of CBA in communities (Bryan et al., 2013; Amaru and Chetri, 2013). Again the strategies used is in line with the “ex-ante” type of CBA strategy described by Siegel and Jorgensen (2009) where the adaptation strategies implemented in vulnerable communities are based on predictions of future climate than the past (Bryan and Behrman, 2013). This also confirms how ALP was proactive and focused on the aim of build the capacity of vulnerable communities to face any future impacts of climate change (ALP, 2015a). Although the ALP operated within this broad and strategic interventions, prevailing conditions of the benefited communities including their geographic and socio-economic context informed the specific strategies that were necessary to be used to increase their capacity to reduce vulnerabilities.

4.3.2 The theory of change in East Mamprusi District

Two models of theory of change are developed. The first for business-as-usual (without ALP intervention) and the second for CBA (after ALP intervention). Vogel (2012) demonstrates how important this stage is by emphasizing the need for a theory of change for any project or intervention to critically assess the outcomes during the project cycle especially at evaluation period. Before the ALP intervention, communities were experiencing some initial conditions that made them vulnerable to climate change impacts. From community monitors’ interviews and focus group discussions, communities were able to bring out the prevailing conditions that

existed before ALP intervened, the short-term, medium term and the long-term outcomes that would have occurred if they had not received the intervention. Figure 4.1 shows the theory of change for business-as-usual:

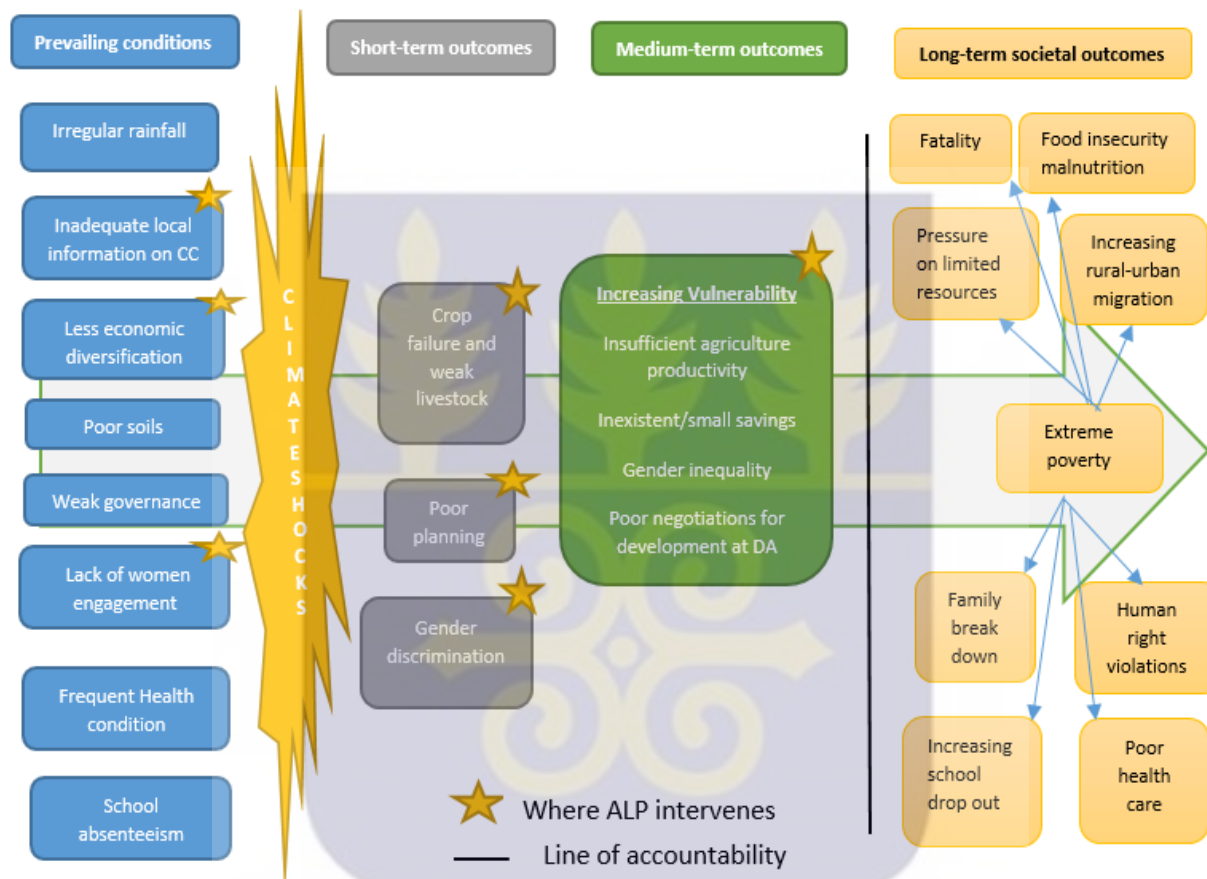


Figure 4.1: Theory of change for business-as-usual

Source: author's compilation from the field based on Vardakoulias and Nicholles (2014).

This model for theory of change in East Mamprusi district was adopted from Vardakoulias and Nicholles (2014) who developed a similar model for four ALP communities in the Dakora region of Niger. Community members were asked to share experiences of their existing or prevailing conditions that increase their vulnerability to climate shocks before ALP intervened. The short term outcomes under this prevailing conditions and climate shocks were the constant reduction in crop yields, weakened livestock and difficulty to plan for households. The women also

complained of consistent rejection by their husbands as they were unable to support them enough to provide food at home. The medium term outcomes reveal the increasing vulnerability that occurs in communities when the short-term outcomes persist. For example, it was reported by some women in Zambulugu community that a man may decide to have an extra wife because the current one is unable to provide food at home; hence having multiple wives to reduce his burden is a coping strategy. The long-term outcomes from persistent vulnerabilities lead extreme poverty in these communities without ALP intervention. Extreme poverty may lead to several other negative social outcomes such as breakdown of the family, school dropouts, malnutrition and many more. In the theory of change by Vardakoulias and Nicholles (2014), they found out that the long term effect of persistent vulnerability without any action will lead to emigration from communities which will also lead to many other challenges.

The ALP strategies in the East Mamprusi district were meant to empower communities to address specific vulnerabilities within the prevailing conditions, short-term and medium term outcomes in order to prevent the long term consequences of climate change. This is where the line of accountability helps to define the scope to which ALP activities could be measured for its success.

The theory of change for CBA shows how the strategies selected and managed by vulnerable communities produced specific social and economic outcomes to meet their needs and priorities.

Figure 4.2 illustrates the theory of change for Saamini and Zambulugu communities:

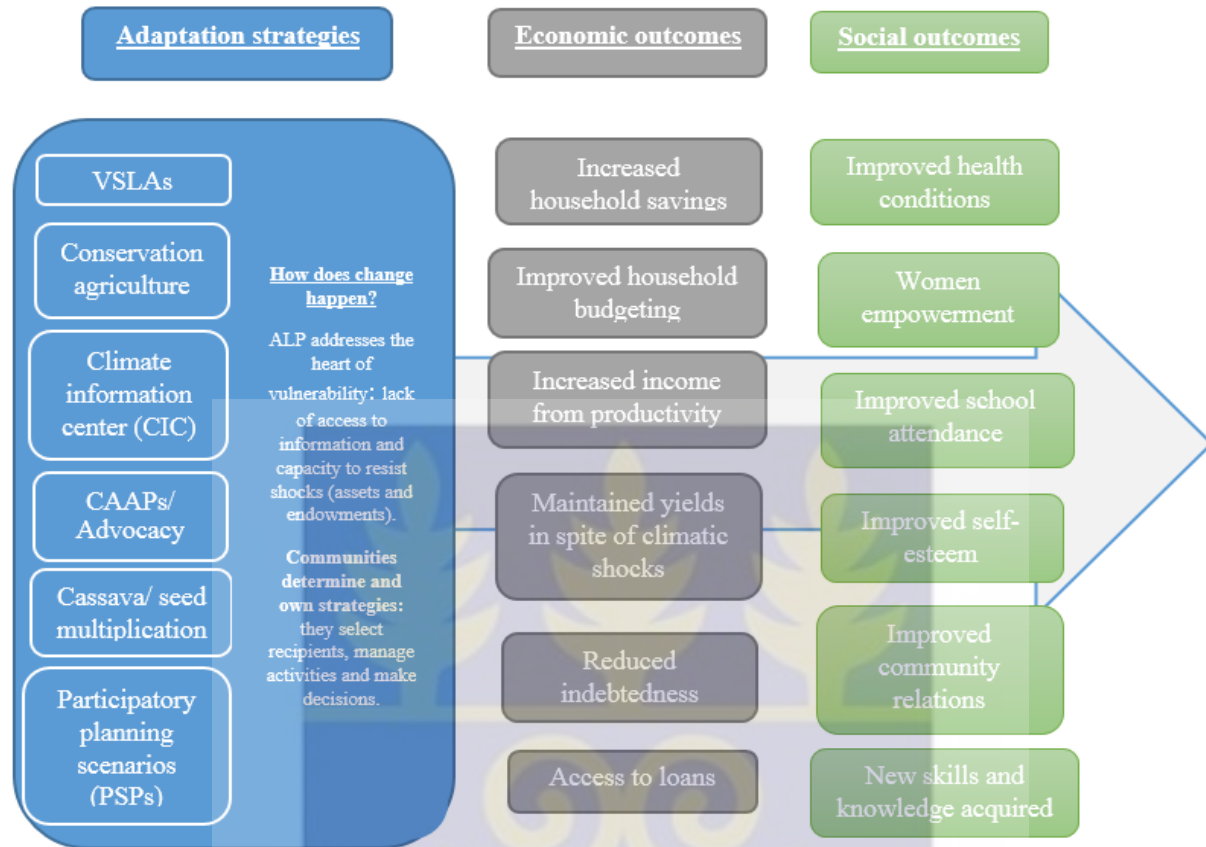


Figure 4.2: The theory of change for CBA

Source: author's compilation from field based on Vardakoulis and Nicholles (2014).

Change occurs when communities are empowered to have access to climate information and receive the capacity to resist climate shocks which depends on already existing community challenges (Vardakoulis and Nicholles, 2014). Through participatory process, communities determine their own strategies and select the recipients and those to manage or lead (community monitors) and make decisions. The strategies selected in both communities were similar but different in terms of their relevance. Their economic and social outcomes were unanimously the same but also different in terms of the level of change.

4.3.3 The selection of relevant CBA strategies by households.

Households were asked to select the most relevant strategy out of the ones they benefited from.

The result showing the most relevant and beneficial CBA strategy is summarized in table 4.2.

Table 4.2: Most relevant CBA strategy in sampled households

Category	Relevant strategy	% of households	Total %
Off-farm strategies	Village savings and loans associations (VSLAs)	64%	76%
	Climate adaptation action plans (CAAPs)/Advocacy training	12%	
On-farm strategies	Early cassava/seed multiplication	11%	24%
	Early warning system (CICs/rain gauge/PSPs)	6%	
	Conservation agriculture/block farming	7%	

Source: Author's compilation from field

From Table 4.2, more households (76%) find off-farm strategies (VSLA and CAAPs/Advocacy) more relevant and beneficial than on-farm strategies (early bulking cassava, conservation agriculture and early warning systems) which was relevant and beneficial to 24% households. This finding is in line with the mid-term review of the ALP by Nottawasaga Institute in 2012, that suggests that livelihood diversification through off-farm activities like the VSLA was an important adaptation goal of ALP in Ghana, Kenya and Niger unlike the solely on-farm strategies used in Mozambique. From the quantitative survey, the selection of a particular strategy as relevant and beneficial was based on the community of the household in question, the year they received intervention, the gender and marital status of household heads.

More than half (64%) of the household data collected shows the village savings and loans associations (VSLAs) were the outstanding strategy for both communities. As shown in

Appendix A2, within communities, 89% of households in Saamini ranked the VSLAs as the most relevant adaptation strategy as compared to the 32% of households from Zambulugu. There were not much difference among male and female headed households who benefited from the VSLA as 67% of female headed households benefited from this strategy than the 63% male headed households. 84% of households headed by widows selected VSLAs as the most beneficial and relevant ALP strategy than the 62% of married household heads who said same. This relevance of the VSLAs to communities is confirmed by Tembo (2014) that quick win strategy appeals to community members especially women who are empowered financially to be able to purchase farm inputs, buy food and cater for the children's education. The success stories of the VSLAs were reported in the Garu-Tempene district as women in the communities are able to access loans to invest into small scale businesses (ALP, 2011).

As shown in Appendix A2, the on-farm strategies such as early bulking cassava, early warning systems and conservation agriculture/block farming were fairly distributed over the households in Zambulugu community than in Saamini. For example, 25% and 12% of households in Zambulugu community said they find the early bulking cassava and conservation agriculture respectively as the most relevant and beneficial strategy while no household in the Saamini community mentioned the early bulking cassava and just 4% said they benefited from conservation agriculture. The differentiation in the selection of relevant strategy by communities is consistent with Lyle (2015) viewpoint that a household selection of an adaptation strategy is based on the location or the community a household is in due to collective decision making and communal action.

4.3.4 Household perception on level of benefit obtained from the ALP

Household heads were asked about their perception on how beneficial they feel the ALP has been to them economically and socially. They were made to choose over four scale of benefits obtained from the intervention including not beneficial, little/less beneficial, beneficial and extremely beneficial. The results obtained are presented in the pie chart in Figure 4.3.

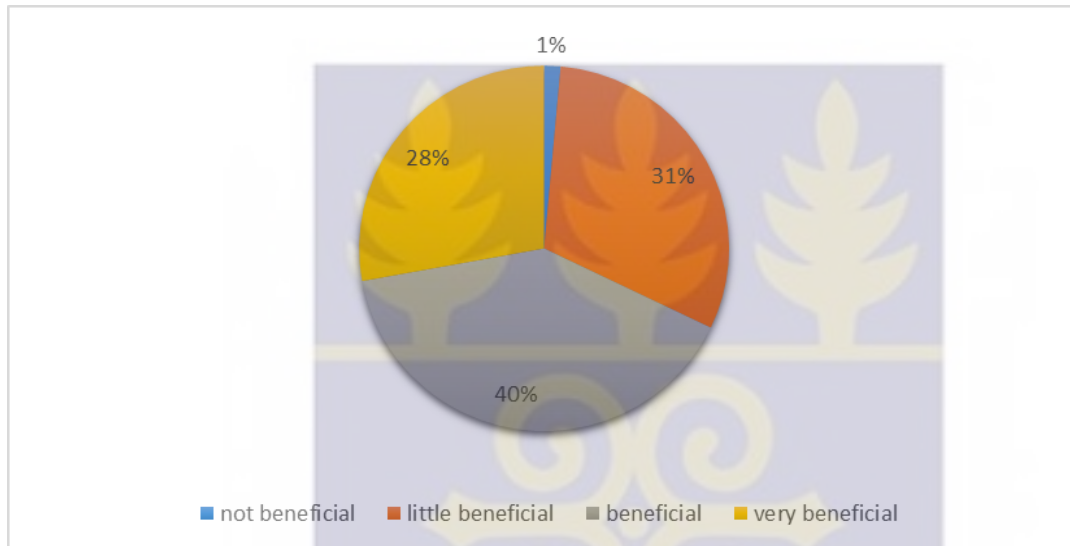


Figure 4.3: The perception of benefits from ALP by Households.

From Figure 4.3, 40% and 28% of household respondents admitted that they have benefited or extremely benefitted from the intervention respectively. On the other hand, 31% perceived they had little benefit and as low as 1% of household respondents said they did not benefit at all. From their perception, it is evident that the ALP has been beneficial to households in both communities as 68% could agree that ALP has been of immense economic and social benefit to their livelihoods as compared to the 32% with little or no benefit. In reference to why CBA benefit's some households more than others in the same community, Adger et al., (2006) and Ericson and Lind (2009) indicate that CBA is a "political" process that naturally creates winners and losers in terms of cost and benefits. In contrast, Bryan and Behrman (2013) argue that, the wide range of needs from all community members should be considered in making the benefits

of CBA universal since CBA may end up benefiting only the “less vulnerable” leaving the “most vulnerable”.

Chi-square test results shows that although ALP seems to have been beneficial, these benefits are differentiated depending on a respondent’s community, the year ALP was received, the CBA strategy most relevant and whether a person borrowed from the VSLAs or not. The chi-square table (table 4.3) shows evidence of a relationship between how beneficial ALP has been and other household variables.

Table 4.3: Chi-square results for the benefits of ALP and other variables.

Relationships	Chi-square	df	p-value
Benefit*community	28.952	1	0.000
Benefit*year received ALP	8.074	1	0.004
Benefit*CBA strategy	17.251	1	0.028
Benefit*borrowing from VSLA	4.813	1	0.028

Significant interval of 0.05 or 95% confidence level.

From table 4.3, there is very strong evidence of a relationship between how beneficial ALP has been and the community a respondent is residing. This is true because, 86% of household respondents in Saamini community reported that they have benefited or extremely benefited from ALP as compared to the 43% of respondents in Zambulugu community (43%). More than half (57%) of the respondents in Zambulugu perceived they did not benefit or had a little benefit from ALP with few respondents (14%) from Saamini admitting same. This can be explained based on the availability of social amenities in the Saamini community which has access to health post, market, road and electricity which are nonexistent in the Zambulugu community. These findings confirm the report by Kyler (2015) that the community or place a household is

can be significant to the results obtained from adaptation interventions and as such any positive or negative result is based on the household's attachment to their community.

Again from Table 4.3, there is a strong evidence of a relationship between how beneficial ALP was and the year respondents received the intervention. This strength of evidence is true as households (77%) who started benefiting at the commencement of the programme in 2010 admitted that ALP has been beneficial or extremely beneficial to them with only a few (23%) who benefited the same year saying it had little benefit or no benefit to their livelihoods. Those who benefited from the programme in 2011 and beyond (54%) reported that ALP was beneficial or extremely beneficial and 46% confessed it was not beneficial or little beneficial to the livelihood of their households. These results confirms Simane and Zaitchik (2014) view point that, CBA projects usually start with much energy and enthusiasm in the first year or at the early stages of implementation during the project cycle when resources are available but loses its drive within the preceding years due to challenges relating to financial and administrative resources and lack of community participation.

The relationship between how beneficial ALP has been to a household and the type of CBA most relevant showed a strong relationship. From the analysis, 81% of households who saw off-farm strategies as most relevant to them also said they benefited or extremely benefited from the ALP as compared to the 19% of the same group who said they had little or no benefit from ALP. This finding is consistent with an argument by Kyler (2015) that, the type of adaptation strategy chosen by a household is related to the level of benefits expected to be obtained from an adaptation intervention.

Lastly, the p-value of 0.028 at a significant level of 0.05 shows a strong evidence of a relationship that exist between how beneficial ALP was to respondents and whether they ever

borrow from the VSLAs. Close to two-thirds of respondents (71%) who borrow from the VSLAs admitted that they have benefited or extremely benefited from the programme as compared to the respondents (44%) who did not borrow but yet benefitted or extremely benefited. More than half of the people who did not borrow (56%) confessed the ALP was not beneficial or a little beneficial to the livelihood of their households as compared to a third (29%) of those who borrowed. This shows how most households will adopt an intervention that yields an immediate outcome or return such as the VSLAs than those that will take longer time to earn returns (ALP, 2015a; ALP, 2011; Nottawasaga Institute, 2012).

4.4 Economic benefits of ALP in East Mamprusi District

Households were examined on the economic benefits of ALP using the change in crop and animal production, consumption and sales of yields and income from production for 2010 and 2014 (before and after ALP). The second part is focused on the frequency and amount of borrowing, saving, budgeting and lending of households before and after ALP. The third and last aspect of this section is establishing the relationships between some of these economic variables and other relevant variables.

4.4.1 Changes in crop and animal production.

Three major crops (maize, millet and groundnut) that are grown in Saamini and Zambulugu communities were assessed to establish the mean production in bags (50kg). From paired-samples t-test analysis, total average production for the three crops reduced from 19.1 bags (955kg) in 2010 to 13.9 bags (695kg) in 2014 with a reduction in total crop production of about 5.2 bags (260kg). This also means there has been a percentage loss over total crop production of about 27%. Although there was a change, different crops had different percentage changes. Household groundnut production had the highest average loss of 36% (1.7 bags/85kg), followed

by maize production with about 35% (3.1bags/157kg) average loss and millet with the least average production loss of 8% (0.4bags/20kg). Figure 4.4 is a bar graph showing the mean and the mean changes in the distribution of crop production for the three major crops (maize, millet and groundnut) between 2010 and 2014 from the sampled households in bags of 50kg.

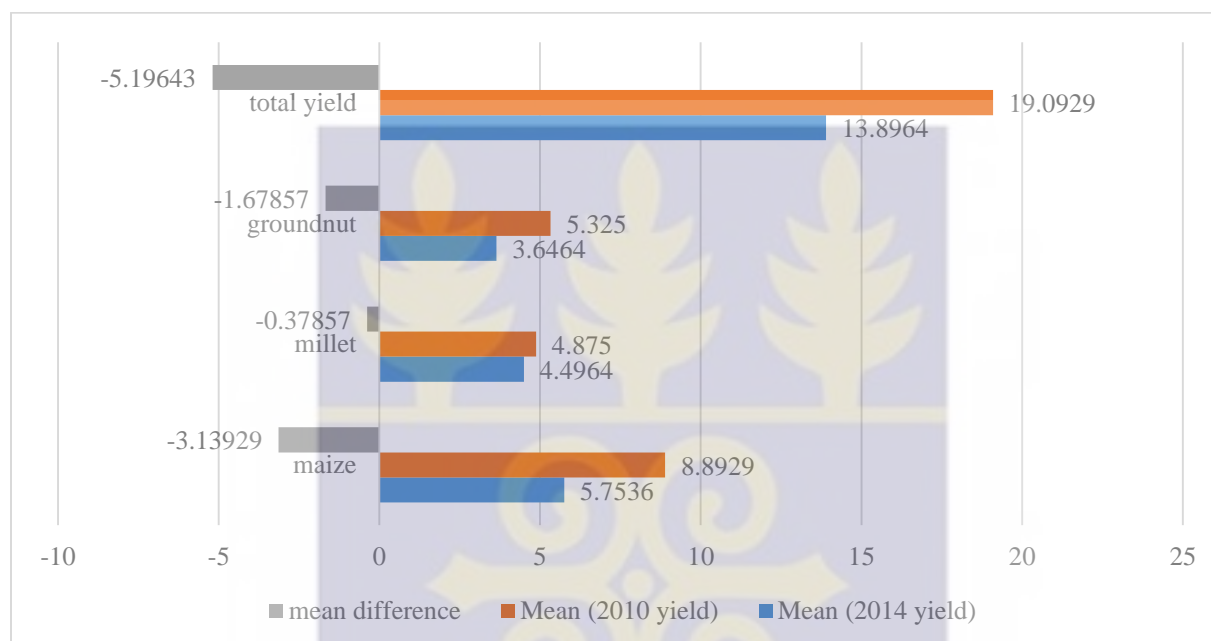


Figure 4.4: Mean changes for the three major crops produced by sampled households.

The various communities also had different changes in the total average production for 2010 and 2014. Table 4.4 shows the distribution of production changes for households in both Saamini and Zambulugu communities between 2010 and 2014.

Table 4.4: Mean and mean change per community

Community	Crop yields in 50kg bags			
	2014 mean	2010 mean	Mean change	% loss
Saamini	14.2	16.2	-2	12%
Zambulugu	13.8	21.2	-7.4	35%

Source: Authors compilation from field

From Table 4.4, Saamini community had the highest average loss of crop production of about 35% (7.4 bags/370kg) which is higher than the average percentage change of the total average production for both communities. Zambulugu community also had a slight average percentage loss in crop production of about 12% (2bags/100kg) which is lower than the total percentage loss for both communities.

These findings contradict crop production results obtained from some of the ALP sites in Niger and Kenya by the NEF (new economic foundation) consult in 2012 and 2013 respectively. Their findings suggest that crop production within ALP intervention areas increased even though they admitted these increases were marginal especially for Niger which was based on a reduction in sorghum production. The reduction in total crop productivity can be attributed to other counterfactuals such as high prices of farm inputs, weather conditions and lack of government extension support (Vardakoulias and Nicholles, 2014). For instance the findings of the study is a confirmation to the Nottawasaga Institute (2012) report that suggests that changes in rainfall pattern was reported to have affected staple crops especially for millet in ALP communities in Northern Ghana. Wossen et al., (2014) also indicated in their study that reduction in crop production in Northern Ghana was due to the inability of farmers to purchase new crop varieties that yields more and faster than the traditional seeds that takes long and yields little.

Furthermore, the loss in crop production for the various crops can be attributed to the average reduction in the farm size cultivated for 2010 and 2014. There was a total average farmland loss of about 10% (1 acre) to a household. The average cultivated maize land reduced to 17% (0.6 acre), millet land to 6% (0.2 acre) and groundnut land to 9% (0.2 acre). The total cultivated land size for Saamini community also reduced by 17% (1.6 acres) whilst that of the Zambulugu community reduced by 7% (0.7 acre). These results reflect Bryan and Behrman (2012) position

that most adaptation interventions related to crop production assume community members would have access to and control over land which is not always the case. In the case of agricultural lands use Vardakoulias and Nicholles (2014) indicated a correlation between the extensions of farmlands and the increase in crop production especially for millet and cowpea in ALP communities in the Dakora region of Niger. This confirms the findings from the study that assume the reduction in farmlands has played a major role in the reduction of crops produced in both communities.

Furthermore, the performance of Zambulugu community over Saamini community in crop production could be explained by the high benefits obtained from the on-farm adaptation strategies than off-farm strategies which was of most relevance and beneficial to the Saamini community. For instance, 44% of household respondents within Zambulugu reported that they have benefited mostly from conservation agriculture, early variety seeds and climate information usage as compared to the 14% of households from Saamini who also benefited from the on-farm ALP strategies.

Head counts were taken for poultry (chicken and guinea fowls) and livestock (goats and sheep) reared in the ALP communities to determine the average change in numbers. From the paired-samples t-test, the average poultry production reduced from 10 in 2010 to 6 in 2014 with an average loss of four poultry per household. Livestock production was also reduced by only one goat or sheep per household as headcount declined from seven in 2010 to six in 2014. Saamini community lost 7 poultry on the average more than the total average of the two communities. Only a single poultry was lost per household in Zambulugu community. Whilst there was no average change in the headcount of livestock in Zambulugu for the two years, there was a single loss of a goat or sheep per household in Saamini community. As demonstrated in section 4.6 of

this study, the programme did not give any support for small ruminants rearing even though communities were promised. Figure 4.5 shows the total mean and mean changes for headcount of poultry and livestock reared in both communities for 2010 and 2014.

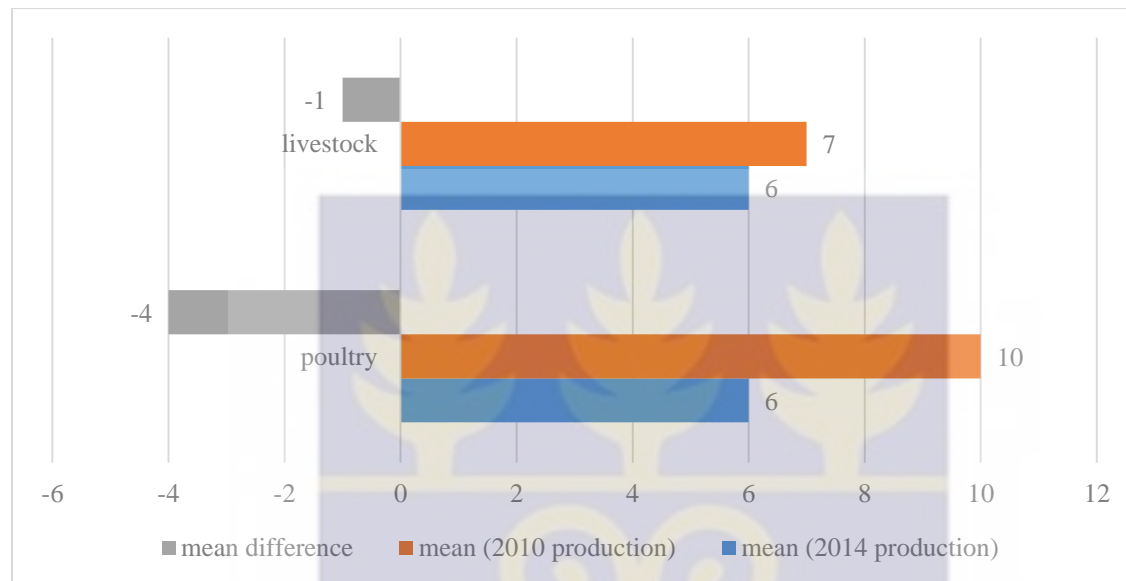


Figure 4.5: Changes in total mean distribution of poultry and livestock.

The 2014 report conducted for ALP in four communities in the Dakora region of Niger shows a decrease in livestock and poultry production and as such confirms the findings of this study. The report confirmed that there was a reduction in animal production particularly for poultry and sheep rearing although communities were supported with small ruminants (Vardakoulias and Nicholles, 2014). In Garissa County in North-Eastern Kenya where livestock pastoralism is the main source of economic livelihoods, reports show that even though there was an increase, there is the need to diversify into a more drought resistant agriculture and other economic valuable tree crops such as mangoes and cashew (Nicholles and Vardakoulias, 2012). Similarly, there is the need to balance the intervention for crop production with animal production since animals production can be a good source of livelihood diversification especially in the lean seasons.

4.4.2 Changes in incomes for crop sold

As subsistence farming communities, more crops produced are consumed than sold. The results from the change in average crops consumed and sold for 2010 and 2014 are presented in Table 4.5.

Table 4.5: Mean distribution of crops consumed and sold in 2010 and 2014.

Crops	2010		2014	
	Mean crops consumed (kg)	Mean crops sold (kg)	Mean crops consumed (kg)	Mean crops sold (kg)
Maize	285	156	192	98
Millet	132	112	124	102
Groundnut	83	181	60	124
Total	500	449	376	324

Source: Authors compilation from field

From Table 4.5, it can be noticed that households consumed more than 50% of what they produced especially for the staple crops such as maize and millet. Groundnut is usually produced on small scale for sale and for preparation of soups and stews. Although total crops consumed reduced in 2014, there is no significant percentage change for staple crops (maize and millet) consumed in 2010 and that of 2014. Similarly, percentage of household crops sold did not changed either although price-value for all three major crops changed significantly between 2009 and 2015. Figure 4.6 shows the mean income from crops sold for 2010 and 2014 in Ghana cedi (GHC).

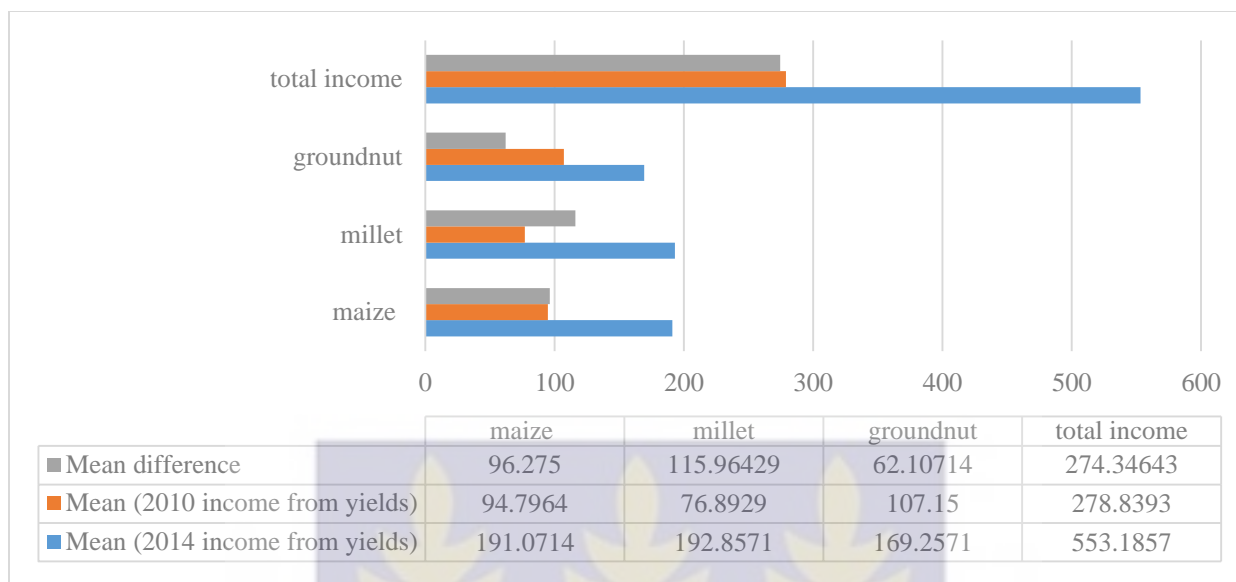


Figure 4.6: Mean and mean changes in incomes for three major crops for 2010 and 2014.

From Figure 4.6, there is an increased mean income of crops for households in 2014 although Table 4.4 shows a reduction in crops sold in 2014 as compared to 2010. This was due to the price-value change of crops between 2009 and 2015. A 50kg bag of maize and millet that was sold for GHC30 and GHC35 respectively in 2010 was sold for GHC100 each in 2014, showing a percentage increase in price-value for maize and millet at 233% and 186% respectively. The percentage price-value for groundnut also increased by 133%, thus from GHC 30 in 2010 to GHC 70 in 2014. The mean difference of total income on crops for households was almost the same as the mean income for crops in 2010, thus resulting in a percentage increase of 98% in total income for crops in 2014. This means more income for farming households especially for households in Zambulugu community who had a total mean difference on income of GHC 318.33 per household which is higher than that of Saamini community with GHC 241.36 per household. The findings from the study is in line with ALP study in Niger and Kenya that showed significant income increase in production even though crop production did not increase much. For instance Vardakoulias and Nicholles (2014) reported that the increase in agriculture

revenues by 48.1% in Niger was due to counterfactuals such as the increase in prices for major crops. Wossen et al., (2014) also emphasized that climate change provides the opportunity for farmers to have higher prices for their produce in order to meet the cost of production.

4.4.3 Household Savings, borrowing, budgeting and lending.

Increased income for household is expected to reflect in other economic engagements such as savings, borrowing, budgeting and lending. To quantitatively analyze the changes in household savings, household heads were asked how much they saved in 2010 before ALP and how much they saved in 2014. The results showed that the average amount saved per household increased from GHC 16.83 in 2010 to GHC 84.15 in 2014 which increased the mean difference of saving to about GHC 66.32 per household. This increase in savings was due to the patronage of the VSLAs which is the main livelihood diversification opportunity for households in both communities. 87% of respondents reported that their household saves with the VSLAs as compared to only 13% who did not. This is an improvement over the CVCA report issued by ALP in 2013 that indicates that 60% of household in Northern Ghana had savings mostly in the house or with local savings and loans institutions with high interest rates (ALP, 2013).

As mentioned in Section 4.3.3, the VSLAs are the most preferred strategy especially for Saamini community due to its quick-win characteristics. Again as shown in an early analysis, the chi-square analysis shows that there is a strong relationship between those who benefited or extremely benefited from ALP and those who saved with the VSLAs. The ALP mid-term report submitted by the Nottawasaga Institute (2012) confirms this finding on high returns on the usage of the VSLAs by indicating that the VSLAs in all ALP communities have proven to be the most successful ALP livelihood diversification strategy. In a field story by Madeleine McPherson in 2011, she reported on how ALP has helped community members especially women in

Tariganga, Garu-Tempene District, in the Upper East Region of Ghana. In Niger, the percentage increases on households savings by 36.4% between 2009 and 2013 confirms the results obtained in East Mamprusi district.

Again respondents were asked how often they borrowed from friends and family before the ALP and in 2014. 46% of respondents reported that they never borrowed from anybody in 2014 as compared to the 35% who also never borrowed before the introduction of ALP in 2010. Another 28% also claimed they “did not borrow often” in 2014 as compared to the 20% before ALP. On the other hand, 45% of respondents reported that they consistently borrowed often or very often from friends and family before the introduction of ALP intervention in 2010 but reduced to 25% in 2014. This is true as the amount of borrowing from friends and family reduced from GHC 147.53 before ALP intervention in 2010 to GHC 130.75 in 2014, thus 11% reduction in household indebtedness. It is worth noting that, the amount borrowed in 2014 includes monies borrowed from the VSLA. Indebtedness is considered as one of the underlying causes of vulnerability and the livelihood diversification like the VSLAS were designed to reduce this indebtedness and as such reduce this vulnerability. In a CVCA report by ALP on Northern Ghana, it was reported that communities are highly indebted especially for Garu-Tempene district which had more than 50% of household holding loans from different sources (ALP, 2013). The reduction in indebtedness is consistent with the mid-term report by the Nottawasaga Institute (2012) that suggests that households in most ALP communities are able to have access to loan facilities from the VSLAs and as such reduce the vicious circle of indebtedness.

As already established in Section 4.3.4, there is a strong evidence of a relationship between those who borrowed from the VSLAs and how beneficial ALP has been to the livelihood of their households (chi-square = 4.813, df=1, $p < 0.05$). This is evident from the fact that 93% of

household heads who borrowed from the VSLAs also confirmed they have benefited or extremely benefitted from the programme. Monies borrowed were used for various activities including farming, payment of school fees, investing in business (petty trading), purchasing food, payment of health bills and others. This is consistent with the finding from the CVCA conducted in 2009 and the mid-term report by Nottawasaga Institute (2012) that suggests that most monies borrowed from the VSLAs go into starting a new business, buying farm inputs, purchasing food and payment of health bills. Figure 4.7 displays the percentage pie chart showing the usage of the monies borrowed from the VSLAs.

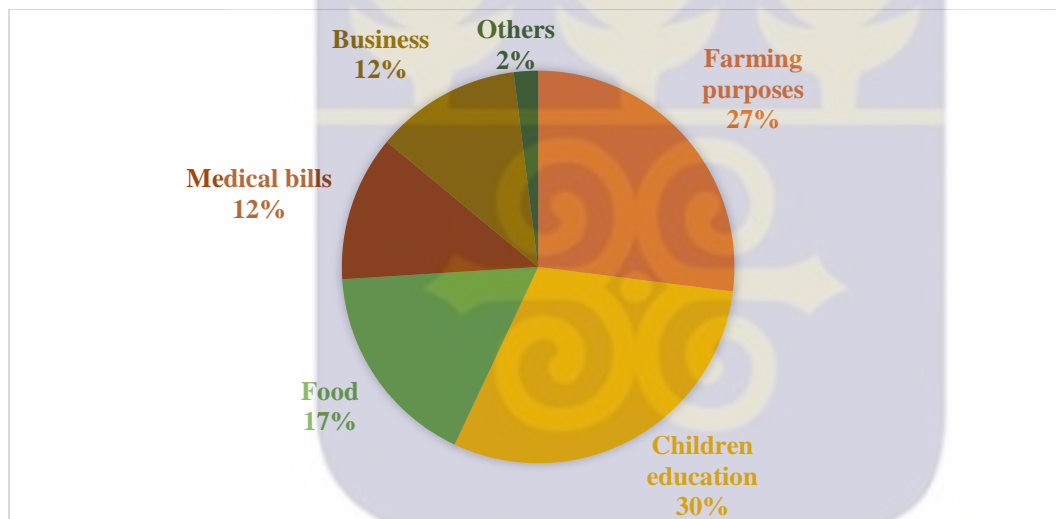


Figure 4.7: Usage of monies borrowed by sampled households.

From Figure 4.7, it can be observed that the largest proportion (30%) of monies borrowed are used for children's education especially for the payment of school fees and the purchase of other school requirements such as books and stationaries. Farming purposes including the purchase of fertilizers, pesticides and improved seeds, hiring of labourers and tractor or bullock for ploughing takes 27% of the borrowing expenditure. This confirms Madeleine McPherson report in 2011 on how borrowing from the VSLA has supported farmers in Garu-Tempene district to obtain seeds and labourers for their farms and as such helped to increase yields. During lean

seasons where there is shortage of food in most households, 17% of respondents borrow monies to feed their families. Borrowing for medical bills (payments and renewal of health insurance) and business takes 12% each. Other activities including funeral expenses, clothing and community contributions makes up the rest of the 2%. Experiences from Malawi on the use of VSLAs as reported by Tembo (2015) indicates that households are able to use monies borrowed from communal savings as security in “bad years”.

Monies borrowed from the VSLAs according to respondents goes into starting a new business or investing into an existing one. More than half (74 households) are involved in off-farm income generating activities related to a business venture. 41% of those who are engaged in a business venture are into petty trading usually the sale of provisions on tables or in small shops. 17% are into handcraft making including roof making, carpentry and basket weaving. Shea butter and dawadawa processing makes up 13% whilst pito brewing also makes up 8%. Other business ventures such as dress making, salon operation, mechanics, transportation (motor bike drivers) and so on also makes up 21% of the off-farm income generating activities. Most of the off-farm activities especially petty trading, pito brewing, shea butter and dawadawa processing are operated by women most of whom are in Saamini community while the men are largely into handcraft making activities especially those in Zambulugu. This is evident of how ALP’s aim of diversifying livelihoods in vulnerable communities in Northern Ghana (Nottawasaga Institute, 2012) has taken roots in both communities. In an ALP field story, it was reported that people especially women have the opportunity to choose a livelihood diversification strategy that empowers them economically to face the impacts of climate change (ALP, 2011b).

Although community members seem to have been economically empowered through higher average savings and reduced indebtedness respondents are unable to lend money. Only 17% are

able to lend money as compared to the 83% who are unable to. The mean monthly budget for households increased from GHC 160.40 in 2010 to GHC 197.30 in 2014 thus a percentage increase of 23% for each household. These findings are in conformity with the 49.8% increase in household budget also recorded for the Dakora region of Niger as reported by Vardakoulias and Nicholles (2014). Figure 4.8 displays the bar chart of the total mean savings, borrowing and monthly budgeting for household in both communities.

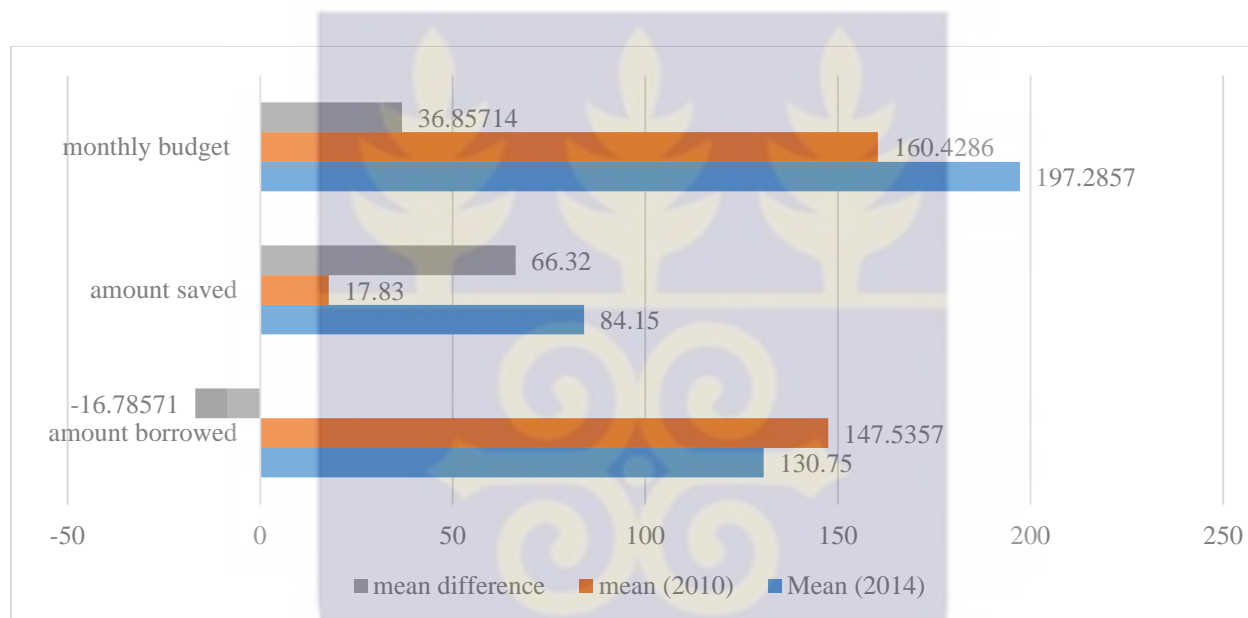


Figure 4.8: Mean and mean changes in household yearly savings, debt and monthly budget.

From Figure 4.8, it can be observed that households borrowed less from friends and other relatives in 2014 than before ALP in 2010. Savings also increased more than 360% within the same period. Although ALP educated households on effective household budgeting, monthly budgeting increases by 23% in 2014. Table 4.6 shows a general picture of economic benefits of ALP using the total mean difference of income, savings, borrowing and budgeting (without counterfactuals).

Table 4.6: Summary of economic benefits from ALP obtained households in EMD.

Economic variable	2014 mean amount (GHC)	2010 mean amount (GHC)	Mean difference (GHC)	% change	Remarks
Income from yields	553.00	279.00	+274	98%	Highly beneficial
Household savings	84.00	18.00	+66	367%	Extremely beneficial
Household borrowing	131.00	148.00	-17	11%	Moderately beneficial
Household budgeting	2,292.00	1,920.00	+372	19%	Less beneficial

Source: Authors compilation from field

From Table 4.6 the yearly budgeting is more than the yearly savings and this is consistent with existing literature which indicates that poorest households in developing countries spend more than they save (Vardakoulias and Nicholles, 2014) although the findings from this study show that increased incomes increases savings.

Borrowing also reduced fairly although households were unable to reduce spending for the year. Again, it gives a clear indication that ALP has generally been economically beneficial to households in Saamini and Zambulugu communities as both communities had nearly a double in incomes from yields, a triple from their savings and a reduction in indebtedness which is a positive sign for poverty reduction. These economic achievements would have been hard fought under business-as-usual which rather reveals extreme poverty in these communities. The findings in this study is supported by Reid et al., (2009) who noted that any effective CBA should consider poverty reduction and livelihood benefits as part of its core process. Again, the findings from the study is coherent with Wossen et al., (2014) study that suggests that access to credits reduced poverty head count in Northern Ghana as compared to without credit.

4.5 Social benefits of ALP to communities in East Mamprusi District

In this section, four social outcomes or benefits obtained from ALP is assessed. These outcomes include; food security, education, health status and gender equality. Communities were asked their perception on the changes they have observed within these social variables over the period between when ALP had not yet started and their present state, thus between 2009 and 2015. These outcomes except for gender equality were not directly supported but ALP purpose was to increase the capacity of households to build resilience against the impacts of climate change of which these outcomes were affected.

4.5.1 The benefits of ALP on food security

Most of the strategies used by ALP were to help vulnerable communities to increase resilience in the face of climate change. This is to help them manage their own resources in order to address their needs and priorities of which food security is vital. As seen in Section 4.4.2, ALP communities in East Mamprusi District consume more of their yields than they take to the market exhibiting typical subsistence characteristics. From the earlier results, it was observed that more than half (53% to 54%) of total production are consumed although less was produced in 2014 than before ALP began in 2010. Major food security crops consumed such as maize (64% to 66%) and millet (54% to 55%) are used to prepare almost all staple foods in these communities including “tuozaafi”, “koko” and “banku”. Groundnut consumption is only 31% to 33% mainly used for soups and stews and the rest are sold. Furthermore, 17% of the monies borrowed from the VSLA are used to purchase food to feed households during the hunger periods especially from March to April yearly. These findings are backed by ALP field reports that suggests that households use part of the monies borrowed to purchase food in “bad year” (Tembo, 2014; Nottawasaga Institute, 2012).

Households were asked to confirm how many months food was available in the house before the introduction of ALP and in 2014. The mean monthly results of food availability in the households (without purchasing or borrowing) shows that there were roughly five months each of food availability before the introduction of ALP and after ALP even though Saamini community had half a month (2 weeks) higher than Zambulugu community in both periods. This shows that households were unable to have access to three set of meals between 6 to 7 months without purchasing. These findings contradict the CVCA report that suggests that households in ALP in Northern Ghana do not have access to food for only four months of the year (ALP, 2013) but consistent with a study by Akudugu (2013) which noted that food available to households in Northern Ghana before the planting season do not last for more than 6 months of the year.

With the power to use savings or borrow from the VSLAs to purchase food for their households, respondents claim they had an additional average of 2 months in 2014 higher than what they did before the introduction of ALP in 2010 (thus 7 months of food availability in 2014 and 5 months in 2010). This confirms the focus group discussion results compiled in the theory of change model that reveals that ALP has helped households to be more food secured in 2014 than how they were before the introduction of the ALP in 2010. Again, the results from the study is backed by popular literature that confirms that households are more empowered to be food secured when they have access to credit to engage in off-farm activities or expand agricultural productivity or purchase food during hunger periods (Wossen et al., 2014; Tembo, 2014; Nottawasaga Institute, 2012; Nicholles and Vardakoulias, 2014).

4.5.2 The benefits of ALP on children's education

Although UNICEF's (2011) report shows that climate change impacts on food security and health care can hinder children's education, the results from both ALP communities show the

contrary. Respondents were asked how often children miss school due to illness or food unavailability and the number of days in a week they did absent themselves from school before ALP and in 2014. The results show that more children missed school in 2010 than in 2014 as 77% of respondents reported that their children never missed school in 2014 as compared to the 59% who also confirmed that their children did not miss school in 2010 due to climate related impacts. Out of the respondents whose children missed school for any of the reasons, 12% admitted their children “did not miss school often” in 2014 as compared to the 16% in 2010. Those whose children missed school “often and very often” in 2014 were only 11% as compared to the 25% of respondents in 2010.

The average number of days children in a household had to miss school in a week reduced from 2 days in 2010 to 1 day in 2014. This also means that the average school attendance for an academic term (60 days) in both communities increased from 36 days in 2010 to 48 days in 2014. For the entire academic year (3 academic terms) school going children spent an extra average of 36 days in the classroom in 2014 than in 2010. This finding is contrary to Percy and Otzelberger’s (2011) report that suggest school attendance will decrease in the face of climate change in developing countries. The findings is actually consistent with Vardakoulias and Nicholles (2014) who indicated that CBA has the capacity to increase in school attendance as discovered in the Dakora region in Niger between 2009 and 2013.

In an interview the head community monitor in Saaministated:

Through the CAAPs the community monitors were able to negotiate at the district assembly for a junior high school to be built in the community. This initiative I believe has gone along to the reduction in student absenteeism and increased attendance at

school. Our children were no longer walking long distance to Lamgbensi to attend school.

Furthermore, community members reported that school absenteeism was also due to parents' refusal to let their children go to school especially during planting and harvesting months because they had to help in the farm. Before ALP came to Zambulugu community, community members reported that there were frequent cases where parents often sought permission from school authorities to take their children to farm during planting or harvesting periods. This is consistent with Nenova-Knight's (2011) study that noted that children become labourers as a necessity in order to cope with climate change.

Again, respondents were questioned on the frequency in which they are able to afford their children's education before the ALP and in 2014. Quantitative results showed 74% of respondents who could "not afford or hardly afford" the payments of their children's education within the period before ALP was introduced. In 2014, 41% of the respondents also reported they could "not afford or hardly afford" their children's education. More of those who could afford on a regular basis increased from 26% in 2010 to 59% in 2014.

From the focus group discussions in both communities, community members reported that even though the cost of education has increased especially for those in the senior high schools, they are able to access loans from the VSLAs or sell their crops at a high price-value to meet their children's educational needs which was not the case before ALP was introduced. Some of the community members in Zambulugu community also reported that they have been able to transfer their children from the government or public school in the community to private schools in Nalerigu.

Before ALP came my children were in the public primary school in the community. After few years of ALP intervention in the community I can now afford a weekly tuition of GHC5.00 for my children's education in a private school in Nalerigu.

A respondent from Zambulugu community.

As observed in section 4.4.3, 30% of the loans obtained from the VSLA are used for children's education particularly the payment of school fees and buying of books and stationary. Although most household heads (89%) may not have had the opportunity to have any form of formal education, 97% of them have found the need to use the opportunities ALP has provided to put their children into school. This shows how ALP communities see their children's education as a long term adaptation strategy. This is also consistent with other studies on CBA that suggest that the VSLAs has help parents to afford their children's education (Tembo, 2014; ALP, 2011a; Vardakoulias and Nicholles, 2014).

4.5.3 The benefits of ALP on health care

The impacts of climate change on the public health of vulnerable communities is expected to exacerbate in the 21st century (Poutiainen et al., 2013) and as such the need to address it appropriately will also be key in this century (Lesnikowski et al., 2013). ALP does not directly tackle public health issues relating to climate change but the indirect outcomes from building communities capacity and resilience against the impacts of climate change is expected to have an impact on the public health of communities. Communities reported the most frequent illness they suffer in their households. Figure 4.9 shows the percentage of most frequent illness in sampled households.

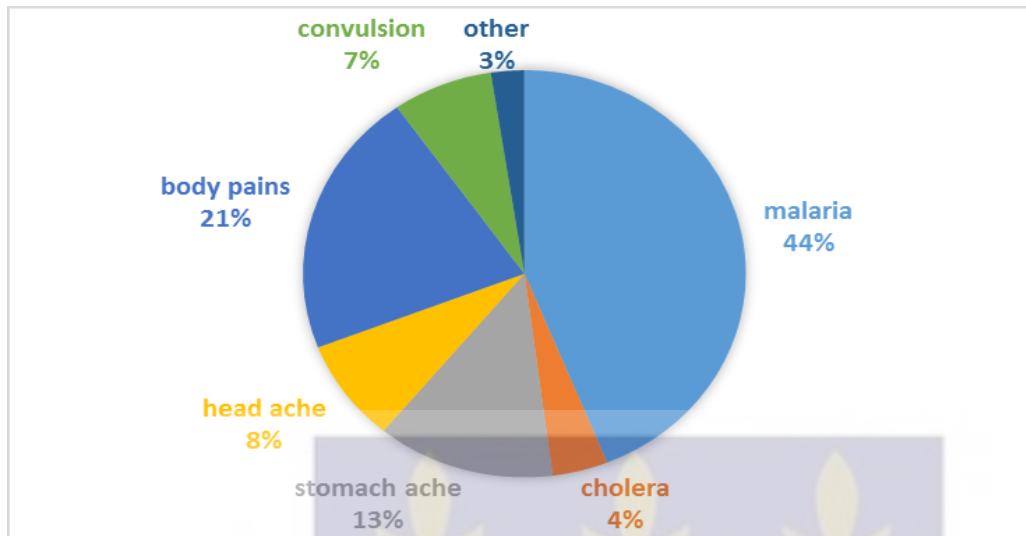


Figure 4.9: Most frequent illness in sampled households

From the Figure 4.9 above, it can be noticed that malaria (44%) is the most frequent illness in households in these communities. Through frequent physical activities on the farm, 44% reported of frequent body pains including joint pains. 13% complained of stomachache, which could be due to the unhealthy drinking water system in the communities. Headache (8%) and convulsion (7%) which mostly affect children also perceived to occur as a results of the high intensity of the sun in that part of the country. Cholera (4%) was the least frequent reported illness in the communities. Other illness (3%) such as stroke and onchocerciasis was also reported. This study is coherent with Poutiainen et al., (2013) who indicated that climate change will increase the incidence of vector borne diseases like malaria in most developing communities in sub-Saharan Africa.

Households were asked how often do they got ill and as a result were unable to go to work or school before ALP was introduced and in 2014. The results obtained revealed that 83% of households in 2014 never suffered any form of serious illness or had little illness, which was a big improvement over the 66% who reported same before ALP. As much as 44% of respondents

admitted that their household suffered serious illness in 2010 that they were unable to do anything about as compared to the 17% who were in the same health condition in 2014.

Respondents who admitted they had one form of illness or the other were further probed into how many months they fell ill before ALP and in 2014. The results showed there was not much significant change between the number of months households fell ill before the ALP and after the ALP. For instance, the average number of months households fell seriously ill in 2014 was two months and 14 days as compared to the two months and twenty days in 2010. This also means that there was an average of nine months ten days of complete health in 2014 better than the nine months sixteen days before the ALP began in 2010. Although the months of complete health did not considerably change for those who complained of serious illness, those who “never had any form of illness” in 2014 were 37% as compared to the 18% before the ALP thus showing an improvement of 19%. Similarities of improved health condition from ALP communities in Niger was drawn as there was improved health for community members in 2013 than before CBA began in the communities in 2010 (Vardakoulias and Nicholles, 2014).

From the earlier discussion in section 4.4.3, both communities use 12% of the monies borrowed from the VSLAs to cater for medical bills especially for renewing expired health insurance, buying medicine and paying for medical treatment bills.

Am always grateful to the ALP for saving my husband's life. I was able to borrow some money from my VSLAs group to supplement the little I had to cover for my husband's surgery expenses. Which would not have been possible if ALP did not exist in the community.

A respondent from Saamini community.

This is consistent with literature that suggests that households borrow to attend to medical bills or buy health insurance scheme (Tembo, 2014; Nottawasaga Institute, 2012). Another ALP community monitor in Saamini community also commended the ALP for the advocacy training they received which has enabled the community to lobby for the Community Health Improvement Services (CHIPS) compound. Due to this, community members need not walk long distances to Lamgbensi in order to access a health facility which used to be the case before ALP was introduced.

4.5.4 The benefit of ALP on gender equality and women empowerment.

ALP considers gender inequality as one of the main causes of vulnerabilities in communities. From this premise, ALP took pragmatic measures to bridge the gender gap between men and women through participatory approach especially in the CAAPs and the PSPs. The results from the field showcase the positive effort done by the programme on gender equality and women empowerment. Respondents were asked how they saw women participation in decision making in their households and in the community before ALP was introduced and in 2014. From the analysis, 94% of the respondents admitted that women in their households and in the community were not given the opportunity to contribute to decision making before ALP began in 2010. This is in line with McCright (2010), who indicated that although women understand and are concerned about issues of climate change than their male counterparts, their knowledge is usually under estimated. With the introduction of ALP, households in the community were taught the need to engage women in the decision making process and this has resulted in an overwhelming 96% of the respondents agreeing to the fact that women are now allowed to participate in the decision making process in the household and community as compared to 4% before the ALP began. A community monitor in Saamini praised ALP by saying:

Before ALP came in 2010, men and women never sat together to make decisions. Whatever the men in the community said was final and binding to the women but with the introduction of the ALP men and women sit together to make decisions and the views of women are recognized in the decision making process.

This finding is a huge milestone for ALP activities in East Mamprusi district and is confirmed by the Nottawasaga Institute (2012) in the mid-term review of ALP. Again the findings is agreeable with Gyang (2012) and Percy (2012) that the harsh impact of climate change at the local level is creating an opportunity where communities are appreciating the need for gender equality in development.

Furthermore, respondents were asked whether they had observed any changes in the roles women play in their households and in the community and what kind of changes they had observed. 95% percent confirmed they noticed changes in the roles women play in their household and the community since ALP came as compared to the 5% who maintained they had not observed any changes. According to 27% of the respondents (largely males), the VSLAs has given opportunity to women (wives) to support their homes financially as they often borrow to pay children's school fees, pay medical bills or buy fertilizer for their farms. Financial responsibility used to be the sole role of the man but now women are actively supporting husbands since they largely patronize the VSLAs than men and can borrow or withdraw from their savings. Evidence supports the findings from communities in ALP communities that women outnumber men in the use of the VSLAs and as such they are usually economically empowered more than the men (Nottawasaga Institute, 2012).

Again, 20% of the respondents also said women have become more team players than it used to be when ALP was not in existence. This has resulted in unity among couples since husbands

cannot do anything without consulting their wives. Another 19% of respondents said they had observed women in their households and community transformed from being cowards and shy to being bold and active participants in the family and community decision making process. 18% also confirmed that women are now symbols of respect in the community as they are allowed to own farmlands which was not the case some years back before ALP was introduced. According to 15% of the respondents, women were not allowed to lead men especially in Zambulugu community but with the introduction of the ALP women are now leading as community monitors and VSLAs leaders locally known as “Magagia”. Saamini community has had the better share in gender participation than Zambulugu largely because it is one of the two communities in the Northern region that has a woman as the community chief (“Poa Naa”). This finding is also confirmed by Wairimu Ngugi in a field story for ALP where he noted that women in Saamini community are actively involved in community adaptation initiatives which could be a result of their long standing traditions on women leadership (ALP, 2011c). Again, the outcome of this study is backed by Percy and Otzelberger (2011) who noted that both men and women are taking new roles and responsibilities as well as working together at the local level to cope with climate change impacts.

Female headed households seem to have benefitted from ALP more than the male headed households. Records from data analyzed shows that 77% of female headed households benefited or extremely benefited from the programme as compared to the 65% of male headed households who did. This is evident from the change in average annual savings of females between 2010 which was GHC 74.60 higher than that of the male headed household which was GHC 65.30. Although the average of crop production for male headed household was higher (1,064kg/21bags in 2010 and 750kg/15bags in 2014) than female headed households (613kg/12bags in 2010 and

526kg/10.5bags in 2014), the change in production shows female headed households lost less (87kg/1.5bags) than the male headed household who lost 314kg/6bags. More female headed households (59%) are also actively involved in alternative livelihood (off-farm) activities than male headed households (51%). Again women in Saamini community enjoyed the highest form of benefits from the ALP as 94% of female headed households reported they had benefited or extremely benefited from the programme as compared to the 59% of women who did in Zambulugu community. This finding is consistent with Bryan and Behrman (2013), who indicated that women in the household are likely to choose CBA strategies that bring long term food and extra opportunity to feed their families.

From focus group discussions, it was observed that women were able to speak publicly without any intimidation from the men. One community member in Saamini stated:

I thank ALP for helping my wife overcome shyness and enabled her to boldly speak publicly during community meetings when she was made a “magagia” (women’s leaders). This was not the case before the introduction of ALP.

According to Lambrou and Nelson (2010), there are differences in choosing a longer term of adaptation strategies between men and women such that women in Northern Ghana prefer diversifying their livelihoods locally than the male counterparts who usually migrate as a coping strategy.

In conclusion, the social benefits of ALP has been very visible in food security, education, public health, gender equality and women empowerment. Table 4.7 shows the summary of the social benefits obtained from ALP.

Table 4.7: Summary of social benefits from ALP obtained by Households in EMD.

Social Variables	2014 mean	2010 mean	Mean Change	% change	Remarks
Food Availability (days)	210	150	+60	40%	Very Beneficial
Children's Education (days)	144	108	+36	33%	Beneficial
Public Health (days) (for only those who were ill)	290	284	+6	2%	Moderately beneficial
Gender equality (Frequency of respondents agreed women participate in decision making process)	134	6	+128	91%	Highly beneficial

Source: Authors compilation from field

From Table 4.7, it can be identified that ALP has been beneficial to households in both communities thus giving them the capacity to increase food security, educate their children, reduce incidence of illness and providing the participatory opportunity for women to support men the CBA process.

4.6 Challenges and sustainability of ALP

The operations of ALP like any other intervention was faced with different limitations. In this section, the study focuses on these limitations of ALP from the community to ALP implementing agency level. Secondly, the study examines whether the ALP is sustainable after operations in the district end despite all the prevailing challenges.

4.6.1 Challenges in ALP operations

Three major challenges are identified for ALP operations in the communities in East Mamprusi district. These includes; challenges from within ALP communities (Saamini and Zambulugu), challenges from the partner NGOs (PARED, Eagle FM and EMD assembly) and challenges from the implementing agency (CARE International).

4.6.1.1 Challenges within ALP communities.

Respondents were asked whether they have observed any challenges with the ALP ever since its operations began in 2010. From the analysis, 28% of the respondents claim they have not seen any challenges with the ALP as compared to the majority of the respondents (72%) who admitted they have noticed some challenges with the ALP operations within the community. Seven major challenges were reported by respondents in both communities and they include the following;

Firstly, the biggest challenge cited by respondents (39%) in both communities was the lack of distribution of small ruminants. According to respondents small ruminants such as goats and sheep were not given to households to diversify their farming activities in order to cope during the lean season. Although communities were promised small ruminants during the course of the programme, that promise never materialized. From the earlier analysis in Section 4.4.1, it was observed that there was a reduction in the average farm animals in 2014 especially for livestock which reduced by a single goat or sheep for both communities. This may be evidence that ALP did not do enough to support them in this area. One respondent remarked:

ALP could have scored a 100% for me if they had given out goats and sheep as these ruminants can withstand climate change impacts better than our crops do. We could be engaged in keeping and selling these ruminants to make extra money during the lean season than go to the city as “kayayie” (head porters).

A respondent from the Zambulugu community

Contrary to the findings in Ghana, in Garissa County in Eastern Kenya, ALP directly supported pastoralism which is the main livelihood strategy and also supported diversification into drought resistant agriculture (Nicholles and Vardakoulias, 2012).

Secondly, 17% of the respondents claim ALP was not consistent in the distribution of farm input such as fertilizers, pesticides and seeds for their farms. According to them, ALP collaborated with MoFA in East Mamprusi and supported farmers with seeds, fertilizers, tractors to plough and even extension services in the early stages of their operations but these services stopped along the way. Among these respondents were those who claimed they never had any support from ALP in relations to farm inputs distribution or extension services on their farms. This may also be partially responsible for the reduction in yields for 2014 in both communities. According to Wossen et al., (2014) increases in cost of production also cause farmers to resort to traditional systems of farming which is unproductive.

Thirdly, 14% of the respondents perceive the time consuming nature of ALP was a big challenge. They complained that there are too many meetings within the ALP process which takes away a lot of time especially during the planting season. Some community monitors also expressed dissatisfaction in the long distances they have to travel to attend meetings in Tamale or Bolgatanga which takes away much of the productive hours they could have used to work on their farms. Another community member in Saamini complained:

Whilst others are actively working on their farms during the planting hours, VSLA meetings delays me and reduces the time I could have spent on the farm.

According to some community members, the time consuming nature of the programme is the reason for the frequent absenteeism from ALP community meetings which actually hinders the participation process of the programme in these communities. This challenge is consistent with the ALP mid-term report, which suggested that some activities of the ALP in some communities in Ghana, Kenya and Mozambique was reported to be repetitive and time consuming (Nottawasaga Institute, 2012).

Fourthly, although the VSLAs have been very vital in the ALP operations in the district, 11% of the respondents complained that there is no access to an external loan service apart from what they already contribute. This challenge according to them limits the amount of money an individual can borrow from the VSLAs and that the access to external loan facilities from rural banks and credit unions in the district could help them purchase farm inputs and expand production. Some also complained that due to lack of collateral, they are unable meet the requirements or conditions to obtain these external loans on their own and suggested it would be helpful if ALP could serve as a guarantor for these loans. Spires et al., (2014) and Ebi and Semenza (2008) recognized that the availability of funds at all levels in the CBA process is necessary and is also considered as one of the main challenges limiting effective implementation of CBA strategies in communities.

The fifth challenge reported by 8% of the respondents was on the unfulfilled promises made by ALP to communities. These respondents reported that ALP promised to distribute small ruminants (goats and sheep) and farm inputs (fertilizers and seeds) but it was never fulfilled. Members of Saamini community in a focus group discussion also complained that they were promised to receive the cassava multiplication intervention but that promise was also not fulfilled. Moreover, there have also been instances where ALP informed the community of a visiting person or team and the community gathered for hours waiting for the team or individual only to be disappointed by them not showing up. This to them, is part of the break in promises by the programme. This challenge is usually a communication gap between stakeholders which Spires et al., (2014) considers as one of the major challenges in most CBA processes.

The sixth challenge was made by 5% of the respondents who reported that ALP focused too much on the group and community rather than the individual households who make up the

community. For instance, respondents in Zambulugu community complained that the cassava multiplication and the block farming was done in groups and this they believe did not benefit them as much as it would have if the assistance had been given to individual households. One respondent at Zambulugu complained:

I have not had access to the early bulking cassava cuttings we were promised, it is only in the hands of the community monitors.

In the Zambulugu community, the fenced cassava multiplication gardens are in the backyards of some community monitors who are expected to keep it and distribute the cuttings to the community members to plant in their farms. Given the collective nature of CBA, participation must be conducted in such a way that all households in the community feel involved and are not left out. Ebi and Semenza (2008) recognized there is the need for an effective CBA participatory approach that includes all members and groups in the community.

The seventh and the last major challenge reported by 4% of the respondents was about the bureaucratic nature of ALP in terms of resource acquisition and distribution. These were mostly community monitors who reported that before ALP gives any support to a community it has to go through different channels including PARED, the district assembly and other local institutions before it comes to the benefitting community. This to them usually causes problems between communities and the institutions involved as there could be changes to suit the priorities of the institutions and not the communities. This finding is consistent with the study by Simane and Zaitchik (2014) that indicates that bureaucracies in CBA procedures usually take so long that it hinders the adaptation process to the beneficiaries. Other challenges indicated by 3% of the respondents included language barrier, inability to utilize technical information, breakdown of rain gauge and the CIC.

Respondents were asked whether they have personally expressed these challenges to the ALP or PARED officers at any community meetings before. The results revealed that 70% of the respondents have openly expressed dissatisfaction of these challenges to ALP and PARED officers who join them for community meetings while 30% have never complained about these challenges to any official. Respondents who said they have openly addressed the challenges they have observed with the ALP to officials were asked if they have noticed any of their concerns being addressed. 95% of them said they have not seen any of their concerns being addressed as compared to the 5% of the respondents mostly community monitors from Saamini who said they have seen something done to address their concerns. Community monitors in Saamini said they have now decentralized their meeting system to places closer and central to most communities. They now have some meetings at Nalerigu which is closer to them than Tamale and Bolgatanga. Again, some have been given motor bikes to help them attend meetings outside their communities.

4.6.1.2 Challenges within ALP partner organizations

In East Mamprusi district ALP is in partnership with a PARED (a local NGO), Eagle FM (local radio station) and the East Mamprusi District assembly to help facilitate their activities in the various communities within the district. Although these organizational partnerships in the district had seen much success the following challenges are from secondary sources of information (presentations by PARED, Eagle FM and EMD assembly during ALP reflection meeting in January 2015) on the challenges they faced as partner organizations working at the grass root with ALP.

First, there is not enough motivation for ALP community monitors, regardless of the tedious work involved in going around, to mobilize people for community meetings and activities. There

are inadequate resources such as motor bikes, bicycles and mobile phone credit to make contact with community members to attend ALP meetings. Again, these resources are necessary to help monitors attend meetings in and out of the communities. For instance, community monitors in Zambulugu usually walk a long distance of about 5 kilometers to Nalerigu (location of PARED office) for meetings, to make enquiries or to give reports. The work of the community monitors was recognized in the study by Gyang (2012) as cadre of expertise who serve as a chain between partners and the community serving different purposes such as community extension and mobilization.

Secondly, there are still some challenges with the operations of the VSLAs even though the successes are very visible. For instance, non-adherence to the constitution regarding the use of the VSLAs especially rules relating to savings and borrowing from funds. Some community members particularly those who do not have any off-farm economic activity are unable to contribute their expected weekly quota. This non-adherence to the VSLAs guidelines has led to high levels of default payments in some VSLAs groups. There is also the issue of no adequate opportunities for income generation groups and farmer groups to access loans from financial services in the district. The mid-term report recommended that there should be support from external banking services such as loans and bank accounts to serve as a backup for the use of the VSLAs and should be done under careful monitoring.

Thirdly, the livestock initiative promised by ALP never materialized in the communities PARED worked with. These have reduced livelihood adaptation options for ALP communities in the district. Unlike earlier initiatives by the Presbyterian Agriculture Station in Lamgbensi (PAS-L) and OXFARM which gave start-up livestock to communities many years before ALP came, PARED did not receive any of such assistance to support communities they worked with. Again

the cassava initiative was taking root in the district but the business outlook was lacking value chain for cassava. In the Dakora region of Niger, local NGOs were given assistance to directly support ALP communities in livelihood diversification like the small ruminants, as it was also the case for ALP communities in Garissa County in Kenya (Vardakoulias and Nicholles, 2014).

The fourth challenge reported by PARED includes the disaster volunteer groups who were not well equipped with tools like wellington boots, whistles, cutlasses and knap sack prayers to fight bush fires. There was also institutional-staff turnover in PARED, which affected the activities being carried out within the communities.

The fifth challenge as reported by the management of Eagle FM was about the nonexistence and the constant breakdown of the CICs in some ALP communities. For instance, Zambulugu community does not have a CIC whilst the CIC in Saamini community was constantly breaking down. Again, frequent power outages in the district hinders transmission and the adequate preparation of Panel before the programme. This findings agree with Rodima-Taylor et al...(2012), who emphasized that the lack of adequate and sufficient climate information about the community in question can mislead practitioners and researchers in the design of an appropriate CBA strategy for a community.

The sixth and last set of organizational challenges were expressed by the East Mamprusi district assembly also reported that the inadequate availability of funds to up-scale the CAAPs to different communities in the district was a major challenge. Another challenge faced by the district assembly was their inability to make follow-ups to communities to verify the usefulness and the application of the weather information obtained through the PSPs. Furthermore, there is the challenge of the district assembly's inability to integrate all development issues raised during the CAAPs into the District Mid-term Development Plan (DMTDP). This challenges are

consistent with Grubels (2013) compilation of experiences of CBA in West Africa which reveals financial and technical difficulty for CSOs and NGOs usually creates a problem for CBA upscaling.

4.6.1.3 Challenges with implementing agency

The lead coordinator of ALP reported on the two main challenges faced by CARE International in the implementation of the ALP in Northern Ghana.

Firstly, the problem of facilitating effective balance of various competing interest amidst very limited resources is a major challenge to ALP/CARE. Trying to satisfy the various interest groups such as partner organizations, community members, hardworking community monitors and other stakeholders with different needs and priorities is very challenging and puts constraints on the limited funds available for ALP activities. Grubels (2013) report also confirms this study indicating that limited funds available to CBA projects amidst the competing interest have challenged the CBA process in West Africa over the years.

Secondly, there is the high level of attrition for the local implementing partners as well as CARE/ALP technical team. Due to the hard work involved in getting ALP activities done in the various communities, staff working at both the local and regional level easily wear down since they have to go through all the communities frequently to organize meetings and carry reports. The poor transportation system including bad roads and long distances between communities in the ALP districts usually makes the work tiresome.

4.6.2 The sustainability of ALP in East Mamprusi District

ALP operations in the Saamini and Zambulugu communities have seen many successes as well as challenges as identified in the previous sections. This study went a step further to ask households from both communities whether they feel they have obtained enough capacity to be

able to continue on their own after ALP ends operations in the district. From the analysis, 96 respondents (69%) said they feel ALP has given their households enough capacity to continue on their own whilst 44 of the respondents (34%) said they will not be able to make any gains after ALP ends operations in the district. This sustainability level of ALP is consistent with a CBA study conducted by Simane and Zaitchik (2014) which suggests that CBA interventions which are sustainable are those that are bottom-up participatory in nature and provide a means of financial assistance to farming households.

Chi-square test was conducted to identify the strength of the evidence of a relationship between a respondent's ability to continue after ALP and factors such as the community a respondent resides in, how beneficial ALP has been to their household and the year the household received the intervention from ALP. It was evident from chi-square test that there is a very strong evidence of a relationship between the community a respondent resides in and the ability to continue (chi-square = 11.403, df=1, $p < 0.001$). For instance, 85% of the respondents from Saamini community said they felt they had the capacity needed to continue after ALP as compared to 53% from Zambulugu community. For those who felt they could not continue after ALP, 15% were from Saamini and 47% from Zambulugu. Even though both communities have more than 50% of the respondents who can continue, ALP may be more sustainable in the Saamini community than in the Zambulugu community. The finding is in line with Kyler (2015) study that suggests that choosing an adaptation strategy that is sustainable is based on the location or the community of an individual or household.

How beneficial ALP has been to a respondent was also found to be strongly related to the relationship with their household's capacity to continue after the ALP (chi-square = 29.175, df=1, $p < 0.001$). This evidence is factual as 83% of the respondents who benefitted or extremely

benefited from the ALP admitted their households can continue to adapt after ALP as compared to the 38% of respondents who had little benefit or no benefit from the ALP. Only few respondents (17%) who felt that they could not continue on their own after ALP ends its activities in the district benefitted or extremely benefited from ALP as compared to the majority (62%) of those who had little benefit or no benefit. This results proves that households are able to sustain their benefits from ALP strategies when they feel their livelihoods have been positively affected by ALP initiatives in their communities.

Again, there is a very strong evidence that respondents who received the intervention in 2010 when ALP started will be more able to continue after ALP than those who received the intervention in 2011 and beyond (chi-square = 11.403, df=1, $p < 0.005$). The evidence shows that majority of respondents (79%) who feel they can continue after ALP received the intervention in 2010 as compared to the 52% who received from 2011 and beyond. Only 21% those who cannot continue received the intervention in 2010 as compared to the 48% who received in 2011 and beyond. This means that the earlier a household receives the intervention the more benefits they will receive and the more sustainable it will be for them. This finding is consistent with Simane and Zaitchik (2014) which proved that many CBA interventions are effective in the early stages where external investments are active.

The 34% of respondents who felt their household would not have the capacity to continue on their own when ALP ends its operations in the district were further probed on the reasons why they felt their households would not be able continue using the intervention. The three major reasons given by respondents are illustrated in Figure 4.10:

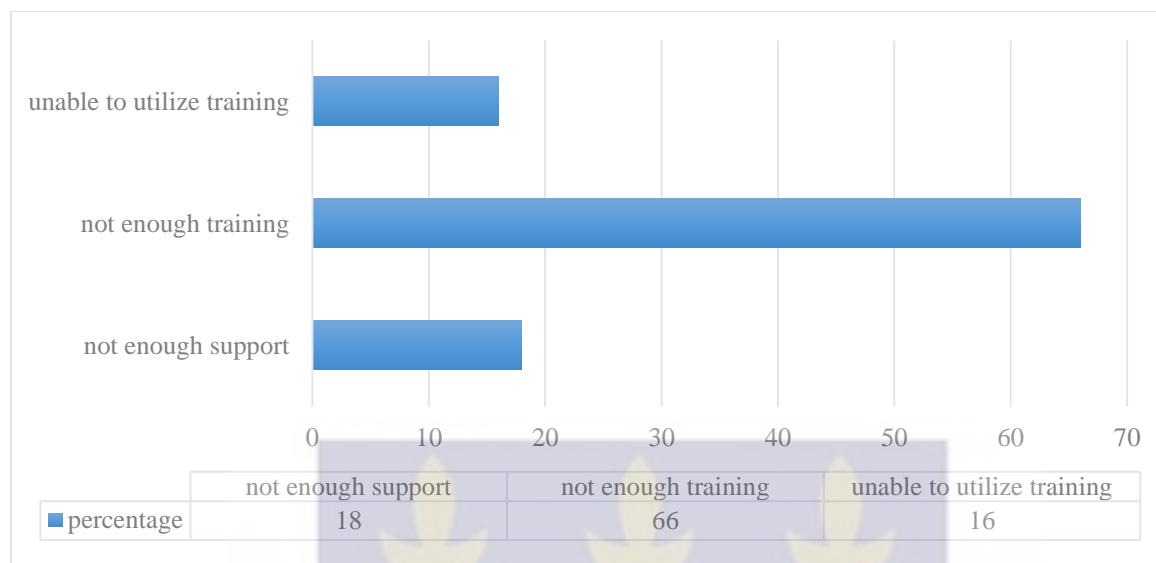


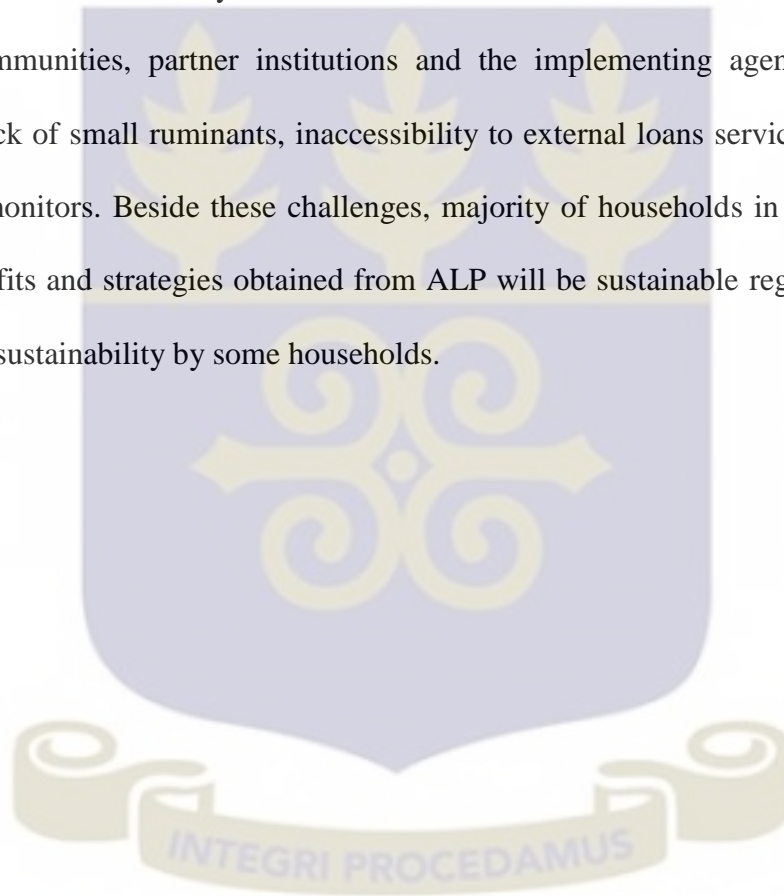
Figure 4.10: Reasons for the inability to continue after ALP

From the Figure 4.10, 66% of respondents claimed they would not be able to use the intervention from ALP after its operations ends in the district because they felt their households had not had enough training to be able to make any long-term gains after the current intervention ends. Another 18% said although they can continue, they felt the current support from ALP in terms of fertilizer distribution and training was not enough to carry them through a long period of time. Lastly, some of the respondents (16%) claimed they were unable to use the trainings taught by ALP due to its technicality and language barrier. These reasons are supported by Grubels (2013) and Spires et al., (2014) who indicated that communication problems including technicality and language can render CBA ineffective to some community members who may eventually not find the intervention useful. Furthermore, Simane and Zaitchik (2014) findings to the unsustainability of CBA is related to inadequate training, lack of financial support and lack of participation by community members.

ALP like any other community-based initiative has its challenges at the community level, partner organization or institutional level and the implementing agency level. These challenges raise

questions as to whether households can continue to use strategies to make gains without ALP's support in the long term. Even though some may fail to use strategies from ALP to make future gains, it is clear from the above discussion that most households will be able to use strategies to make future gains after the ALP intervention is over in the districts especially for people in the Saamini community.

In conclusion ALP has been very beneficial to communities but has also had its challenges arising from communities, partner institutions and the implementing agency. Among these challenges are lack of small ruminants, inaccessibility to external loans services and motivation for community monitors. Beside these challenges, majority of households in both communities confirm the benefits and strategies obtained from ALP will be sustainable regardless of the few reasons for its unsustainability by some households.



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the key findings of the study. Conclusions based on the research problem and objectives of the study are also presented in this chapter. The chapter ends with policy recommendations based on the findings and conclusions of the study.

5.2 Summary

As climate change impacts challenge the very livelihoods of households in vulnerable communities, the need to focus on robust adaptation interventions will be key for the survival of these communities. The study sought to identify the CBA strategies used by ALP to achieve specific socio-economic benefits and the challenges that have resulted from the adaptation process as well as the sustainability of the programme in two communities in East Mamprusi district in Northern Ghana. A combination of qualitative and quantitative methods were used to analyze primary and secondary data through key informant, community and household interviews of beneficiaries of the programme.

The results from the study identified four broad intervention areas used by ALP and an enabling strategy in the 40 ALP communities across four countries including Ghana, Niger, Kenya and Mozambique. These strategies included Climate Resilient Livelihoods (CRL), Disaster Risk Reduction (DRR), Local Adaptive and Organizational Capacity (LAOC), Addressing Underlining causes of Climate Change (ACCC) and an Influencing Policy (IP). A theory of change model for the two ALP communities under study revealed that the long term prevailing conditions under business-as-usual (if there was no intervention) would have resulted in extreme poverty which would have also resulted in many other negative social outcomes such as food

insecurity, poor health conditions, school drop outs and gender injustice. The theory of change model developed for CBA shows the current economic and social impact on both communities under ALP including increased income and savings, food security, improved health and women empowerment.

Five main CBA strategies used by ALP were found to be of socio-economic benefit to households in the district. These strategies include: the village savings and loans associations (VSLAs), seed and cassava multiplication, conservation agriculture, early warning systems (CICs and PSPs) and the climate adaptation action plan (CAAPs). The VSLAs were reported by households to be the most relevant and beneficial strategy especially for female headed households and households in the Saamini community. Most households in both communities found ALP to be very beneficial particularly for households in the Saamini community, households who received the intervention in 2010, households who used off-farm diversification strategy and households who borrowed from the VSLAs.

The economic benefits such as high yields, increased income and savings, reduced borrowing rate, efficient budgeting and the ability to lend as reported by communities between the year ALP started in 2010 and the year of the study in 2014 were examined to identify the extent of economic impacts. The results from crop production showed a reduction in yields for the three major crops (maize, millet and groundnut) cultivated in both communities for 2014, although the Zambulugu community performed better than the Saamini community. There was marginal reduction in headcount recorded for both poultry and livestock (sheep and goats) production in 2014 for both communities. There was no significant change in the part of crop production consumed and the part which was sold for both periods. Both communities as a typical subsistence farming community consumed more than they sold especially for the staple crops

(maize and millet). Groundnut was cultivated largely for sale and little was used for soups and stews. While crop production reduced, the price-value of all three crops increased more than a 100% within the four year period giving households high incomes for crops sold in 2014 than before ALP began in 2010. Results at community level showed that the Zambulugu community benefited more in incomes from crop production than the Saamini community.

Household saving through the VSLAs showed a percentage increase of almost 400% in savings for households in 2014 than without the VSLAs in 2009. This demonstrated how the VSLAs were a useful livelihood diversification opportunity introduced by ALP to economically empower communities to eradicate extreme poverty, which was reported by communities to be the long term societal impact. Borrowing from friends and other relatives reduced by 11% between 2009 and 2014. Although, incomes increased and borrowing reduced for households only a few households (17%) could lend money to other households. Monthly household budgeting for both communities also increased by 23% for each household and was largely blamed on high increase in the cost of education and farm inputs.

The social benefits or outcomes of ALP including food security, improved children's education, improved health condition and the gender equality were examined to identify the extent to which households have benefited from these outcomes. The months of food availability in the household (without the ability to purchase) did not change before the ALP was introduced and in 2014. With the ability to purchase food during the lean season household monthly food availability increased from 5 months in 2010 to 7 months in 2014. Children's school attendance for the academic year in 2014 was increased by 36 days in reference to 2010, reducing their school absenteeism by 33%. Household heads noted that even though the cost of education was

higher in 2014 than before the ALP started, the intervention has empowered them to be able to afford some basic school requirements such as school fees, books, stationary and feeding.

The health outcomes for households shows that there were more people who stayed healthy in 2014 than before the ALP began in 2010. The percentage of households in both communities who never got sick increased from 19% before the ALP to 37% in 2014. There was not much change in the number of months between those who fell sick before the ALP and in 2014 as there was only 6 days of improved health condition for households. ALP made a lot of gains in bridging the gap between men and women in terms of decision making in the households and the communities in general. Almost all households confirmed that women are now active participants in household and community discourse. Their voices are now an integral part of the decision making process in the family and any gathering. They have also been empowered to become community leaders such as ALP monitors, VSLAs leaders (“Magagia”) and community project coordinators. The economic empowerment such as savings reduced borrowing; and crop production for female headed households were better in 2014 than male headed households in comparison to 2010.

The challenges observed in the operation of ALP were identified at the community level, local partners’ level and implementing agency level. At the community level, households expressed that the ALP failed to fulfill some of the promises given especially on the distribution of small ruminants and fertilizer distribution. The number of times and hours community meetings were held was also one of the major challenges which has resulted in a number of absenteeism. Even though VSLAs have been helpful, communities complained about the inability to receive external loans apart from the ones they are able to borrow from the VSLAs. There is also the challenge of ALP being too bureaucratic and group focused instead of individual assistance

focused. Other community challenges include the breakdown of community CICs, language barrier and the inability to utilize technical information.

Local partner institutions such as PARED, Eagle FM station and the East Mamprusi district assembly also expressed various challenges. PARED supported the fact that there is no external access to loan facilities to farmers groups and the small ruminant project which was promised never came to fruition. Furthermore, the constitution guiding the use of the VSLAs was usually not followed leading to mismanagement of funds. Again, there is not enough motivation for hardworking community monitors who work tirelessly to mobilize community members for meetings. The business outlook for the cassava multiplication also lacked value-chain. Both PARED and Eagle FM complained of the constant breakdown of the CICs in some communities especially in Saamini. The constant power outages also affected the transmission of programmes from Eagle FM to the various communities. The East Mamprusi district assembly also pointed out that the inability to follow up with communities after PSPs on the use of climate information was a major challenge. Moreover, the assembly also lacks funds to expand the useful CAAPs to other communities in the district. ALP implementing agency (CARE International) had challenges with trying to satisfy the needs and priorities (sometimes conflicting) of all stakeholders within the ALP. Also, due to the hard work involved in ALP operations, there is a high level of attrition among ALP technical team and the staff of partner institutions.

ALP was found to be very sustainable as majority of community members admitted that they had enough capacity to continue with the use of the strategies to achieve favourable outcomes over a long period of time. Households who were unable to continue on their own after ALP activities ends in 2015 shared the following reasons including ALP not giving communities enough support in terms of farm inputs, small ruminants and financial assistance. Furthermore, some

households complained they were unable to utilize information given to them due to its technicality. Lastly, households complained the trainings given them were not enough to be able to carry them through after the ALP intervention ends in 2015. Findings show that, a household's ability to continue on its own to make future gains without ALP support was based on the community they reside, the year they received the intervention and how beneficial ALP has been to them.

5.3 Conclusion

In conclusion, CBA is an important adaptation tool to be considered in planning any future adaptation project in vulnerable communities. The ALP by CARE International was a CBA project carried out in 40 communities across four countries in Africa including Ghana, Kenya, Mozambique and Niger. In Ghana, the intervention was carried out in eight communities within two districts namely Garu-Tempane and East Mamprusi districts. The study focused on evaluating the socio-economic benefits of ALP between 2009 and 2015 in Saamini and Zambulugu communities in the East Mamprusi district in Northern Ghana.

ALP operates in a specific CBA framework which defines the appropriate intervention to be used at a particular community due to its geographical context. The CBA strategies used in these two communities were not different from each other except for the cassava multiplication that was not available in the Saamini community and the CIC that was also not in the Zambulugu community. Even though both communities using similar CBA strategies except for the ones already indicated identified the ALP to be very beneficial, the Saamini community proved to have benefited more from the ALP than the Zambulugu community. The off-farm strategies such as the VSLAs was shown to be the most relevant adaptation strategy for the Saamini community whilst on-farm strategies such as conservation agriculture and cassava multiplication was the

most relevant strategy for the Zambulugu community. The evidence from the study shows that there is a strong relationship between how beneficial ALP has been, the community a household is in, the year they received the intervention and the type of intervention received.

Households in both communities particularly those in Zambulugu showed how they have benefited economically from the ALP using high incomes from three major crop yields even though they sold less than they consume especially for their staple crops (maize and millet). High incomes then empowered households to increase savings and reduce borrowing which was a plus for both communities though only few could lend money. Household budgets also increased significantly particularly the cost of children's education.

Socially, ALP was found to be very beneficial in the areas of food availability for the 7 months of the year against the 5 months before the ALP was introduced in both communities. The regular absenteeism before ALP was introduced has reduced and as such increased school attendance. Both communities saw more people with complete health condition in 2014 than in 2010. The wide gender gap that existed in the communities before ALP was introduced has seen major improvement as both men and women team together to make decisions for the household and the community.

ALP like any other CBA intervention had some limitations or challenges. These challenges were noticed at the community, with the local partner institutions and the implementing agency level. Some of the common challenges running through all these levels includes the failure to fulfill promise on small ruminant distribution, the breakdown of the CICs, lack of motivation for community monitors and lack of access to loans by farmer groups from financial services. ALP was found to be sustainable as close to 70% of households indicated that they would be able to

use the knowledge acquired from ALP to adapt and make gains against any future impact of climate change in their respective communities.

From the findings, the strategies used by ALP have been economically and socially beneficial to communities in the East Mamprusi district in spite of all the challenges faced. It has also proven to be sustainable after ALP exit the communities in June 2015.

5.4 Recommendations

The findings of the study have important policy relevance that could enable communities in climate sensitive regions in Ghana to effectively adapt and take advantage of the opportunity climate change presents to develop. The following are some of the key policy recommendations for government, implementing agencies and Non-governmental organizations:

- There is the need to extend successful CBA strategies used in the ALP communities to other vulnerable communities. Relevant strategies that were used in the CBA process especially the CAAPs, PSPs and VSLAs should extend to different vulnerable parts of the region and the nation as a whole. These strategies are not only helpful as adaptation strategies but they show a pathway to a participatory and proactive community development. They also contribute to national development as already demonstrated by the Saamini community which was able to engage the East Mamprusi district to advocate for a Junior high school, electricity and health post.
- Furthermore, with the help of donor agencies and government support, the five year ALP should be renewed and extended to different parts of the country and into different ecological zones. Since climate change affects communities differently based on their ecology, any future CBA intervention should also take into consideration the different ecological zones in Ghana and implement an appropriate CBA intervention. There will

also be the need to carefully study the vulnerability and adaptive capacity of these vulnerable communities within the different ecological zones in order to propose appropriate CBA strategy that can yield results which match the needs and priorities of communities.

- Again, there is the need for government through the district assemblies to continue the support and collaboration with agencies and NGOs to continue CBA projects since it has the potential to produce a “double-win” outcomes where climate change vulnerability is effectively tackled and developmental challenges are resolved as well. For instance, the “double-win” for ALP communities in EMD shows how communities are able to reduce their vulnerability and at the same time increase socio-economic outcomes.
- Furthermore, government through the district assembly has the responsibility to provide basic social amenities that could facilitate the CBA process in vulnerable communities. From the study, it was observed that, one of the reasons Saamini community benefited more and were more likely to sustain the ALP than Zambulugu community was because of the availability of social amenities such electricity, market, Junior high school, health facility and road which are not available in the Zambulugu community. These facilities serve as catalyst for community adaptation and development in general.
- Moreover, future CBA interventions in the region should give particular attention to the “quick-win” strategies that provide immediate results while gradually integrating the strategies that has a long term adaptation impact. For instance, while communities are introduced quickly to the VSLAs, cassava multiplication and small ruminants at the early stages of the project, strategies with long term impacts such as tree planting and conservation agriculture should be introduced gradually. This could prevent the “over

load of adaptation strategies” on communities and help them to identify which strategies work best and the strategies they should focus their attention on.

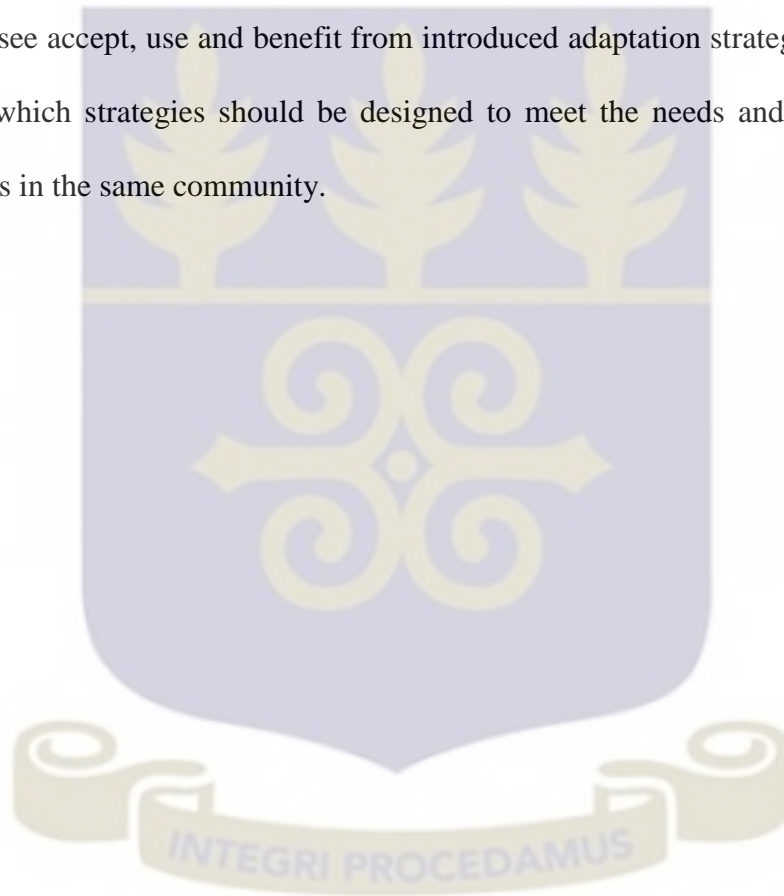
- Future CBA interventions should be particular about designing adaptation strategies that can address specific social and economic issues such as health, education, access to market and food security. Although ALP strategies provided indirect benefits especially to some social outcomes, the results achieved from these benefits would have significantly increased if they had been more specific in addressing vulnerabilities relating to these issues as they did for addressing gender inequality and poverty.
- In other to effectively measure the outcomes of CBA on the livelihoods of communities, there is the need to keep yearly quantitative records of crop yields, incomes, savings and rain information obtained from rain gauge measurements. These records are vital in order to keep track of definite successes being made from the programme. This is also necessary for the effective evaluation of the overall performance of the intervention and to enable the specific challenges to be addressed. This will also provide enough evidence for advocacy and policy.

In all, stakeholders from communities, partners and the implementing agency working together in a particular community should make the effort to synchronize their needs and priorities into a single CBA framework that would produce satisfactory results for all. This will reduce conflicts that usually result from competing interest.

5.5 Suggestions for future research

A study could be conducted to compare social and economic outcomes of households who received the intervention and those who did not in the same community. Again communities which received the intervention could be compared to communities who did not receive the

intervention in the same district. This will help to identify whether households or communities who received the intervention are socio-economically better than those who did not receive. Another study could also be conducted to look at the broad assessment of the ALP by using all 8 communities in order to establish the performance of ALP in each community and the whole intervention as a whole. The environmental assessment of the ALP can also be studied in order to build a case for CBA as a tool for mitigation. Gender studies could also be conducted to see how men and women see, accept, use and benefit from introduced adaptation strategies. This is useful to help identify which strategies should be designed to meet the needs and priorities of both males and females in the same community.



REFERENCES

- Adaptation Learning Programme. (2011a). *Empowered women lead on community-based adaptation to climate change*. Accra: CARE International.
- Adaptation Learning Programme. (2011b). *Adaptation Learning Programme in Ghana; Savings and enterprise for adaptation to climate change*. Accra: CARE International.
- Adaptation Learning Programme. (2011c). *Adaptation Learning Programme in Ghana: Women take lead in tackling climate change*. Accra: CARE International.
- Adaptation Learning Programme. (2013). *Climate change vulnerability and adaptive capacity in Northern Ghana*. Accra: CARE International.
- Adaptation Learning Programme. (2015a). *Climate Change Vulnerability and Adaptive Capacity: Synthesis and Lessons from Ghana, Kenya and Niger*. Nairobi: CARE International, Kenya.
- Adaptation Learning Programme. (2015b). *Annual reflection meeting reports (28th -29th January 2015)*. Tamale: CARE International, Ghana.
- Adger, W. N., Paavola, J., Huq, S., & Mace, M.J. (2006). *Fairness in adapting to climate change*. Massachusetts: MIT Press.
- Akudugu, M. (2013). The climate change menace, food security, livelihoods and social safety in Northern Ghana. *International Journal of Sustainable Development & World Policy*, 1(3), 80-95.
- Allen, K. (2006). Community-based disaster preparedness and climate adaptation: local capacity-building in the Philippines. *Disasters*, 30, 81–101.
- Amaru, S., & Chetri, N.B. (2013). Climate adaptation: Institutional response to environmental constraints, and the need for increased flexibility, participation, and integration of approaches. *Applied Geography*, 39, 128-139.
- Anderson, A. (2004). *Theory of change as a tool for strategic planning. A report on early experiences*. New York, NY: The Aspen Institute roundtable on community change.
- Asafu-Adjaye, J. (2014). The Economic Impacts of Agricultural Productivity Losses from Climate Change: Estimates for Ghana and the World and the Policy Implications. *Ghana Policy Journal*, Special Edition on Climate Change.
- Baas, S., & Ramasamy, S. (2008). *Community Based Adaptation in Action*. Rome: FAO Environment and Natural Resources Service Series.
- Banuri, T., & Opschoor, H. (2007). *Climate Change and Sustainable Development. Working Paper, 56*. New York, NY: United Nations Department of Economic and Social Affairs, UNDESA.
- Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544-559.

- Bell, E., Seidel, B. & Kilpatrick, S. (2013). Climate change: How scientism has neutralized health policy effectiveness for rural communities. *Journal of Rural Studies*, 32, 365-374.
- Bose, P. (2011). Community-based adaptation of tribal women to climate change in semi-arid India. Forest and Nature Conservation Policy Chair Group. *Parc. Estrat. Brasilia-DF*, 16(33), 41-52.
- Bryan, E., & Behrman, J. (2013). *Community-based adaptation to climate change: A Theoretical Framework. Overview of Key Issues and Discussion of Gender Differentiated Priorities and Participation. Working Paper, 109*. Washington, DC: CGIAR Systemwide Program on Collective Action and Property Right.
- Calzadilla, A., Zhu, T., Redhanz, K., Tol, R.S.J., & Ringler, C. (2009). *Economy wide Impacts of Climate Change in Sub-Saharan Africa. Discussion Paper, 873*. Washington, DC: International Food Policy Research Institute, IFPRI.
- Canadian Hunger Foundation (CHF). (2011). *Saving Crops, Saving Lives: the Need for More Aggressive Support to Climate Change Adaptation*. Ottawa: Canadian Hunger Foundation, CHF.
- CARE. (2010). *Community-Based Adaptation Toolkit, Digital Toolkit. Version 1.0*. Retrieved from CARE International: www.careclimatechange.org/files/toolkit/CARE_CBA_Toolkit.pdf
- CARE. (2015). *Community Based Adaptation: An empowering approach for climate resilient development and risk reduction*. Retrieved from CARE International: <http://www.careclimatechange.org/adaptation-initiatives>
- Department of Planning. (2015). *Map of East Mamprusi District*. Gambaga: East Mamprusi District Assembly.
- De Vit, C., & Parry, J. (2011). *Review of Current and Planned Adaptation Action: West Africa*. Retrieved from Adaptation Partnership (International Institute for Sustainable Development, IIDS): <http://www.adaptationpartnership.org/>
- Dinse, K. (2011). *Climate Variability and Climate Change: what is the difference?* Retrieved from Michigan Sea Grant, MSG: www.miseagrant.umich.edu/downloads
- Dodman, D., & Mitlin, D. (2011). Challenges for community-based adaptation: discovering the potential for transformation. *Journal of International Development*, 25(5), 640–659. doi: 10.1002/jid.1772.
- Dumar, P. (2010). Community-based adaptation: enhancing community adaptive capacity in Druadrua Island, Fiji. *WIREs Climate Change*, 1, 751–763.
- Ebi, K.L., & Semenza, J.C. (2008). Community-Based Adaptation to the Health Impacts of Climate Change. *American Journal of Preventive Medicine*, 35(5), 501–507.

- Environmental Protection Agency, EPA, (2008) in World Bank (2010b), Economics of Adaptation to Climate Change: Ghana, 1818 H Street NW Washington DC, USA, P 39.
- Eriksen, S., & Lind, J. (2009). Adaptation as a political process: Adjusting to drought and conflict in Kenya's drylands. *Environmental Management*, 43, 817–835.
- Etwire, P. (2010). *Adaptation Responses of Smallholder Farmers to Climate Change and Variability in Northern Ghana*. (Unpublished MPhil thesis). University of Ghana, Legon.
- European Union Climate Action. (2015). *Adaptation to climate change*. Retrieved from European Union : http://ec.europa.eu/clima/policies/adaptation/index_en.htm
- Food and Agriculture Organization. (2011). *FAO-Adapt Framework Programme on Climate Change Adaptation (pp. 37)*. Rome: Food and Agriculture Organization, FAO.
- Ghana Statistical Service. (2014). *2010 population and census. District analytical report, East Mamprusi District*. Accra: Ghana Statistical Service.
- Girof, P., Ehrhart, C., & Oglethorpe, J. (2012). *Integrating community and ecosystem-based approaches in climate change adaptation responses*. Retrieved from CARE International: http://www.careclimatechange.org/files/adaptation/ELAN_IntegratedApproach_150412.pdf
- Gogoi, E., Dupar, M., Jones, L., Martinez, C., & McNamara, L. (2014). *How to scale out community-based adaptation to climate change. Working Paper*. Retrieved from Climate and Development Knowledge Network (CDKN): www.cdkn.org/CDKN_Working_Paper_community_adaptation_Final_web-res.pdf.
- Gubbels, P. (2013). *West Africa learning event for community-based Adaptation: conference report (3rd to 6th September 2013)*. Cotonou: CCAFS/CARE/ENDA.
- Gyang, R. (2012). Community monitors take the lead on adaptation in Ghana. *JotoAfrica*, 11, 5.
- High Level Panel of Experts. (2012). *Climate change and food security. A report on Food Security and Nutrition of the Committee on World Food Security*. Rome: Food and Agricultural Organization, FAO.
- Huang, C., Vaneckova, P., Wang, X., FitzGerald, G., Guo, Y., & Tong, S. (2011). Constraints and Barriers to Public Health Adaptation to Climate Change: A Review of the Literature. *American Journal of Preventive Medicine*, 40(2), 183–190.
- Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report*. Cambridge: Cambridge University Press.
- Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability (Summary for Policymakers)*. Cambridge: Cambridge University Press.

- International Development Research Centre. (2011). *Reflections; approaching climate change adaptation as a means to reduce poverty Climate Change Adaptation in Africa Program (2010 –11 Annual Report)*. Retrieved from International Development Research Centre (IDRC): http://www.idrc.ca/EN/Documents/reflection_poverty_e.pdf
- International Institute for Environment and Development. (2009). *Community-based adaptation to climate change: an update. Briefing Report*. Retrieved from International Institute for Environment and Development (IIED): www.iied.org/pubs/display.php?o=17064IIED
- International Institute for Sustainable Development (IISD). (2003). SEI: Livelihoods and Climate Change: Combining Disaster Risk Reduction. *Natural Resource Management and Climate Change Adaptation in a New Approach to the Reduction of Vulnerability and Poverty*. International Institute for Sustainable Development, Winnipeg, Canada, viii.
- Kaaziba, D. (2015, February 2). Overview and benefits of adaptation learning programme. (P. Ansah, Interviewer)
- Kankam-Yeboah, K., Amisigo, B. and E. Obuobie (2010), *Climate Change Impacts on Water Resources in Ghana*, Ghana National Commission for UNESCO/Ministry of Education, CSIR-WRI, Accra, Pp 65-69, Retrieved on June 23, 2012 from [HYPERLINK "http://www.natcomreport.com/ghana/livre/climate-change.pdf"](http://www.natcomreport.com/ghana/livre/climate-change.pdf)
<http://www.natcomreport.com/ghana/livre/climate-change.pdf>
- Kreft, S., Harmeling, S., Bals, C., Zacher, W., & van de Sand, K. (2010). *The millennium development goals and climate change: taking stock and looking ahead*. Retrieved from www.germanwatch.org/klima/klimdg10e.htm
- Kwiatkowski, R. (2011). Indigenous community based participatory research and health impact assessment: A Canadian example. *Environmental Impact Assessment Review*, 31, 445–450.
- Lambrou, Y. & Nelson, S. (2010). *Farmers in a Changing Climate Does gender matter? Food Security in Andhra Pradesh, India (pp.82)*. Rome: Food and Agriculture Organization, FAO.
- Lambrou, Y., & Piana, G. (2005). *Gender: The Missing Component in the Response to Climate Change (pp. 42)*. Rome: Food and Agriculture Organization, FAO.
- Lasage, R., Aerts, J., Mutiso, G.C.M., & De Vries, A. (2008). Potential for community based adaptation to droughts: Sand dams in Kitui, Kenya. *Physics and Chemistry of the Earth*, 67–73. doi:10.1016/j.pce.2007.04.009.
- Lee, D.R., Edmeades, S., De Nys, E., McDonald, A., & Janssen, W. (2014). Developing local adaptation strategies for climate change in agriculture: A priority-setting approach with application to Latin America. *Global Environmental Change*, 29, 78–91.

- Lesnikowski, A.C., Ford, J.D., Berrang-Ford, L., Barrera, M., Berry, P., Henderson, J., & Heymann, S.J. (2013). National-level factors affecting planned, public adaptation to health impacts of climate change. *Global Environmental Change*, 23, 1153–1163.
- Lyle, G. (2015). Understanding the nested, multi-scale, spatial and hierarchical nature of future climate change adaptation decision making in agricultural regions: A narrative literature review. *Journal of Rural Studies*, 37, 38-49.
- Maru, Y.T., Smith, M.S., Sparrow, A., Pinho, P.F., & Dube, O.P. (2014). A linked vulnerability and resilience framework for adaptation pathways in remote disadvantaged communities. *Global Environmental Change*, 28,337–350.
- McCright, M. A. (2010). The Effects of Gender on Climate Change Knowledge and Concern in the American Public. *Population and Environment*, 32, 66–87.
- Ministry of Environment Science Technology and Innovation. (2014). *National Climate Change Policy II, Action Programme for Implementation*. Accra: Ghana Ministry of Environment, Science, Technology and Innovation, MESTI.
- Mitchell, P., & Borchard, C. (2015). Mainstreaming children's vulnerabilities and capacities into community-based adaptation to enhance impact. *Climate and Development*, 6(4), 372-381.
- Müller-Kuckelberg, K. (2012). *Climate Change and Its Impact on the Livelihood of Farmers and Agricultural Workers in Ghana*. Accra: Friedrich Ebert Stiftung-Ghana and Ghana Agricultural Workers Union (GAWU).
- Nelson, W., & Agbey, S.N.D. (2005). *Linkages between poverty and climate change: adaptation for livelihood of the poor in Ghana. A Technical Paper*. Accra: National Development Planning Commission.
- Nenova-Knight, P. (2011). *Children and Climate Change: Children's vulnerability and their capacity as agents for community-based adaptation in Mongolia*. UNICEF East Asia and Pacific Regional Office (EAPRO).
- Nicholles, N., & Vardakoulias, O. (2012). *Counting on Uncertainty: The economic case for community based adaptation in North-East Kenya*. Retrieved from CARE International: http://www.careclimatechange.org/files/adaptation/Counting_on_Uncertainty_July12.pdf
- Nottawasaga Institute. (2012). *adaptation Learning programme (ALP). Final report, Mid-term review*. Nairobi: CARE International.
- Paudel, S.N., Khatri, D.B., Ojha, H., Karki, R., & Gurung, N. (2013). Integrating Climate Change Adaptation with Local Development: Exploring Institutional Options. *Journal of Forest and Livelihood*, 11 (1), 1684-0186.
- Percy, F. & Otzelberger, A. (2011). Why mainstreaming gender into community-based climate change adaptation is a priority. *otoAfrica*, 9, 1.

- Percy, F. (2011). What is Community Based Adaptation? *JotoAfrica*, 9, 1.
- Percy, F. (2012). Community Based Adaptation - Experiences from Africa. *JotoAfrica*, 11, 1.
- Picketts, I.M., Werner, A.T., Murdock, T.Q., Curry, J., De'ry, S.J., & Dyer, D. (2012). Planning for climate change adaptation: lessons learned from a community-based workshop. *Environmental Science and Policy*, 17, 82-93.
- Poutiainen, C., Berrang-Ford, L., Ford, J., & Heymann, J. (2013). Civil society organizations and adaptation to the health effects of climate change in Canada. *Public Health*, 127, 403-409.
- Practical Action. (2010). *Governance for Community Based Adaptation. Discussion paper*. Bourton on Dunsmore Rugby: Practical Action, the Schumacher Centre for Technology and Development.
- Prutsch, A., Grothmann, T., Schausser, I., Otto, S., & McCallum, S. (2010). *Guiding principles for adaptation to climate change in Europe*. Bilthoven: The European Topic Centre on Air and Climate Change (ETC/ACC).
- Raymond, C.M., & Robinson, G.M. (2013). Factors affecting rural landholders' adaptation to climate change: Insights from formal institutions and communities of practice. *Global Environmental Change*, 23, 103–114.
- Reed, M. S., Podesta, G., Fazey, I., Geeson, N., Hessel, R., Hubacek, K., Thomas, A.D. (2013). Combining analytical frameworks to assess livelihood vulnerability to climate change and analyse adaptation options. *Ecological Economics*, 94, 66–77.
- Reid, H., & Huq, S. (2007). *Community-Based Adaptation: A Vital Approach to the Threat Climate Change Poses to the Poor. Briefing report*. London: International Institute for Environment and Development, IIED.
- Reid, H., Alam, M., Berger, R., Cannon, T., Huq, S., & Milligan, A. (2009). Community-based adaptation to climate change. In R. B. T. Cannon, *Participatory Learning and Action 60th edition* (pp. 11-29). Nottingham: Russell Press.
- Reid, H., Faulkner L., & Weiser A. (2013). *The role of community-based natural resource management in climate change adaptation in Ethiopia: Assessing participatory initiatives with pastoral communities. Climate Change Working Paper No. 6*. Retrieved from International Institute for Environment and Development, IIED: <http://pubs.iied.org/10048IIED.html>.
- Robledo, C., Clot, N., Hammill, A., & Riché, B. (2012). The role of forest ecosystems in community-based coping strategies to climate hazards: Three examples from rural areas in Africa. *Forest Policy and Economics*, 24, 20–28.
- Rodima-Taylor, D. (2012). Social innovation and climate adaptation: Local collective action in diversifying Tanzania. *Applied Geography*, 33, 128-134.

- Rodima-Taylor, D., Olwig, M.F. & Chetri, N. (2012). Adaptation as innovation, innovation as adaptation: An institutional approach to climate change. *Applied Geography*, 33, 107-111.
- Simane, B., & Zaitchik, B.F. (2014). The Sustainability of Community-Based Adaptation Projects in the Blue Nile Highlands of Ethiopia. *Sustainability*, 6, 4308-4325. doi: 10.3390/su6074308.
- Smit, B. (2001). Adaptation to climate change in the context of sustainable development and equity. In J. C. McCarthy, *Climate change 2001: impacts, adaptation and vulnerability* (pp. 877-912). Cambridge: Cambridge University Press.
- Sova, C.A., Chaudhury, A.S., Nelson, W.A., Nutsukpo, D.K., & Zougmore, R. (2014). *Climate Change Adaptation Policy in Ghana: Priorities for the Agriculture Sector. Working Paper, 68*. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security, CCAFS.
- Spires, M., Shackleton, S., & Cundilla, G. (2014). Barriers to implementing planned community-based adaptation in developing countries: a systematic literature review. *Climate and Development*, 6(3), 277-287. doi: 10.1080/17565529.2014.886995.
- Stanturf, J.A., Warren, M.L., Charnley, S., Polasky, S.C., Goodrick, S.L., Armah, F., & Nyako, Y.A. (2011). *Ghana climate change vulnerability and adaptation assessment*. Accra: USDA Forest Service.
- Stein, D., & Valters, C. (2012). *Understanding theory of change in international Development; Paper 1*. London: Justice Security Research Program and The Asia Foundation.
- Tembo, D. (2014). Building community resilience through an integrated approach in Malawi. *JotoAfrica*, 15, 3.
- Tanner, T. and Mitchell T. 2008. "Entrenchment or enhancement: Could climate change adaptation help to reduce chronic poverty?" *IDS Bulletin*, 39(4), 6–15.
- United Nations. (2012). *Gender mainstreaming: An overview*. Retrieved from United Nations: <http://www.un.org/womenwatch/osagi/pdf/e65237.pdf>
- United Nations Development Programme. (2010). *Integrating climate change into the management of priority health risks in Ghana*. Retrieved from United Nations Development Programme, UNDP: http://www.gh.undp.org/content/dam/ghana/docs/Doc/Susdev/UNDP_GH_SUSDEV_Climate%20change%20and%20health%20project.pdf
- United Nations Development Programme. (2010). *Gender, Climate Change and Community-Based Adaptation*. New York, NY: United Nations Development Programme, UNDP.
- United Nations Development Programme. (2013). *AAP Ghana - Mentoring and coaching initiative Field trip report on climate change adaptation measures at the Keta*

- municipality (25th -26th May, 2012)*. Accra: Programme, United Nations Development, UNDP.
- United Nations Environment Programme. (2009). *IEA Training Manual Volume Two Themes, Vulnerability and Impact Assessments for Adaptation to Climate Change*. United Nations Environment Programme, UNEP.
- United Nations Framework Convention on Climate Change. (2006). *Technologies for adaptation to climate change*. Retrieved from United Nations Framework Convention on Climate Change, UNFCCC: unfccc.int/resource/docs/publications/tech_for_adaptation_06.pdf
- United Nations Framework Convention on Climate Change. (2007). *Climate change: Impacts, vulnerabilities, and adaptation in developing countries*. Bonn: United Nations Framework Convention on Climate Change, UNFCCC.
- United Nations International Children's Emergency Fund. (2011). *Exploring the Impact of Climate Change on Children in South Africa. Summary of Findings*. Pretoria: UNICEF South Africa.
- United States Environmental Protection Agency. (2014). *Adaptation Overview*. Retrieved from United States Environmental Protection Agency, USEPA: <http://www.epa.gov/climatechange/impacts-adaptation/adapt-overview.html#content>
- Vardakoulias, O., & Nicholles, N. (2014). *Managing uncertainty: An economic evaluation of community-based adaptation in Dakora, Niger*. London: New Economic Foundation and CARE International.
- Vogel, I. (2012). *Review of the use of 'Theory of Change' in international development. Review Report*. London: UK Department for International Development, DFID.
- Wlokas, H., Rennkamp, B., Torres, M., Winkler, H., Boyd, A., Tyler, E & Fedorsky, C. (2012). *Low Carbon Development & Poverty: Exploring poverty alleviating mitigation action in developing countries*. Low carbon development and poverty (MAPS) 2012.
- Wong, S. (2009). Lessons from a participatory transboundary water governance project in West Africa. In T. C. H. Reid, *Participatory Learning and Action 60th edition* (pp. 99-105). Nottingham: Russell Press.
- World Bank. (2008). *Development and climate change; A Strategic Framework for the World Bank Group. Technical Report*. Washington DC: World Bank.
- World Bank. (2010a). *Economics of Adaptation to Climate Change: Social Synthesis Report*. Washington DC: World Bank.
- World Bank. (2010b). *Economics of Adaptation to Climate Change: Ghana*. Washington DC: World Bank.
- World Bank. (2011). *Vulnerability, Risk Reduction, and Adaptation to Climate Change, Ghana. Climate Risk and Adaptation Country Profile*. Washington DC: World Bank.

- World Health Organization. (2005). *Immunization Coverage Cluster Survey—Reference Manual*. WHO Document Production Services. Retrieved from World Health Organization, WHO: <http://www.who.int/vaccines-documents/DocsPDF05/www767.pdf>
- Wossen, T., Berger, T., Swamikannu, N., & Ramilan, T. (2014). Climate variability, consumption risk and poverty in semi-arid Northern Ghana: Adaptation options for poor farm households. *Environmental Development*, 12, 2–15.
- Würtenberger, L., Bunzeck, I. G., & Tilburg, X.L. (2011). *Initiatives related to climate change in Ghana: Towards coordinating efforts*. Retrieved from Energy research Centre of the Netherlands, ECN: <http://www.ecn.nl/docs/library/report/2011/e11010.pdf>



APPENDICES

Appendix A1: Basic information from households

Basic information used for descriptive analysis					
Variables	N	Min	Max	Mean	Std. Deviation
Community (1= Zambulugu, Saamini=2)	140	1.00	2.00	1.5714	.49665
Sex of household head (0=Female, Male=1)	140	.00	1.00	.2429	.43035
Age of household head (years)	140	26.00	85.00	52.4643	14.97980
Marital status (Married=3, widow=3)	140	1.00	3.00	1.1857	.58255
Formal Educational (No=1, Yes=0)	140	.00	1.00	.1071	.31041
Years of stay in community (years)	140	25.00	85.00	52.7286	14.99537
Num of persons in household (head count)	140	4.00	40.00	10.8500	6.46843
Num of males in a household (head count)	140	1.00	25.00	5.3143	3.74950
Num of females in a household (head count)	140	1.00	20.00	5.4786	3.50430
Num children in a household (head count)	140	.00	33.00	6.4214	4.16748
Num males children (head count)	140	.00	17.00	3.2071	2.48303
Num of female children (head count)	140	.00	16.00	3.1143	2.37822

Appendix A2: Cross tabulation of CBA strategies used by community, gender, marital status and educational of household heads.

CBA Strategy	Community		Gender		Marital status		Education	
	Zambu.	Saamini	Male	Female head	married	widowed	none	educa
VSLA	(19)32%	(71)89%	(67)63%	(23)67%	(79)62%	(11)85%	(81)65%	(9)60%
EBC	(15)25%	(0)0%	(10)9%	(5)15%	(14)11%	(1)8%	(14)11%	(1)7%
CIC/PSP	(4)7%	(5)6%	(9)9%	(0)0%	(8)6%	(1)7%	(8)6%	(1)7%
CA	(7)12%	(3)4%	(8)8%	(2)6%	(10)8%	(0)0%	(8)6%	(2)13%
CAAPs	(15)25%	(1)1%	(12)11%	(4)12%	(16)13%	(0)0%	(14)11%	(2)13%
Total	(60)100%	(80)100%	(106)100%	(34)100%	(127)100%	(13)100%	(125)100	(15)100

Appendix A3: T-test results socio-economic variables

variables	2014 mean	2010 mean	Mean difference
Crop income (GHC)	553.00	279.00	+274
Savings (GHC)	84.00	18.00	+66
Budget (GHC)	2,292.00	1,920.00	+372
Borrowing (GHC)	131.00	148.00	-17
Food availability (days)	210	150	+60
School attendance (days)	144	108	+36
Health condition (days)	290	284	+6

Appendix A4: Chi-square t-test for ALP sustainability

Relationship	Chi-square	df	Sig. /p-value
Sustainability*community	11.403	1	0.000
Sustainability* Level of benefits	29.175	1	0.000
Sustainability*year household received ALP	11.403	1	0.028

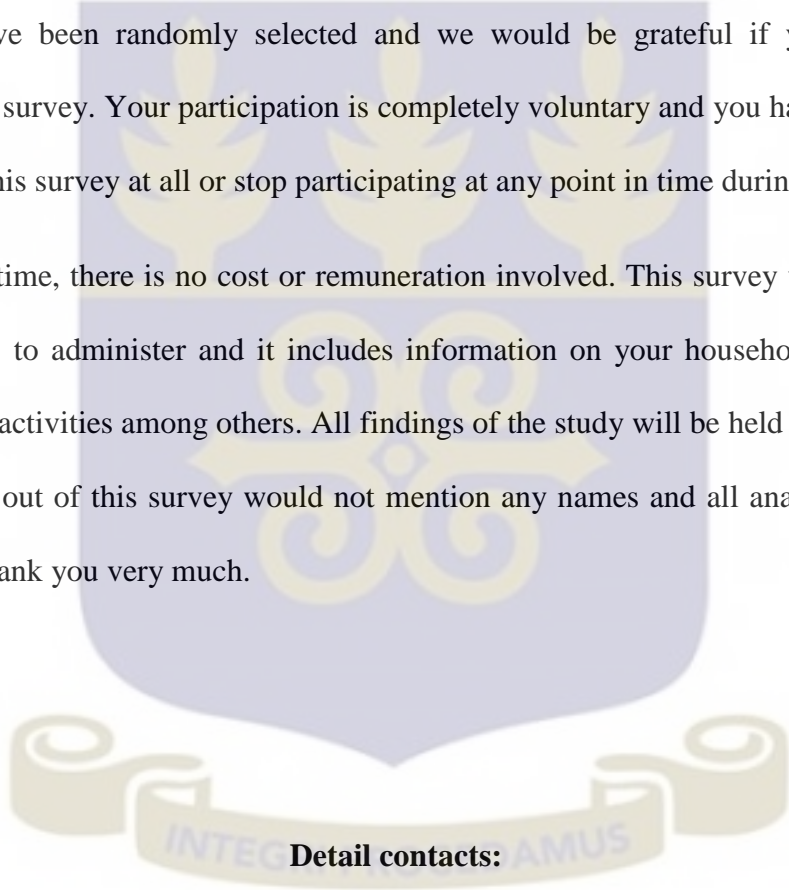
Appendix B: Household Questionnaire

UNIVERSITY OF GHANA

CLIMATE CHANGE SUSTAINABLE DEVELOPMENT (CCSD)

The main objective of this study is to identify the socio-economic benefits of ALP on the livelihoods of households in the East Mamprusi District. The study is in partial fulfillment for the award of an MPhil degree in Climate Change and sustainable development (University of Ghana). You have been randomly selected and we would be grateful if you could kindly participate in this survey. Your participation is completely voluntary and you have the right NOT to participate in this survey at all or stop participating at any point in time during the survey.

Apart from your time, there is no cost or remuneration involved. This survey which would take about 20 minutes to administer and it includes information on your household characteristics, crop yields, ALP activities among others. All findings of the study will be held in confidentiality. All reports made out of this survey would not mention any names and all analysis would be in general terms. Thank you very much.



Detail contacts:

Prince Ansah

Climate Change and Sustainable Development

University of Ghana, Legon

pansah005@st.ug.edu.gh

0241804414

Household Level Questionnaire

Questionnaire ID:	Date
District:	District code:
Community:	Community code:

A. General Information

1. Household code: [.....]
2. Sex of respondent: [] 1=Female 0=Male
3. Age of respondent: [.....]
4. Highest level of formal education of respondent: [] 0=None
1=Basic(Primary/JHS/Middle) 2=Secondary (Secondary/Vocational) 3=Tertiary
(Training college/Polytechnic/University)
5. Marital status of respondent: [] 0=Single 1=Married 2=Divorced/Separated 3=Widowed
6. Years of respondent’s stay in the community: []
7. Is the respondent the head of the household? (If man is away >6months/yr, then woman is head)? [] 1=Yes 0=No, If yes, skip to question 13.
8. Sex of the head: [] 1=Female 0=Male
9. Age of head: [.....]
10. Highest level of formal education of head..... 0=None 1=Basic(Primary/JHS/Middle)
2=Secondary (Technical/Vocational) 3=Tertiary (Training college/Polytechnic/University)
11. Marital status of head: [] 0=Single 1=Married 2=Divorced/Separated 3=Widowed
12. Household head’s years of stay in the community: [.....]

B. Household Composition

13. How many persons are in this household? Total: [.....] Male: [.....] Female: [.....]
14. Number of persons with ages below 15 years. Total: [.....] Males: [.....] Females: [.....]
15. Number of persons between ages 15 and 65 years. Total [.....] Males: [.....] Females: [.....]
16. Number of persons with ages above 65 years. Total: [.....] Males: [.....] Females: [.....]

C. Access to credit and income sources

17. What was the main income source (occupation) of the head of the household in before the ALP (2010)? [.....] 1=farming 2=Petty trading 3=Craftsmanship 4=Salaried work (formal sector) 5=other (specify)
18. What is the main income source (occupation) of the head of the household after the ALP (2014)? [.....] 1=farming 2=Petty trading 3=Craftsmanship 4=Salaried work (formal sector) 5=other (specify):
19. Are members of your household engaged in any off-farm income generating activities? [.....] 1=Yes 0=No,
20. If yes, please provide the details below

Activity	Before ALP (2010)	After ALP (2014)
Petty trading		
Handicrafts making		
Shea butter processing		
Pito brewing		
Dawadawa processing		
other		

21. How often did you borrow any money from relatives/friends before ALP? [] 1=never 2=not often 3=often 4=very often, what was the average amount borrowed? [.....]
22. How often do you borrow any money from relatives/friends after ALP? [] 1=never 2=not often 3=often 4=very often, what is the average amount borrowed? [.....]

23. Have you borrowed any money before from the community savings and loans? [] 1=Yes
0=No, If yes,

24. What did you use it for? [.....]

25. Did you lend any money to relatives/friends in the past 12 months? [] 1=Yes 0=No

D. Household education/health/capacity/knowledge

26. Do the children in the household attend school? [] 1=Yes 0=No

27. How often did your children have to miss school due to lack of food, health or finances before the ALP? [...] 1= never 2=not often 3= often 4= very often

28. What was the average number of days in a week absent from school in 2010? 1= once 2= twice 3= thrice 4=forth 5= fifth.

29. What was the average number of days in a week absent from school in 2014? 1= once 2= twice 3= thrice 4=four times 5= five times.

30. How frequently were you able to afford basic school requirements for your children at school before the ALP (2010)? [...] 1= never 2=not frequent 3= frequently 4=very frequently

31. How frequently were you able to afford basic school requirements for your children at school after the ALP (2014)? [...] 1= never 2=not frequent 3= frequently 4=very frequently

32. How often do any of your household gets ill that they had to miss school or work in before the ALP (2010) [...] 1= never 2=not often 3= often 4= very often

33. How many months in a year? [.....]

34. How often do any of your household gets ill that they had to miss school or work in before the ALP (2010) [...] 1=never 2= not often 3= often 4= very often

35. How many months in a year? [.....]

36. What is the most suffered illness observed in your household?
.....

37. Did the women in the household contribute in decision making before the ALP? [...] 1= never 2= not always 3= Always

38. Did the women in the household contribute in decision making after the ALP? [...] 1= never 2= not always 3= Always

39. Have you noticed a change in the role women play in the household? [...] 1= Yes 0= No

40. What are the changes observed? (a)..... (b).....

41. Do you feel you have obtained the capacity to support your household after the ALP? [...] 1=Yes,0=No, if no why.....

42. What other social benefit has the ALP brought to your household and community?

E. ALP between 2010 and 2014

43. When did you start benefiting from the ALP? [...] 1=2010 2=2011 3=2012 4=2013 5=2014

44. Did you have any intervention before the introduction of the ALP? 1=Yes 0=No,

45. If Yes, what was the intervention and where was it from?

46. What adaptation strategy from ALP has been the most helpful and relevant to you and your household?

Adaptation strategies

47. How beneficial has the introduction of CBA strategies been to you? [...] 1= not beneficial 2=little beneficial 3= beneficial 4=very beneficial

48. What are the social and economic outcomes obtained from the ALP

Economic outcome	Social outcome

49. What crops did you cultivate in 2010	50. Area of size cultivated 2010 (hectares)	51. Harvest of this crop per planting season 2010 (100kg).	52. % consumed 2010	53. % sold 2010	54. Total value of crops sold 2010 (GHC)

55. What crops did you cultivate in 2014	56. Area of size cultivated 2014 (hectares)	57. Harvest of this crop per planting season 2014 (100kg).	58. % consumed 2014	59. % sold 2014	60. Total revenue from sold 2014 (GHC)

61. Livestock and poultry 2010	62. Number (headcount) 2010	63. % number (head count) 2014

64. No. of months food is available in a year (2010)	65. No. of months food is available in a year (2014)	66. Household Savings (2010)	67. Household Savings (2014)	68. Household budget for the year (2010)	69. Household budget for the year (2014)

70. How many months are you able to use monies saved or borrowed to purchase food during the lean seasons?.....

71. What other benefits have you obtained from the ALP aside the socio-economic benefits?
 (a)..... (b).....

72. Have you observed any challenges with the ALP? [.....] 1=Yes 0=No, If yes what are they

73. Rank the challenges with most challenging ranked 1.

challenges	Period of time

74. Are the programme officers aware of these challenges? [.....] 1=Yes 0=No

75. Are there efforts to address these challenges? [.....] 1=Yes 0=No

76. What are the specific efforts to address these challenges?

77. Any other information you want to add?

End of Questionnaire. Thank you very much!

Appendix B2: Focus group discussion checklist

Checklist for Community Focus Group Discussion

1. Community identification

Questionnaire ID:		Date:	
District		Community:	
GPS coordinates	X	Y	Altitude
Facilitator 1			
Facilitator 2			

2. Demographic characteristics

Categories	Total	Males	Females	Occupation		
				Farming	Trading	Other
Interview group composition						
No. of female head households						

3. Available services in the community (multiple choice)

1=Basic school 2=Health Post 3=Electricity 4=Extension post 5=Formal credit post 6=Area Council 7=church 8=mosque 9=other (specify):

4. Is there a market in this community? [] 1=Yes 2=No
5. If no how far away is the nearest market? [] km
6. How many drought situations have been experienced in this community before the ALP?
7. How many flood situations have been experienced in this community after the ALP?
8. What changes have been observed in the weather?

- (a).....
 (b).....

9. What were the Prevailing conditions, the immediate, medium term and the long term

Prevailing conditions	Immediate outcome	Medium-term	Expected/long term impacts

impacts of climate change before ALP?

10. What were the adaptation strategies used to meet these prevailing conditions

Prevailing condition	Adaptation strategy	Rank

(Most important adaptation strategy rank=1)

11. What are the social and Economic benefits from the ALP?

Economic benefits	Rank	Social benefits	Rank

(Most important benefit rank=1)

12. Are men and women working together? [] 1=Yes 2=No

13. What separate roles did men and women play before and after the ALP?

Role of men before ALP	Role of men before ALP	Role of women before ALP	Role of women before ALP

14. Have you observed any challenges with the ALP? [] 1=Yes 2=No

15. What are those challenges that are hindering the effectiveness of the ALP?

Challenges with ALP	Rank

(Most observed challenge rank=1)

Appendix C: Pictures from the field



Early bulking cassava in Zambulugu



Millet yields for sale



CIC building in Saamini.



Public announcement system provided by ALP



Rain gauge for early warning system



Traditional silos for storing cereals